



C E N T E R F O R
FOOD SAFETY

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The Wheel of Life

Food, Climate, Human Rights,
and the Economy

By Debbie Barker, Center for Food Safety



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EXECUTIVE SUMMARY

The links between climate change and industrial agriculture create a nexus of crises—food insecurity, natural resource depletion and degradation, as well as human rights violations and inequities.

While it is widely recognized that greenhouse gas (GHG) emissions due to human activity are detrimental to the natural environment, it can be difficult to untangle the cascading effects on other sectors. To unravel some of the effects, this paper focuses on three interrelated issues:

- 1) What are the critical links between climate change and agriculture?
- 2) How is the nexus of agriculture and climate change affecting human societies particularly regarding food and water, livelihoods, migration, gender equality, and other basic survival and human rights?
- 3) What is the interplay between economic and finance systems, on the one hand, and food security, climate change, and fundamental human rights, on the other?

In the process of drawing connections among these issues, the report will identify the commonality of drivers, or “push” factors, that lead to adverse impacts.

A central theme throughout this report is that policies and practices must *begin* with the ecological imperative in order to ensure authentic security and stability on all fronts including food, water, livelihoods and jobs, climate, energy, and economic. In turn this engenders equity, social justice, and diverse cultures. This imperative, or ethos of nature, is a foundation that serves as a steady guide when reviewing mitigation and adaptation solutions to climate change.

Infused within this theme is the sobering recognition that current consumption and production patterns are at odds with goals of reducing GHGs and attaining global food security. For instance, consumption and production levels, based on the global average, are 25 percent higher than the earth’s ecological capacity.¹ As societies address the myriad ecological and social issues at the axis of global warming, a central task will be to re-align consumption and production trends in a manner that can fulfill economic and development requirements. This will require a major shift away from present economic growth paradigms based on massive resource extraction and toward creating prosperous and vital societies and economies that preserve the planet’s environmental capacity.

How urgently and effectively we mobilize and respond to global warming and its associated impacts will be a test of our collective humanity. The challenge requires that a broad, diverse coalition of civil society movements unite to ensure that proposed solutions maintain ecological integrity, which in turn helps to secure human rights. To facilitate alliance building, the paper provides a compendium of organizations engaged in and writing on these issues.

Policies and practices must begin with the ecological imperative in order to ensure authentic security and stability on all fronts.

Part I: Climate Change and Food Security Links

Impacts on Food Security and Rural Livelihoods

A recent World Bank report concludes that current agricultural practices account for more than 30 percent of global GHG emissions.² Concurrently, global warming negatively affects food production.

With a probable temperature rise of 1.8 to 4 degrees Celsius (C), and a possible rise of up to 6.4 degrees C, the impact of global warming on agriculture will be devastating.³ According to the Intergovernmental Panel on Climate Change (IPCC) and other sources, crop productivity will decline in Central America, South and Southeast Asia and sub-Saharan Africa. It is particularly troubling that yield declines of 20 to 40 percent are anticipated for major food crops in Africa well before 2050.

The World Bank frames the stark situation: Almost 80 percent of global warming effects will be suffered by developing countries, even though they contribute only about 30 percent of global GHG emissions.⁴ (This includes historical and cumulative emissions of China and India since 1850.⁵) Given that agriculture provides livelihoods for 40 percent of the global population, with 70 percent of the poor in developing countries depending on agriculture for their subsistence, there is an urgent need for concerted adaptation strategies and actions.⁶

Adding to the aforementioned figures and projections is the tragic reality that already more than 1 billion people go hungry every day.⁷ This further emphasizes that mitigation and adaptation solutions in agriculture need to simultaneously address hunger, livelihoods, social inequities, and environmental sustainability.

A 2009 joint assessment report of the World Bank and the United Nations (UN) by over 400 researchers and scientists concludes that “business as usual” policies and actions need to shift away from industrial food systems to more sustainable agricultural practices. Other reports concur, and specifically address agriculture within the context of climate change. A recent report presented to the United Nations Human Rights Council by Special Rapporteur on the Right to Food, Olivier De Schutter, expresses a clear view: “Conventional farming relies on expensive inputs, fuels climate change, and is not resilient to climatic shocks. It simply is not the best choice anymore today.”⁸

An FAO report states: “*Extreme weather fluctuations present a growing threat to agriculture. Organic systems appear to be more stable and resilient in response to climate disruption based on comparisons with their conventional counterparts under stress conditions such as severe drought and flooding.*”⁹

Agroecological, Organic Food Models: Keys to Resolving Myriad Crises

Currently, climate change and food security dialogues in international and most domestic fora assume that expensive agricultural inputs and technologies are the primary way to address hunger, environment, and social harms. However, there is another way forward—societies can provide tools and incentives that encourage and enhance a transition away from industrial agriculture toward low-cost, viable agroecological, organic farming methods.

Mitigation and adaptation solutions in agriculture need to simultaneously address hunger, livelihoods, social inequities, and environmental sustainability.

This report provides a plethora of robust research demonstrating that agroecological agriculture offers hope for resolving several crises simultaneously. As these studies demonstrate, organic food systems are the path toward ensuring food security and addressing major health, environmental, economic, and social challenges facing the world today.

In this report, the terms “ecological,” “organic,” “traditional,” and “agroecological” denote farming practices that: a) do not use synthetic chemicals and pesticides; b) regenerate soil quality through the use of manures, compost, cover crops, crop rotations; c) utilize integrated pest, or biological, management systems; d) incorporate water conservation practices; and e) cultivate diverse crops to maintain biodiversity. Biodynamic and permaculture systems are also encompassed within these criteria. The use of “organic” does not refer to any certification criteria. Within these practices, a high value is placed on farmer innovation, knowledge, and skill; dignified livelihoods and vital community-based economies; and cultural and social diversity.

Studies also show that organic systems have exciting potential to mitigate global warming. A thirty-year study by the Rodale Institute demonstrates that organic regenerative agriculture practices could sequester nearly 40 percent of current carbon dioxide (CO₂) emissions (based on the planet’s 3.5 billion tillable acres).¹⁰

This section also addresses the perpetual question—Can organic farming feed the world? *Vigorous research demonstrates that organic methods can produce yields equal to or higher than industrial agriculture yields.* “Model estimates indicate that organic methods could produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population without increasing the agricultural land base,” states a report based on a long-term, comprehensive global research project.¹¹ Based on 293 test cases, the research found that, in developing countries, organic methods produced 80 percent higher yields than industrial farms.¹² A review of 40 projects in 20 African countries is particularly relevant to anticipated impacts of climate change in Africa. Farms using ecological farming methods such as plant breeding, integrated pest management, soil and water conservation, and agro-forestry more than doubled crop yields over a period of 3-10 years.¹³

Despite numerous studies demonstrating the multiple benefits of agroecological farming, many governments and institutions still advocate the industrial agriculture paradigm as a prime way to reduce GHGs and provide food security. In part this is due to the influence of multinational corporate agribusiness. The concentration of corporate power amplifies the influence they have in shaping policies as well as trade and financial agreements, and financial rules. For example, on the agriculture front—as of 2005, the top 10 commercial seed companies controlled more than 67 percent of the world’s commercial seed sales. Five grain trading companies control 75 percent of the world’s cereal commodity market and its prices. The top 10 agrochemical companies control 80 percent of global sales.¹⁴

Another influencing factor that could explain why most business interests are biased toward industrial agriculture technologies is because multi-functional, ecological food systems with low external inputs do not provide the same level of returns on investment for business and financial institutions as do current industrial systems.

Organic methods can produce yields equal to or higher than industrial agriculture yields.

Environmental Legacy

Contrasting environmental and social legacies of industrial practices to organic methods can help to clarify valid mitigation and adaptation proposals. For example, the nearly 1 billion pounds of pesticides used annually in the U.S. over the last several decades has polluted the air, waterways, soils, created “dead zones” in oceans, negatively impacted wild life, and more. These environmental stresses were created independent of climate change and therefore, it is necessary to recognize these negative historical precedents so they can be avoided in proposed strategies for addressing global warming.

Green Revolutions

Many governments and institutions are calling for a “second Green Revolution” to address agricultural policy within the United Nations Framework Convention on Climate Change (UNFCCC) and other international fora; therefore, a brief review of Green Revolution practices is also included.

The Green Revolution, an extension of industrial agricultural practices into developing countries, began primarily in India in the late '60s but the model has been replicated throughout many regions during the last few decades. In sum, the model requires farmers to purchase commercial seeds, known as high-yielding varieties (HYV), and requisite inputs such as pesticides and synthetic nitrogen fertilizer. The seeds also require high amounts of water for optimum performance. While these methods can increase yields in the short term, the intensive chemical and water usage have compromised the health of soils, waterways, biodiversity, and other natural resources essential for ensuring long-term food security.

African countries are a central focus of the second Green Revolution. However, as Gathuru Mburu, coordinator of the African Biodiversity Network explains, “The Green Revolution is not new to Africa. Countries in Africa have had a green revolution in their own way because we have been using fertilizers, we have been using herbicides and fungicides.” She concludes, “For small-scale farmers, the backbone of food security in Africa, this system has failed.”¹⁵ Contrasting Green Revolution industrial approaches with ecological models can provide guidance for how to go forward in times of climate chaos and food insecurity.

The Role of Genetically Engineered (GE) Seeds and Crops

Genetically engineered (GE) seeds and crops are strongly promoted within the second Green Revolution construct. GE proponents advocate that this technology has the capacity to mitigate GHG emissions and provide food security, yet this report demonstrates that such claims are simply not credible given the performance and scientific record to date. For example, counter to industry claims that GE crops reduce pesticide usage, the U.S. Department of Agriculture (USDA) recently released data finding that GE crop acres in the U.S. used over 26 percent more pesticides per acre than non-GE, conventional crops.¹⁶

In part, GE crop’s high chemical usage is due to the fact that weeds are developing resistance to the toxic herbicide, glyphosate, currently being used. In response, the industry is moving on to stronger chemicals. Dow AgroScience is await-

ing approval for GE crops that are resistant to 2, 4-D, an ingredient of Agent Orange, the deadly defoliant sprayed during the war in Vietnam during the 1960s and 1970s.

International institutions and governments are exploring funding mechanisms that may help advance GE technologies. The biotechnology industry is strongly positioning itself. Approximately 1,663 patent applications for “climate-ready” crops have been submitted for approval since June 2008 to June 2010. Three companies—DuPont, Monsanto and BASF—comprise 66 percent of the patents.¹⁷ Such proprietary dominance has significant societal and economic implications and should stimulate robust discussion about the control of seeds and, ultimately, food supply.

Climate Change Discussions and the Role of Civil Society

Finally, we turn to crucial issues raised within the UNFCCC, including agricultural mitigation and adaptation measures. Many proposed solutions are based on the very industrial agriculture paradigm that has contributed to global warming and has also failed to feed the world. With the recent emergence of agriculture as a major issue at the UNFCCC negotiations, there is a need for heightened civil society engagement.

Most governments, multinational agribusinesses, and financial institutions assume that industrial technologies in agriculture are the primary way to feed a hungry world and curb global warming. Civil society can shift discussions away from this paradigm and steer actions toward regenerative food systems that address environmental and social challenges in a more comprehensive, systemic manner.

Civil society can also play an important role in persuading the donor and business communities to re-assess potential biases toward industrial agriculture and re-direct funds toward agroecological models.

A New Way Forward

The section ends with a summary of policies and actions that governments/nation-states, donors, and international institutions can implement. The recommendations emphasize building on-farm capacity as a better way of ensuring food security and sustaining natural resources as well as fostering self-reliant, vigorous rural economies, especially in vulnerable communities.

Part II: Links Between Climate Chaos, Food Security, Migration, and Gender Issues

The trajectory of climate change demonstrates how ecological destruction affects not only survival rights but also human rights, including those of migrants and women. Just as the ethos of nature serves as a beacon of reason when devising food security strategies, maintaining ecological integrity is equally critical when establishing genuine security and rights on all fronts.

Many solutions proposed by the UNFCCC are based on the very industrial agriculture paradigm that has contributed to global warming and has also failed to feed the world.

Migration

Environmental shocks and stresses, especially those related to climate change, are pushing millions of people to leave their homes and land. As impacts of climate change worsen, migration density and patterns will escalate. A recent 2010 report by the International Organization for Migration predicts an explosion in global migrant populations that could reach 406 million by 2050.¹⁸

Human rights issues are fundamentally linked to nature and access to natural resources, yet often proposed mitigation and adaptation solutions are framed within an industrial paradigm and thus, de-linked from nature. For instance, under the banner of alleviating global warming and/or enhancing food security, large tracts of land within some of the poorest countries are being purchased by rich countries largely to provide food and fuel for their domestic populations. These foreign land acquisitions (FLAs), dubbed as "land grabs" by civil society, result in mass displacement of people from their homes and lands, which constrains access and availability to natural resources. Alongside social, political, and economic factors, natural resource and environmental conflicts exacerbate unstable situations and escalate conflicts. There are three categories of human migration and displacement reviewed in this report:

- 1) Chronic, Slow Onset Natural Resource Degradation: This is brought on by shortages of water, food, land, and damage and depletion of natural resources.
- 2) Sudden, Catastrophic Natural Disasters: The 2010 flooding in Pakistan is an example of this category. The United Nations tells us that these sudden disasters impact the largest numbers of displaced persons.
- 3) Mitigation Projects/ Land Use Changes: Many mitigation and adaptation schemes fall under this category. The report focuses especially on this category.

Foreign Land Acquisitions, Or Land Grabs

Foreign Land Acquisitions (FLAs) are fast becoming a dominant contributor to massive migrations. As already noted, land grabs primarily impact the poorest and most vulnerable communities and can lead to tragic consequences. For example, of the 405 FLAs reviewed by the World Bank (Foreign Investment Review Board Annual Report 2006-7, 2008), the majority of the projects were primarily devoted to biofuel crops and cash crops for export. This leaves local populations landless and hungry. Such schemes should be fully examined to ensure that vulnerable populations are not displaced and denied. Reviewing the actors and push factors driving this rapidly growing phenomenon suggests responses that can stop the displacement of millions of people.

Impacts on Gender

As Jacques Diouf, director-general of the Food and Agriculture Organization (FAO) proclaimed at a recent press conference in Rome: "Gender equality is not just a lofty ideal, it is also crucial for agricultural development and food security."¹⁹ Rural women are the backbone of agriculture throughout much of the developing world. They produce half of the world's food; in some developing countries women produce as much as 80 percent of the food.²⁰ It is estimated that women's agricultural work produces 35-45 percent of gross domestic product (GDP) in developing countries.²¹

"Gender equality is not just a lofty ideal, it is also crucial for agricultural development and food security." (FAO)

Comprehensive analyses on gender equality issues are essential when addressing climate change and food security initiatives. Yet, remarkably, gender impacts of policies and programs are still frequently ignored. For example, the Committee on World Food Security acknowledged that women farmers receive only 5 percent of agricultural extension services worldwide.²²

As industrial agriculture and globalization expands, women are increasingly joining the ranks of migrant laborers. Often women are subject to low levels of protection in terms of wage levels, employment security, health and safety, and environmental standards and social security. Women typically earn less than men for the same agricultural work. For example, in Bangladesh, female fry catchers and sorters earn about 64 percent of what male fry catchers and sorters earn.²³ Additionally, representation of women in traditional labor institutions is weak.

While economic indicators are often looked to as a guide for measuring progress for women, the majority of women in the world remain in unpaid, informal economic sectors that are closely linked to the state of natural resources and the environment. Thus, for most women environmental factors are the indicators of their quality of life. Climate change and environmental degradation impact women more immediately and keenly in their everyday lives.

Global warming and associated impacts—rise in sea levels, increase in droughts and floods, and other such occurrences—impact women in a disproportional way as many provide most of the household food and subsistence and serve as the primary caregiver. Such unpaid work in the informal sector is frequently unrecognized within international policies and agencies and therefore the value of this “care economy” is not considered when undertaking climate change mitigation and adaptation measures.

Women play a central role in agriculture and are on the “front lines” experiencing climate change-related impacts on natural resources. Civil society can fulfill a pressing need to comprehensively incorporate gender issues into climate and agriculture arenas. Particularly relevant to linking climate change and gender policies is to ensure that women’s traditional care and unpaid contributions are not externalized, but instead are fully recognized in economic, social, and development constructs.²⁴

Climate change and environmental degradation impact women more immediately and keenly in their everyday lives.

Part III: Economic and Finance Systems: Across Ecological and Human Rights Sectors

Finance, economic and trade policies, climate change, and food security are integrally connected, yet these issues are too often segmented into separate governmental and policy arenas. As a result, policies and proposals frequently fail to encompass a broad systemic analysis. At times, actions in one arena can thwart or contradict actions within other policy fora.

For example, the *raison d’être* of international economic and trade entities such as the World Trade Organization (WTO) is to stimulate and increase economic activity. This goal is fundamentally at odds with the UNFCCC goal of reducing actions that lead to global warming. Currently, these two goals are on a serious collision course. Within this context, two aspects of the tension between paradigms are discussed: The role of trade and economic institutions, and the role of the “casino economy.”

The Role of Economic Growth

Growth is touted as the universal economic cure-all, yet there is a fundamental tension between promoting economic growth and the need to reduce GHG emissions as well as maintain ecological harmony.

As author and environmental advocate Jerry Mander wrote recently in *The Guardian*: "Whether it's the political left or right, Obama, or Cameron, or Sarkozy, or Putin, or Wen, or Harper, or Miliband, or Gingrich, or Palin, or any political candidate for any office, they're all talking about the necessity to stimulate growth. ... But there's a missing link in the discussion, ignored by nearly everyone in the mainstream debate: nature."²⁵

Economies are linked to a fixed amount of natural resources, yet most political leaders and societies carry on as though economic activity is not connected to any other reality—the reality that we live in a planet of finite resources. While increasing populations certainly add to planetary stresses, the relentless consumerism of industrialized countries continues to be a prime culprit of natural resource depletion. For instance, the richest fifth of the world's people consumes 86 percent of all goods and services, while the poorest fifth consumes just over 1 percent.²⁶

But what about notions of sustainable growth? According to economist Herman Daly, "To delude ourselves into believing that growth is still possible and desirable if only we label it 'sustainable' or color it 'green' will just delay the inevitable transition and make it more painful."

This has implications for the kinds of policies pursued in venues such as the UNFCCC where a central challenge is how to provide development space for poorer countries while also reducing hyper-consumption in the North. To meet this enormous challenge, societies need "a radical paradigm shift in production systems, in economic and business models..." says Martin Khor, director of the South Centre.

Economy: Speculating on Food Security

The policies and speculative activities of financial markets have a dramatic influence on food security and poverty. Gambling on food commodities was a major factor leading to the 2007-2008 food crisis that resulted in the rise of extreme poverty levels by 130 to 150 million people, according to the UN Special Rapporteur on the Right to Food, Olivier De Schutter. He concluded: "A significant portion of the increases in price and volatility of essential food commodities can only be explained by the emergence of a speculative bubble."²⁷ For instance, the price of rice rose by 165 percent between April 2007 and April 2008, a magnitude difficult to explain by supply and demand market fundamentals alone, especially given that rice supplies were not unusually low during this period.²⁸

Most experts agree that unless market and financial reforms are made, the cycle will repeat itself. This report reviews the complex world of futures markets, speculation, and other high finance to demonstrate how these mechanisms impact issues such as food security.

Economic Trade Institutions—Effects on Climate Change, Food Security, and Financial Reforms

As already noted, the WTO and other trade agreements intensify economic activity that is at odds with the goal of addressing global warming. Unlike the UNFCCC, the rules of the WTO are binding and have enforcement capacity. To illustrate: The WTO has stated that member nations can challenge measures to reduce GHG emissions.²⁹ Such global trade rules and policies that constrain the ability of nations to enact measures that reduce GHG emissions need to be reviewed and amended.

As a result of lifting “trade barriers,” via the WTO and other trade agreements, developing countries have been increasingly forced to give up appropriate national farm and food policies that protect their own farmers and domestic food security. For instance, prior to the WTO, many developing countries grew 90 percent of the food they consumed domestically.³⁰ Today, 55 percent of developing countries are net food importers.³¹ (See *Developing Country Indicators* for more data.) This report also discusses how global trade rules restrict the ability of domestic governments to appropriately regulate their own financial sectors.

Opportunities for Civil Society

The connections between cross-sectoral issues discussed in this report provide unique opportunities for civil society to build a diverse movement to work toward common solutions on issues that seem disconnected from one another. For example, NGOs working on climate change fronts may benefit from more closely aligning with trade groups. Food and farm NGOs can greatly advance efforts toward reducing hunger and poverty by coordinating with groups working on domestic and international finance reform. Citizens must ensure that the rights of investors are not being secured at the expense of human rights and the rights to food.

Sharing information and strategies on a cross-sectoral basis will help stimulate movements toward common goals. Stemming from diverse civil society perspectives and approaches, a central goal of this report is to facilitate rigorous, and more unified analyses and actions that lead to profound and rapid change.

Conclusion

Addressing the challenging issues of climate change, food security, and human rights—notably migration and gender equality as discussed in this report—requires bold, new thinking and strategies. Most of all it will require that governments, opinion leaders, and civil society highlight the central role of food systems and promote new visions and solutions grounded in ecological and social justice principles that relate to people’s everyday realities. Civil society can galvanize and encourage ambitious public policies that realize goals of building climate and food security and safeguarding human rights.

Civil society can galvanize and encourage ambitious public policies that realize goals of building climate and food security and safeguarding human rights.

References

- 1 World Summit on Sustainable Development, *Facts about consumption and production patterns*, Johannesburg, South Africa, August/September 2002.
- 2 Dipti Thapa and Marjory-Anne Bromhead, *The Hague Conference on Agriculture, Food Security and Climate Change, Opportunities and Challenges for a Converging Agenda: Country Examples*, issue brief, Conference ed., World Bank, 2010, p. 2.
- 3 IPCC, *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, in: B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds.), *Agriculture*, Cambridge University Press: Cambridge, 2007.
- 4 World Bank, "Climate Smart" World Within Reach, Says World Bank, news release, November 9, 2009, <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:22384188~pagePK:34370~piPK:34424~theSitePK:4607,00.html>.
- 5 World Resources Institute, http://pdf.wri.org/navigating_numbers_chapter6.pdf
- 6 IAASTD, *Agriculture at a Crossroads: Global Summary for Decision Makers*, publication, Washington, D.C.: Island Press, 2009, p. 8.
- 7 FAO, *1.02 Billion People Hungry*, news release, 19 June 2009, Food and Agriculture Organization of the United Nations, <http://www.fao.org/news/story/en/item/20568/icode/>.
- 8 United Nations Standing Committee on Nutrition, http://unscn.org/layout/modules/news/documents/Agroecology_press_release.pdf.
- 9 Environment and Natural Resources Service Sustainable Development Department, *Organic agriculture, environment, and food security*, Hattam, C. and N. Scialabba (eds.), FAO, Rome, 2002.
- 10 Tim J. LaSalle and Paul Hepperly, *Regenerative Organic Farming: A Solution to Global Warming*, (Rodale Institute, 2008), http://www.rodaleinstitute.org/files/Rodale_Research_Paper-07_30_08.pdf.
- 11 Catherine Badgley et al., *Organic Agriculture and the Global Food Supply*, Cambridge Journals, 9 June 2006, Introduction, doi:10.1017/S1742170507001640.
- 12 Ibid.
- 13 J. Pretty et al., *Sustainable intensification in African agriculture*, in: *International Journal of Agricultural Sustainability*, 9:1, forthcoming in 2011.
- 14 ETC Group, <http://www.etcgroup.org/en/node/5237>.
- 15 Inter Press Service, <http://ipsnews.net/africa/nota.asp?idnews=46015>.
- 16 Dr. Charles Benbrook, *Impacts of Genetically Engineered Crops on Pesticide Use in the United States: The First Thirteen Years*, 'The Organic Center, Nov. 2009, p. 47 & Supplemental Table 7, http://www.organic-center.org/science.pest.php?action=view&report_id=159.
- 17 ETC Group, <http://www.etcgroup.org/en/node/5237>.
- 18 International Organization for Migration, <http://www.iom.int/jahia/Jahia/about-migration/lang/en>
- 19 FAO, *Closing the gender gap in agriculture: FAO report makes strong business case for investing in women*, news Release, 7 March 7 2011, <http://www.fao.org/news/story/en/item/52011/icode/>.
- 20 *Women Thrive Worldwide: The Effect of the Food Crisis on Women and Their Families*, report, September 2008, <http://www.womenthrive.org/images/food%20crisis%20%26%20impact%20on%20women.pdf>.
- 21 Sabiha Ibrahim, *Dismantling Poverty and Building Economic Security Fact Sheet on Data & Policy: A Survey of Women's Funds Programs*, Women's Funding Network, 2009, http://www.womensfundingnetwork.org/sites/wfnet.org/files/WomensFunds_Survey_HumanSecurity.pdf.
- 22 *Women Organising for Change in Agriculture and NRM*, Women Leaders' Dialogue, 36th session of the Committee on World Food Security, 13 October 2010.
- 23 USAID, *USAID Women in Development (WID): Value Chain Analysis by the Women's Economic Growth Greater Access to Trade Expansion*, U.S. Agency for International Development, 11 March 2009, Wage Differentials, http://www.usaid.gov/our_work/cross-cutting_programs/wid/eg/gate_valuechain.html.
- 24 Liane Schalatek, *More than an Add-on: The Centrality of Gender Equality for Development and Climate Solutions. A Look at Gender at IDA 16*, Heinrich Boell Stiftung North America.
- 25 Jerry Mander, *Climate Change v. Capitalism*, Guardian.co.uk, 15 October 2010, <http://www.guardian.co.uk/music/2010/oct/15/climate-change-economic-growth-capitalism>.

- 26 Maude Barlow, *Blue Gold, The Global Water Crisis and the Commodification of the World's Water Supply*, report, Spring 2001, "Unequal Access," http://www.blueplanetproject.net/documents/BlueGold_revised_01.pdf.
- 27 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief, Geneva, Switzerland: United Nations, 2010, p. 1-2, http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf (accessed 18 January 2011).
- 28 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief, Geneva, Switzerland: United Nations, 2010, p. 3, http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf (accessed 18 January 2011).
- 29 Public Citizen, <http://www.citizen.org/Page.aspx?pid=2131>.
- 30 S. Murphy, *Managing the invisible hand: Markets, farmers and international trade*, Minneapolis: Institute for Agriculture and Trade Policy, 2000.
- 31 Trade InvestSA Staff, *SA Should Become a Net Exporter of Food Again*, TradeInvestSA - Business, Trade and Investment Opportunities in South Africa, 8 August 2008, <http://www.tradeinvestsa.co.za/news/709828.htm>.



Climate change. © shutterstock

PART ONE: CLIMATE CHANGE AND FOOD SECURITY LINKS

1.1 Introduction

Impacts on Food Security and Rural Livelihoods

Recent research has determined that industrial agriculture practices are responsible for more than one-quarter of all greenhouse gas (GHG) emissions. At the same time global warming threatens the ability to grow food. This section discusses why industrial farming methods are particularly vulnerable to the vagaries of climate change, and proposes that agroecological practices can better guarantee food security and reduce emissions that cause global warming.

The World Bank frames the stark situation: Almost 80 percent of global warming effects will be suffered by developing countries, even though they contribute only about 30 percent of global GHG emissions.¹ (This includes historical and cumulative emissions of China and India since 1850.²) Given that agriculture provides livelihoods for 40 percent of the global population, with 70 percent of the poor in developing countries depending on agriculture for their subsistence, there is an urgent need for concerted adaptation strategies and actions.³

In many climate change and development arenas, it is often proposed that farmers could improve their income and lives if they gave up agriculture and sought jobs in other sectors. However, instead of adhering to the notion that rural communities and farmers need to be “relieved” from the yoke of producing food, this report proposes that re-orienting policies and programs to focus on small-scale, local

agricultural systems is a central way to create vibrant rural economies and dignified livelihoods. The World Bank *2008 World Development Report* notes that 81 percent of the reduction in rural poverty was due to enhancing rural conditions rather than people migrating to cities.⁴

Environmental and Social Legacies of Contrasting Models

Contrasting and comparing traditional farming practiced by farmers for centuries and “modern” industrial systems may help to clarify constructive modes to pursue. Part of this examination explores the environmental and social experience associated with industrial food systems in the U.S. over the last several decades.

A second Green Revolution is advocated in international arenas as an antidote to climate change and to enhance food security. A review of Green Revolution practices demonstrate that while yields may increase over a short period, future food security may be destroyed in the process as seed and crop monocultures, chemical inputs, and high water usage compromise the health of soils, waterways, biodiversity, and other natural resources essential for ensuring long-term food security. In addition to summarizing the legacy of environmental harms, the report explores socio-economic implications and histories associated with this model.

The Role of Genetically Engineered (GE) Seeds and Crops

To move beyond false dichotomies and assumptions biased toward industrial agriculture, some persistent myths are reviewed, including the assertion that genetically engineered (GE) seeds and crops are a major solution to reducing GHGs and providing food security.

GE proponents advocate that this technology has the capacity to mitigate GHG emissions. This report provides copious scientific research to demonstrate that this claim and other assertions do not stand up to scientific rigor. For example, counter to industry claims that GE crops reduce pesticide usage, the U.S. Department of Agriculture (USDA) recently released data finding that GE crop acres in the U.S. used over 26 percent more pesticides per acre than non-GE, conventional crops.⁵

Toward Agroecological, Organic Food Models

A plethora of robust research demonstrates that agroecological, organic agriculture offers hope for resolving several crises simultaneously. As these studies demonstrate, transforming farming systems toward regenerative, organic farming has numerous economic, environmental, and social benefits.

United Nations Framework Convention on Climate Change (UNFCCC)

Finally, we turn to crucial issues raised within the United Nations Framework Convention on Climate Change (UNFCCC), including agricultural mitigation and adaptation measures. Many proposed solutions are based on the very industrial agriculture paradigm that has contributed to global warming while also failing to feed the world. With the recent emergence of agriculture as a major issue at the UNFCCC negotiations, there is a need for heightened civil society engagement.

The Role of Civil Society

Civil society can amplify and advocate for models that maintain ecological integrity. Expanding the civil society base to include groups that have expertise and knowledge about agriculture and food systems is essential. Movements could perform a great service by developing an overall framework for agricultural mitigation/adaptation policies and practices that comprise the many complex aspects and interconnections of agriculture.

The section ends with a summary of policies and actions that governments, donors, and international institutions can implement. The recommendations emphasize building on-farm capacity as a way of better ensuring food security and sustaining natural resources, and as means to foster self-reliant and vigorous rural economies, especially in vulnerable communities.

1.2 Industrial Agriculture: Major Culprit of GHG Emissions

Climate change and agriculture are uniquely intertwined. A recent World Bank report concludes that *current agricultural practices account for more than 30 percent of global GHG emissions*.⁶

The relationship between climate change and food systems was an emerging theme at the December 2010 meeting of the Conference of the Parties (COP) of the UNFCCC in Cancun, Mexico. Even though industrial agriculture is a major contributor of GHG emissions, and conversely, affects the ability to grow food, these issues were little discussed at the UNFCCC prior to the Cancun gathering.

When examining the agriculture sector in more detail, one finds further cause for alarm. For example, *60 percent of global nitrous oxide (N₂O) emissions, a greenhouse gas 296 times more potent than carbon dioxide (CO₂), is primarily due to use of synthetic nitrogen fertilizers*.⁷ Industrial agriculture practices account for approximately 50 percent of methane emissions, a GHG gas 25 times more potent than CO₂.⁸

The impasse of international climate negotiations at the UNFCCC and insufficient nation-state actions, to curb GHG emissions demonstrate the urgent need for new frameworks, strategies, and leadership. *Transitioning societies away from harmful agricultural practices toward ecological, organic farming will not only reduce GHG emissions and better ensure food security but will also result in a multitude of benefits for rural economies, farmers, natural resources, and the environment as a whole*. Such a transition provides a new paradigm for action.

The harms caused by industrial agriculture systems range from grave environmental destruction to human rights abuses to economic breakdown of farmer livelihoods and rural communities. Many would argue that hunger around the globe has intensified due to a global industrial model. There is a corresponding relationship between increased hunger and poverty as countries that were formerly food self-sufficient have shifted to growing crops for export. (See *Developing Country Indicators* for more information.)

Current agricultural practices account for more than 30 percent of global GHG emissions.

Transitioning societies away from harmful agricultural practices toward ecological, organic farming will result in a multitude of benefits for rural economies, farmers, natural resources, and the environment as a whole.

1.2.1 Double Jeopardy: Climate Change Links to Food Security

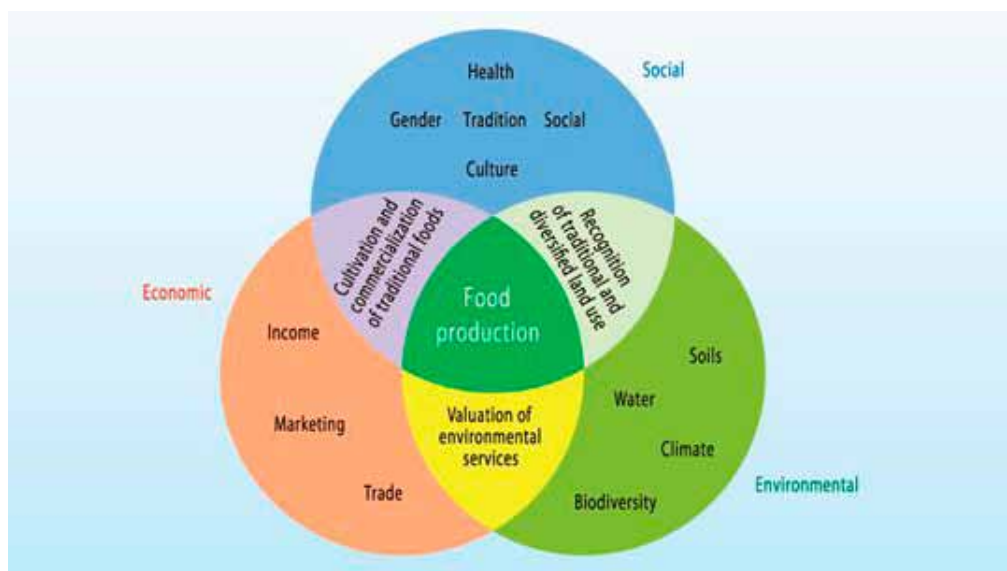
*Climate change is a major challenge to world food security.*⁹ - FAO Director-General Jacques Diouf on behalf of FAO

*No credible or effective agreement to address the challenges of climate change can ignore agriculture and the need for crop adaptation to ensure the world's future food supplies.*¹⁰ - Global Crop Diversity Trust

The double jeopardy of industrial agriculture is that high energy- and chemical-intensive farming practices contribute to climate change which, in turn, negatively impacts the ability to grow food.

Even though developing countries currently contribute only about 30 percent of global GHG emissions (historically even less), almost 80 percent of global-warming effects will be suffered in these regions.¹¹ Given that agriculture provides livelihoods for 40 percent of the global population, with 70 percent of the poor in developing countries depending on agriculture for their subsistence, it is clear that immediate adaptation strategies and actions are needed.¹²

The Intergovernmental Panel on Climate Change (IPCC) outlines a frightening scenario describing how agricultural production in Africa, Asia, and Latin America will be severely compromised. Global warming increases the intensity and frequency of drought, floods, hurricanes, forest fires, and many other extreme weather events. Such extreme weather events also contribute to increased pest and disease migrations. Already societies are experiencing failed harvests due to erratic and unpredictable weather associated with climate change. The Pakistan floods of 2010 had a massive impact on agriculture and food production. In Niger drought and failed harvests put more than half the country's population of 14 million at risk of famine. Drought in Russia contributed to failed wheat crops that led to higher global food prices.



Box 1. A Multifunctional Perspective of Agriculture; IAASTD Global Summary for Decision Makers

A recent study by the International Food Policy Research Institute (IFPRI) suggests that rice production in South Asia could decline by 23 percent, maize production by 36 percent, and wheat production by 57 percent relative to 2000 levels by 2050 due to climate variability.¹³ Other studies anticipate that yields in sub-Saharan Africa will decline 20 to 40 percent.¹⁴ In sum, the poorest regions of the globe will experience the highest degree of food instability.

There are more than 1 billion people going hungry every day, according to a recent FAO report.¹⁵ Existing hunger, the projected climate-related decrease in food supply and projected population increases will be calamitous if governments and civil society organizations do not respond quickly and effectively. The need to expand our visions and enhance our collective capacity has never been more vital.

Along with the vagaries of climate change, depletion of other natural resources caused by current industrial agricultural practices is a major problem in and of itself. Soil erosion, water and soil and air degradation and loss of biodiversity are already at critical levels. This harmful legacy should inform climate change policies and practices relating to food systems.

1.3 A Basic Understanding of Food Systems: Historical Precedents

*Agriculture must mediate between nature and the human community, with ties and obligations in both directions.*¹⁶ - Wendell Berry

Contrasting and comparing traditional farming practiced by farmers for millennia and “modern” industrial systems can help clarify which mitigation and adaptation proposals are valid climate and food security solutions. In this report, the terms “ecological,” “organic,” “traditional,” and “agroecological” denote farming practices that: a) do not use synthetic chemicals and pesticides; b) regenerate soil quality through the use of manures, compost, cover crops, crop rotations; c) utilize integrated pest, or biological, management systems; d) incorporate water conservation practices; and e) cultivate diverse crops to maintain biodiversity. Biodynamic and permaculture systems are also encompassed within these criteria. The use of “organic” does not refer to any certification criteria. Within these practices, a high value is placed on farmer innovation, knowledge, and skill; dignified livelihoods and vital community-based economies; and cultural and social diversity.

Regarding organic certification, it should be noted that many farming methods that are certified as organic in some industrial countries have been standard practices in developing countries for centuries.

* * *

Growing food once expressed a personal relationship between humans, wildlife, and the earth. Successful farming was based on generations of accumulated knowledge about place: climate, land, soil, and water. Over centuries, local farmers developed seeds and used them collectively as a community to re-plant for the next harvest. They invented a variety of cultivation methods, crops, and pest and water management systems that were unique to local ecosystems and cultures. Under such local systems maintaining natural resources was central to ensuring

Small-scale local food economies have successfully sustained millions of people for many centuries with little capital investment and infrastructure.

food and water security; therefore most communities nurtured ecosystems.

As one United Nations Environment Program (UNEP) report observes: "In India, peasants grow over 40 different crops on localities that have been cultivated for more than two thousand years without a drop in yields, yet have remained free of pests."¹⁷

Such small-scale local food economies have successfully sustained millions of people for many centuries with little capital investment and infrastructure. Rather than massive technology and investment capital, people and natural resources—"natural capital"—are at the center of these systems. They survive, and thrive, on knowledge and technologies based on low external inputs and develop on-farm energy and nutrient systems.

Ecological, traditional systems are multifunctional. In addition to producing food, medicines, and fiber, they sustain biodiversity, soils, water resources, landscapes, and wildlife habitats and also serve as an important centerpiece for social and cultural values and traditions, and rural economies.

1.3.1 Radical New Approach

In contrast, during the last century a radical new approach to agriculture emerged. Instead of local farmers growing food primarily for local communities, a highly centralized, energy-intensive global system of industrialized agriculture began replacing small-scale, multifunctional food systems. This model is the dominant paradigm for industrial, northern countries and has been exported to regions in developing countries through the Green Revolution, structural adjustment programs of the World Bank and the International Monetary Fund (IMF), and trade agreements and institutions such as the World Trade Organization (WTO).

The globalized industrial food and agriculture model is a highly energy- and chemical-intensive system that is characterized by:

- Commercial, "high yielding" seeds
- Heavy pesticide and chemical usage
- Heavy synthetic, chemical fertilizers
- High water usage
- Monocrops (less diversity of crops)
- Energy-intensive, fossil fuel-guzzling equipment
- Transport system consisting of massive packaging, refrigeration, and giant transport infrastructures; and,
- Highly centralized, oligarchic economic structure

The environmental and social legacy of agriculture in the U.S. is instructive as many of the proposed "solutions" to reducing GHGs and bolstering food supplies are modeled after industrial agriculture as it has been practiced in the U.S. for more than half a century. The following is a summary of practices and their impacts. (For a fuller picture of harms to the environment related to industrial agriculture, see *The Environmental Legacy of Industrial Agriculture*.)

Seeds and Biodiversity

Industrial agriculture in the U.S. and most European countries began in the 1940s with the development of the high yield variety (HYV), or commercial, seed. These seeds require pesticides, synthetic fertilizers, and large amounts of water in order to produce full yield potential.

Increased corporate concentration of seed agrochemical companies has resulted in a steady increase in prices for farmers. For example, the price of seed has increased steadily over the last 20 years, with significant increases in the last decade. Since 1999, seed prices have risen 146 percent.¹⁸ (See *Seeds Are Hope* for a thorough discussion of seeds.)



Seeds are hope. © iStockphoto

Monocultures. Commercial seeds are bred with specific traits that favor monocultures, or monocrops, that in turn require large areas of land for cultivation—a process which has led to displacement and precipitous decline of small farming operations.

Monocultures are extremely vulnerable to pests, plant diseases, and the vagaries of climate. The Irish Potato Famine of 1845, resulting in millions of deaths, serves as a tragic cautionary tale of the perils of monoculture farming. Monocultures are eroding the full arsenal of biodiversity needed by societies to respond to dramatic and inconsistent weather patterns associated with global warming. (See *Biodiversity, Environmental Legacy of Industrial Agriculture*.)

Box 2 Seeds Are Hope

Over centuries local farmers developed seeds and shared them collectively to re-plant for the next harvest. Farmers bred seeds that were unique to local weather patterns, geographies, ecosystems, and cultures. The diversity of seeds not only produced enriching, bountiful food supplies, but also mediated against vagaries of weather and natural resource availability (such as water). In sum, seeds represent the rich heritage of biological diversity and are the repositories of ancestral and cultural knowledge.

An ode to the resilience of seeds can be found in Bidakanne, a small village about 100 miles west of Hyderabad, in southern India. Seeds cultivated and stored by the women of the village grow despite numerous challenges: infertile, laterite-red or alluvial-black soils that characterize this region; fluctuating monsoons; and other climatic disruptions. The seeds grow without much water and no chemical inputs. They are suited to dry-land farming in contrast with the high-cost, energy-intensive modern agriculture systems that are being presented as “climate friendly” solutions by multinational agribusinesses, as well as many governments, foundations, and aid agencies in the North.

As local woman seedkeeper, Chandamma, explains, “If I have control over my seeds, I control my food and my family’s nutrition.”¹⁹

* * *

Today, approximately three-quarters of the world’s farmers save seeds from their locally bred harvests.²⁰ Such non-commercial, traditional seeds are renewable—the nature of the seed is to reproduce itself and multiply. Centuries of traditional knowledge and breeding developed seeds that respond to difficult environments such as droughts, heat stress, and pest and disease outbreaks.

However, the advent of industrial agriculture has severely compromised seed diversity and is increasingly limiting a farmer’s access to and control over seeds. In the early 20th century, industrial countries created an intellectual property rights and patenting regime allowing seeds to become property of large corporations. What was formerly a free, renewable farm input became a costly, non-renewable input. The “technology” claimed as a basis for patenting seeds is in fact based on centuries of indigenous community knowledge and traditional seed breeding. Yet, this Intellectual Property Rights (IPR) system grants seed rights to the new corporate owner and allows corporations to be acknowledged as the inventor of the patented seed.

Industrial, patented seeds are often referred to as “high yielding variety” (HYV) seeds. These commercial seeds are designed to perform well only within a predictable, very narrow weather band; they do not have the adaptive capacity to respond to unpredictable, shifting weather patterns brought on by climate change.

As Dr. Vandana Shiva notes the term high-yielding varieties is a misnomer because the distinguishing feature of these seeds is that they are highly responsive to certain key inputs such as chemicals and intensive water use. She suggests that the term “high responsive varieties” is more appropriate,

and adds: "In the absence of additional inputs of fertilizers and water, the new seeds perform worse than indigenous varieties."²¹

Trade Related Intellectual Property Rights (TRIPS)—Threat to Seed Diversity and Food Security

The advent of the WTO, and in particular, the Agreement on Trade Related Intellectual Property Rights (TRIPS), extends the industrial, western intellectual property rights (IPR) system to a global level. Effectively, TRIPS enables large foreign corporations to obtain patent control of local production and distribution of seeds, plants, and life forms.

As seed is the ultimate symbol of food security, the matter of who owns seed is a matter of survival. By expanding patenting rights of corporations, located primarily in the North, TRIPS fosters what is known as "biocolonialism" and "biopiracy." Since the WTO agreement, multinational corporate patents on traditional seeds and plant varieties have rapidly increased.

Of particular relevance to climate change, there is a scramble to turn climate chaos into cash and "climate ready" seeds are seen as a bonanza opportunity. From June 2008 to June 2010, approximately 1,663 patent applications for "climate-ready" crops have been submitted for approval. Three companies, DuPont, BASF, and Monsanto, comprise 66 percent of the patents.

TRIPS has also advanced consolidation of seed companies and their control over intellectual property of seeds. Today, the top 10 seed companies account for 67 percent of the global commercial seed market. Monsanto is the largest seed company, representing 23 percent of the market, followed by DuPont (15 percent) and Syngenta (9 percent). These three companies dominate 47 percent of the global proprietary seed market.²²

Loss of Diversity

As seed companies have further consolidated, seed varieties and plants have decreased. China historically had 10,000 varieties of rice, by the 1970s, that figure decreased to 1,000. By 2000, Mexico had lost 80 percent of its maize varieties. At one time there were 7,000 varieties of apples in the U.S., now 6,000 of these are extinct. There were around 30,000 rice varieties in India prior to the Green Revolution; today about ten varieties are grown.²³ Instead of promoting a diverse food system, international trade and economic policies are encouraging and rewarding seed consolidation and diminishing biodiversity.

FAO reports on plant genetic resources have concluded that the single most important cause of the massive loss of species diversity and native seeds is due to the introduction of monoculture seeds and crops.²⁴

The loss of control of seed supplies and loss of seed diversity is alarming. Without access to diverse seeds, food security is in peril. Seeds are essential repositories that are especially needed in times of unpredictable, chaotic weather occurrences associated with climate change.

GE Seeds

The biotechnology industry is boldly lobbying at climate change and food security fora in hopes of attaining markets and financing for what it claims are

“climate ready” seeds and crops. Claims include that such seeds are drought- or salt-tolerant. However, these claims have yet to be demonstrated. (For more specific information on this topic, see *Myths That Persist*.)

In contrast, farmers in developing countries have cultivated free, effective climate ready seeds for years. Farmers in regions already experiencing shifts in weather patterns are finding that indigenous seeds, and traditional farming methods are key to adaptation and survival.

Vulnerability of Industrial Countries

The discussion of seeds is often viewed as an issue more pertinent to developing countries where the majority of populations are small farm holders. However, as climate change shifts weather patterns, often unpredictably, it is equally important for industrial nations to review the vulnerability of their highly corporate-controlled, monoculture system. With only a few corporations controlling access to seed, the U.S. and other industrial countries are perhaps even more at risk than some developing countries that maintain seed diversity through locally bred, traditional seeds.

The Future of Seeds

Who owns and controls access to seed? This question relates to food security, water security and access to land as well as to human rights issues such as gender discrimination, equity, social justice, and more.

Of great concern is that many schemes within food security and climate change realms shift access to and control of seeds to a handful of corporate seed and chemical companies. International and domestic proposals responding to the need to provide food security or to reduce GHG emissions must ensure farmers and communities the right to access and control of seeds.

The following rights must be ensured:

- Right to exchange and trade seeds
- Right to “open source,” publically funded seed programs.
- Right to breed and reproduce seed
- Right to save seed
- Right to have seed free from genetic contamination

Some claims for reducing GHG emissions are related to seeds; therefore, it’s critical for civil society movements to review the entire seed cycle in order to understand the authenticity of a proposed climate solution.

As ancestral seed keepers, farmers and rural communities cannot be required to pay for their cumulative knowledge and technology that has been built for centuries. It is against human kind’s deepest morality to take seeds as a hostage so that only those with cash—whether governments or individuals—can purchase this gift of life.

Pesticides

Insecticides (bug killers), herbicides (weed killers), and fungicides (fungus killers) are all pesticides. In the year 2000, global pesticide usage exceeded five billion pounds; according to the U.S. Environmental Protection Agency (EPA).²⁵ In the

U.S. alone, the amount of pesticide used in both 2000 and 2001 exceeded 1.2 billion pounds—representing 20 percent of total worldwide usage.²⁶

Pesticide and synthetic nitrogen fertilizers (see below) lead to numerous air, water, and soil quality problems. For example, pesticides and fertilizers are responsible for nearly 75 percent of water-quality problems in the U.S. This affects fish and fowl, and public health and safety as well. Atrazine, a widely used herbicide, is found in 94 percent of U.S. drinking water tested by the U.S. Department of Agriculture (USDA).²⁷

Repeat pesticide applications can rapidly break down the thousands of microorganisms in soil. Soil viability can be lost in as little as 40 to 50 years. This encourages pest and plant diseases which necessitate even more chemical applications, a phenomenon dubbed the “pesticide treadmill.” In the 1940s, U.S. farmers lost 7 percent of their crops to pests. Since the 1980s, crop losses have increased to 13 percent even though more pesticides are being used.²⁸

Nitrous Oxide—The Most Potent GHG

As noted already, the application of synthetic nitrogen fertilizers is responsible for nearly 60 percent of global nitrous oxide emissions, a gas nearly 300 times more potent than CO₂. The breakdown of soil due to pesticide and other chemical applications inhibits the ability of the soil to efficiently sequester CO₂. From 1961 to 2008, nitrogen fertilizer consumption increased over 375 percent worldwide.²⁹ Maize, or corn, mostly grown for producing biofuels, accounts for nearly half of fertilizer use.³⁰

Some contend that synthetic fertilizers have dramatically increased food production worldwide. However, the unintended costs to the environment and human health have been grave and in many regions have damaged farm soils to the point that yields are in decline. Additionally, nitrogen runoff from farms has contaminated surface and groundwater and helped create massive “dead zones” in coastal areas, such as the Gulf of Mexico. Ammonia from fertilized cropland has become a major source of air pollution.

Due to the 2007/2008 spike in oil prices, the cost of fertilizer increased from \$245 per ton in January 2007 to \$1,600 per ton in August 2008.³¹ This dramatic price increase was part of the reason for the astonishing rise in food costs and the ensuing world food crises.

In many regions, the unintended costs of large amounts of fertilizer and pesticides have damaged farm soils to the point that yields are in decline.

Methane and Livestock Connection

A particularly odious aspect of the industrial agriculture model is the emergence of factory farms, also known as Concentrated Animal Feeding Operations (CAFOs). In the U.S. there are almost 10,000 CAFOs housing millions of cattle, pigs, and poultry. CAFOs are associated with numerous hazards such as contamination of nearby water sources, and have led to the extinction of small-farm, local livestock operations.³² With regard to climate change, CAFOs generate about 65 percent of the nation’s animal manure, resulting in major ammonia, hydrogen sulfide, methane, and nitrogen gases. A good portion of the 50 percent of global methane emissions are due to animal manure ponds of liquid and solid waste.³³

Water

Industrial agriculture uses 70 percent of fresh water on the planet.³⁴ Irrigated crops—almost all large, chemically reliant monocrops—represent the bulk of this figure. Two factors contribute to high water usage: 1) Degraded soils do not retain water efficiently, and 2) industrial, HYV seeds, sometimes referred to as “dwarf” varieties, have shorter stems and root systems that do not dig as deeply for water as traditional plants.

It is asserted that the rapid spread of irrigation has helped food production to keep pace with the world’s rising population; however, many counter that the diversion of waterways for irrigation has been a major contributor to degraded water sources and diminishing water availability.

Box 3 Water Wars

The wars of the next century will be about water.—Ismail Serageldin, Vice President for Environmentally and Socially Sustainable Development (1992-1998), and for Special Programs (1998-2000) at the World Bank

Currently, 1.4 billion people do not have access to clean drinking water. Studies also indicate about 1.5 million children under the age of five die each year of waterborne disease. The World Bank reports that by 2030, demand for water will outstrip supply by 40 percent.³⁵

As Maude Barlow, national chairperson of the Council of Canadians and former senior advisor to the president of the UN General Assembly says, “It is not an exaggeration to say that the lack of access to clean water is the greatest human rights violation in the world.” She adds, “Water scarcity is the first face of climate change.”³⁶

Climate, freshwater, biophysical, and socio-economic systems are interconnected in complex ways. Hence, a change to any one of these systems can induce a change in another system. According to the IPCC’s Climate Change and Water, Technical Paper VI: “Observed warming over several decades has been linked to changes in the large-scale hydrological cycle such as: increasing atmospheric water vapor content; changing precipitation patterns, intensity and extremes; reduced snow cover and widespread melting of ice; and changes in soil moisture and runoff.”³⁷

The IPCC report also discusses the impact on food security: “Changes in water quantity and quality due to climate change are expected to lead to decreased food security and increased vulnerability of poor rural farmers, especially in the arid and semi-arid tropics and Asian and African megadeltas.”³⁸

Industrial Agriculture Links to Water Scarcity

While there is increasing awareness about the dire situation of water scarcity, many are not aware that *industrial agriculture uses 70 percent of fresh groundwater. Irrigated crops—almost all large, chemical-intensive monocrops—represent the bulk of this figure.³⁹ This is because high yield value*

(HYV) seeds, sometimes referred to as “dwarf” varieties, have shorter stems and root systems to make them more stable for mechanized farming. However, the shorter plants means that the root system does not dig as deeply for water as traditional plants. Additionally, soils denuded from chemical applications eventually lose the capacity to absorb water at optimal levels.

According to the International Water Management Institute, 80 percent of land producing food is rain-fed; this produces around 60 percent of the world’s food supply.⁴⁰ Erratic rain patterns due to global warming further highlight the importance of recognizing the symbiotic relationship between seeds and water conservation programs when developing food and climate policies. A systemic solution to one can be a solution to all.

Energy

Another characteristic of industrial food systems is that they are highly energy intensive. According to a University of Wisconsin-Madison report, in 1940, the U.S. produced 2.3 food calories for every one fossil fuel calorie used. After 60 years of industrial methods, U.S. farms now get one food calorie for every 10-15 fossil fuel calories used. This represents a 23-fold reduction in efficiency.⁴¹

Livelihoods and Societal Changes

The transformation to industrial farming dramatically altered landscapes throughout the U.S. as well as Europe, and changed social and economic mores. The U.S., once an agrarian nation comprised of millions of small farms, exemplifies the conversion. Today, less than 1 percent of the U.S population considers farming to be their primary occupation. Since 1945, the number of farms has dropped by two-thirds, and the average farm size has more than doubled to 441 acres. Approximately one million farmers have been forced to give up farming in the last two decades.

The declining farm sector has had a negative ripple effect throughout rural communities across the nation. Not only have farmers lost their livelihoods, but mechanized farming systems have replaced farmworkers—including part-time jobs for youth and for full-time workers. Women, often caretakers and financial managers of family farms, have also lost meaningful employment in the farm sector.

Economics of Industrial Agriculture Model

Agricultural production in the U.S. and Europe requires very high levels of capital investments in land and farm inputs, including seeds, chemicals, storage facilities, machines, and irrigation (high intensity water systems). The efficiencies of scale favor large producers and high-volume production.

The U.S. spends around \$25 billion per year in farm subsidies, the majority going to wheat, cotton, corn, soybeans, and rice farmers.⁴² (Vegetables, nuts, and other crops are typically not eligible for subsidies.) The confluence of rising cost of inputs, agribusiness consolidation, trade and economic agreements, market volatilities, and government policies has contributed to the shrinking population of farmers.

A report by the Heritage Foundation, a conservative think tank, comments: "...even farmers themselves have united around the shared conclusion that the current farm subsidy system is failing and in dire need of reform..."⁴³

In sum, farmer incomes are unpredictable from year to year and rural economies are struggling, yet multinational agribusiness corporate profits continue to soar to all time highs.

With expenditures for agricultural subsidies squeezing the economies of the U.S., Europe (in 2010, the EU spent €57 billion on subsidies and agricultural development), and other industrial nations, it does not seem feasible that struggling developing country economies would be able to replicate such a costly northern industrial model.

The experience of industrial agriculture in northern countries is highly relevant to anyone working on climate change, food security, or social justice and human rights. Particularly instructive is the legacy of the Green Revolution.

1.3.2 The Green Revolution

At the UNFCCC, as well as in other international arenas, industry groups, foundations, aid organizations, and even some civil society groups are calling for a "second Green Revolution," claiming that this is a climate-friendly solution. However, a close review of the first Green Revolution reveals a legacy of grave environmental harms, increased poverty and hunger over the long term, and social justice abuses.

With the introduction of HYV seeds, developed by Nobel Peace Prize winner Dr. Norman Borlaug, the Green Revolution arrived in India, the Philippines, and some other developing country regions in the late 1960s. (Mexico began using HYV maize seeds in the late '40s.) Coined the "Green Revolution" in 1968 by former USAID Director William Gaud, the stated goal was to spread "miracle" seeds in order to solve world hunger and alleviate poverty. Over the last several decades this model has been implemented in many other countries.

Crop yields did increase for monocultures of a few major grains; however, hunger and poverty persist and harms inflicted upon soil, water, biodiversity, and other natural resources have compromised long-term food security in many regions. Ensuing social, political, and cultural disruptions, along with threats to public health, are also related to the Green Revolution.

Physicist and ecologist Dr. Vandana Shiva has written extensively about the environmental, social, political, and economic impacts of the Green Revolution in Punjab, India: "Instead of abundance, the Punjab is beset with diseased soils, pest-infested crops, waterlogged deserts and indebted and discontented farmers. Instead of peace, the Punjab has inherited conflict and violence."⁴⁴ She also chronicles the demise of India's extraordinary biodiversity. For instance, prior to the Green Revolution, India had around 30,000 rice varieties; today there are about ten varieties grown.⁴⁵

Additionally, public health in Punjab has been affected. The incidents of health problems, including cancer rates, have increased since the advent of the Green Revolution. A study by Greenpeace India revealed that water wells in Punjab contained dangerous nitrate levels due to the overuse of synthetic nitrogen fertilizer.⁴⁶ A columnist at the *Mint*, a major business newspaper in India, calls this region the "other Bhopal."⁴⁷

Farmer incomes are unpredictable from year to year and rural economies are struggling, yet multinational agribusiness corporate profits continue to soar to all time highs.

Another aspect of public health related to Green Revolution approaches, but often not recognized in public discourse, is that the shift from growing diverse crops to a few grain crops has contributed to micronutrient malnutrition in many developing countries.⁴⁸ This transition to carbohydrate-based diets containing little protein and other essential nutrients further demonstrates the need for more diverse crops.

Finally, many remain unaware of the hundreds of thousands of farmer suicides in India in regions where Green Revolution practices were introduced. According to India's National Crime Records Bureau 2007, almost 200,000 farmers have committed suicide since 1997. The rising cost of farm inputs—seeds and chemicals—and a decrease in government and private business price support systems have led farmers to the ultimate act of despair.⁴⁹

Africa - A "Second" Green Revolution

There is currently much discussion about extending a Green Revolution to Africa, which will be particularly hard hit by erratic shifts in weather related to climate change. The Alliance for a Green Revolution in Africa (AGRA) is a major initiative aimed to boost food security and agricultural productivity on the continent. A large part of AGRA's program consists of developing and marketing "improved" seeds, fertilizer, and extending credit to small-scale farmers.

However, as Gathuru Mburu, coordinator of the African Biodiversity Network explains, "The Green Revolution is not new to Africa. Countries in Africa have had a Green Revolution in their own way because we have been using fertilizers, we have been using herbicides and fungicides. And, we have also been introduced to HYV seeds in Africa."

She concludes, "For small-scale farmers, the backbone of food security in Africa, this system has failed."⁵⁰

Part of the challenge for industrial methods are the geographical and environmental factors. Africa has a high diversity in slope and soil types and therefore the one-size-fits-all approach of industrial systems is ineffective. Additionally, industrial agriculture requires high water input, yet most regions in Africa have little water.

Industrial farming has also largely failed in Africa because these models require a guaranteed flow of income. Farmers need a continuous and reliable supply of seeds and chemicals and this requires a steady income. If yields or commodity prices are low, a farmer's flow of income is severed and there is no money for planting the next season or purchasing food.

Despite the failure of industrial agriculture to curb hunger in Africa, many governments and corporations are extending the model by promoting GE "drought- and salt-tolerant" crops as an adaptation solution for the region. However, despite millions of dollars spent and over 25 years of research, these traits have not yet been demonstrated. Additionally, several field trials of GE crops in Africa have not been successful. The recent failure of the GE sweet potato is particularly notable as this was heralded by the industry as a success even before field trials were concluded.⁵¹ (GE seeds and crops are discussed in more detail in *Myths That Persist*.)

There is another path for Africa. According to a joint report by the UNEP and UNCTAD, "...conventional farming systems are clearly unable to fulfill the

Potential short-term gains of industrial farming practices will be offset by further degradation of ecosystems.

current food need in Africa. The results observed in the transition to organic agriculture are highly promising for food security in Africa. Evidence indicates that productivity in organic agriculture can grow over time."⁵¹

Here are a few illustrations demonstrating how agroecological, organic systems in Africa can boost food production, enhance the environment, and improve livelihoods of farmers and rural communities. (See *Can Agroecological, Organic Farming Feed the World?* for further studies.)

- A review of 40 projects in 20 African countries using ecological farming methods such as plant breeding, integrated pest management, soil and water conservation, and agro-forestry showed that crop yields more than doubled over a period of three to 10 years. This increased aggregate food production by 5.79 million tons per year.⁵³
- Research in Malawi documents that farmers increased yields by using nitrogen-fixing trees for maize production.⁵⁴
- In West Africa, farmers have increased water retention capacity by five- to 10-fold by building stone barriers alongside fields to slow down water runoff during the rainy season. This simple, inexpensive "technology" also increased biomass production by 10 to 15 times and enabled livestock to feed on the new grass that grows by the barriers after the rains.⁵⁵

As these examples exhibit, heralding a second Green Revolution modeled on a system that has previously failed is a perverse course. In sum, potential short-term gains of industrial farming practices will be offset by further degradation of ecosystems. This threatens the future ability to maintain steady levels of production. Instead, societies need to redirect resources toward models of production that protect and sustain the environment and foster socio-economic equality. Funds should be re-directed to support recovery of indigenous seeds, traditional plant breeding, water catchment systems, and other accessible technological methods.

1.4 Ecological Farming: A Solution We Can Live With

*"Sustainable food production systems are preserving biodiversity and increasing food productivity. These systems have in practice shown alternatives to the high-tech, expensive and unsustainable model of the 'green revolution.'"*⁵⁶—International Assessment of Agricultural Knowledge, Science and Technology for Development

Ecological, organic food systems provide a viable, low-cost, and verifiable path toward reducing GHG emissions, while also better ensuring food and water security in times of climate chaos. Maintaining ecological integrity of agriculture provides dignified livelihoods, thriving rural communities, and bolsters equity, social justice, and cultural values.

According to a report by the Commission on the Future of Food and Agriculture: "Agriculture is the only human activity based on photosynthesis that has the potential to be fully renewable."⁵⁷ Ecological farming creates living, healthy carbon systems instead of dead—and deadly—fossil fuel-based carbon systems.

Transforming societies toward regenerative, organic agriculture engenders numerous environmental benefits. Healthy, carbon-rich soils sequester large

amounts of CO₂, conserve water, and support plant resistance to drought, pests, and diseases. Organic farming also restores biodiversity of plants and animals. Numerous studies unequivocally state that our survival depends on the resiliency and biodiversity of organic farm systems free of fossil fuels and chemical dependency.

Ecological food systems also stimulate rural economies and provide dignified livelihoods and foster diverse cultures and societies. Various reports estimate that small-scale agriculture provides almost three billion livelihoods, which is nearly half of the current global population. Smallholder farmers, livestock keepers, nomadic pastoralists, fisherfolk, forest-keepers, food processors and more—all represent a diverse web of livelihoods that characterize vibrant local economies.

The food processing chain in Indian communities illustrates the deep cultural and societal ties of rural community food systems: A chain of traders (*artis*), bring wheat directly from the farm to the local shops. Most people buy fresh wheat from the local corner store (*kirana*) and then take it to the local mill operators (*chakkiwallas*). It is estimated that more than two million small neighborhood mills produce fresh flour. Additionally, flour is produced by women working in households.⁵⁸

In sum, agroecological farming serves a dual purpose of mitigating GHG emissions and adapting to climate change by building more robust, resilient, and stable food systems and economies.



Farmer on his wheat field. © shutterstock

1.4.1 Mitigation Potential

Numerous studies reveal that organic farming has tremendous potential for mitigating GHG emissions. A recent McKinsey & Company study identified that nearly 75 percent of total GHG abatement potential is “related to CO₂ through the avoidance of the release of carbon from soils or through additional carbon sequestration into soils.”⁵⁹ Regenerative, ecological farming practices maintain and build

healthy soils, a prerequisite for ensuring food production. Ecological farming systems produce 54 percent higher soil organic matter than conventional farms, according to numerous studies by the Rodale Institute, Cornell University, the FAO, and the USDA. These healthy soils provide critical carbon sinks.

A 30-year study by the Rodale Institute demonstrates that *organic regenerative agriculture practices could sequester nearly 40 percent of current carbon dioxide (CO₂) emissions* (based on the planet's 3.5 billion tillable acres). The same study concludes that if current U.S. croplands were converted to regenerative farming methods, we could sequester nearly 25 percent of national fossil fuel emissions (based on 434 million acres).⁶⁰

Other studies concur:

- Organic tomato fields were found to store 28 percent more carbon than conventional fields.⁶¹ (This was demonstrated through a comparison of conventional and organic commercial farms in the Central Valley of California.)
- Experiments in India under four different agro-ecosystems (arid, semi-arid, sub-humid, and humid) found that organic agricultural practices demonstrated numerous benefits ranging from improved microbial activity and increased water retention. Soil carbon sequestration increased by seven to 17 percent (variability is due to different agro-ecosystem climates).⁶²

Cautionary Approach to Carbon Sequestration Projects and Funding

While regenerative farming presents impressive sequestration potential for reducing GHG emissions, it is a cause for concern that the focus within climate arenas, such as the UNFCCC, is on commodifying carbon sequestration. Awarding carbon funds and offset credits for carbon sequestration could divert societies and countries away from the fundamental goal of ensuring food security, equity, economic sustainability, and addressing ecosystems in a comprehensive manner.

The FAO notes: "Emerging carbon markets and payments for emissions removals or reductions have attracted much interest and anticipation of such funding as a source of income for some agricultural activities and producers. However, high transaction costs as well as low potential mitigation benefits in many small-holder systems seriously limit the potential of carbon market offsets to small-holders."⁶³

Methodologies for measuring carbon sequestration are very complex, and tend to favor large-scale, monocrop producers. Expenses to monitor, report, and verify the methodologies could cost developing countries €3.8 billion, according to the FAO.⁶⁴ A recent report elaborates: "...countries with...agribusiness interests may benefit disproportionately, as they are likely to move quickly to influence the agenda for mitigation in their favor. Large-scale agribusinesses are also more likely to be familiar with global market systems, have access to technology and information and be responsive to GHG offset opportunities."⁶⁵

Most proposals for measuring carbon favor measurement practices based on intensive production output; however, small-scale farmers benefit most by land area-based measures.⁶⁶ According to a report by the Consultative Group on International Agricultural Research (CGIAR): "Further technical and conceptual convergence on this issue is essential to informing the design of agricultural mitigation mechanisms and addressing fundamental questions regarding the appropriateness of pay-for-performance incentives in agriculture."⁶⁷

Yet another concern is that bundling carbon as an agricultural commodity could destabilize food markets and increase price volatility, according to research by the Institute for Agriculture Policy (IATP) on speculative markets.⁶⁸ (For more discussion on agricultural commodity markets, see Part III.)

Presently, many proposals for carbon sequestration are based on monoculture farming that undermines resiliency and biodiversity that are essential for long-term environmental health and stability of food supplies. Carbon sequestration offset schemes should be reviewed to ensure that proposals complement multifunctional food and farm models that provide ultimate food security.

1.4.2 Adaptation Potential: Can Ecological Farming Feed the World?

The question that inevitably comes up when discussing ecological, organic farming is: Given rising populations, can it feed the world? The perception is that organic agriculture results in lower crop yields and thus it will require more land in order to produce as much as industrial crops.

A recent joint assessment report of the World Bank and the United Nations by more than 400 researchers and scientists concludes that organic food systems are the path toward ensuring food security and addressing major health, environmental, economic, and social challenges facing the world today.⁶⁹ The report reflects a growing consensus among scientists and many governments that the old paradigm of industrial energy- and chemical-intensive agriculture is an outdated concept. Instead, small-scale farmers and agroecological methods are the way forward.

Traditional agriculture practices represent a repository of knowledge and technologies that have been built up over many generations. For example, farmers in regions already experiencing climate-related shifts in weather patterns are finding that indigenous seeds, and traditional farming methods are key to adaptation and survival. These seeds adapt much better to drought, heat, salinization, and require less water than many commercial, industrial seeds used in “modern” agriculture. The resilience and robustness of multi-functional farming is especially needed in times of climate chaos.

For example: A study of 80 communities of smallholder farmers in Nicaragua following Hurricane Mitch in 1998 found that plots using ecological methods had on average retained 40 percent more topsoil, higher field moisture, less erosion, and lower economic losses than plots on industrial farms.⁷⁰ Agroecological methods result in resiliency that can soften the impacts of extreme weather-related events.

Within some policy circles, there is discussion that societies may have to “compromise” and accept a certain level of environmental harm in order to feed the world. However, this is a slippery slope as the level of compromise has never been established. How many dead zones in the ocean are acceptable? How much more of our top soil can we stand to lose? What level of water shortage will be tolerated? Today’s planetary crises necessitate that biodiversity, along with quality and availability of water and soils, cannot be compromised. Societies simply cannot afford to risk the future ability of natural resources to support food production.

Farmers experiencing climate change effects are finding that indigenous seeds and traditional farming methods are key to adaptation and survival.

Box 4 Can Agroecological, Organic Farming Feed the World?

The effectiveness of ecological agriculture is widely documented:

- In 286 projects across 57 developing countries and 37 million hectares, average crop yields increased by 79 percent using ecological, resource-conserving methods.⁷¹
- A long-term Farming Systems Trial at the Rodale Institute shows that corn and soybean yields from organic systems match the yields from conventional systems except during drought, when the organic systems yielded 30 percent more corn than conventional.⁷²
- On-going field research in Ethiopia concludes that organic compost fertilizer results in higher crop yields (3 to 5 times) compared to yields from plots treated with synthetic fertilizer.⁷³
- Based on assessments of 208 ecological agriculture projects, approximately half of those projects resulted in significant yield increases—50 to 100 percent for rain-fed crops and 5 to 10 percent for irrigated crops. Data also revealed an increase in average food production per household by 73 percent (in one year) for 4.42 million small farmers growing cereals and roots on 3.6 million hectares.⁷⁴
- University of Michigan researchers reviewed 91 studies (including 293 examples) comparing sustainable and conventional agriculture systems, concluding with conservative estimates that organic agriculture could provide as much food as produced today. Furthermore, under more “realistic” estimates, the researchers reported that organic agriculture could actually increase global food production by as much as 50 percent. Specifically for developing countries, the analysis concluded that organic systems could produce 80 percent more than current production.⁷⁵
- The Sustainable Agriculture Farming Systems project at UC-Davis shows organic and low-input systems have yields comparable to conventional systems in all crops tested and in some instances, resulted in higher yields.⁷⁶
- A 2008 joint UNEP-UNCTAD report, *Organic Agriculture and Food Security in Africa*, analyzed multiple studies to conclude that organic systems increase yields and provide benefits for food availability and natural resources. Food production demonstrated yield increases based on per hectare productivity.⁷⁷
- In a region of Burkina Faso, sorghum yields increased by 400 percent through compost/manure management during the dry season which resulted in higher soil fertility and restoration of degraded land.⁷⁸
- In addition to the above studies, the FAO report *Organic Agriculture, Environment, and Food Security* contains numerous comprehensive studies from countries around the planet demonstrating successes in converting to regenerative, organic agricultural systems.⁷⁹

Organic Farming Yields Are Comparable To or Higher Than Industrial Agriculture Yields

Vigorous research demonstrates that organic methods can produce yields equal to and even higher than industrial agriculture yields. “Model estimates indicate that organic methods could produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population without increasing the agricultural land base,” reports a University of Michigan report.⁸⁰

“These research results indicate that organic agriculture has the potential to contribute quite substantially to the global food supply, while reducing the detrimental environmental impacts of conventional agriculture.”⁸¹

A 2011 report presented to the United Nations Human Rights Council by the UN Special Rapporteur on the Right to Food, Olivier De Schutter, is unequivocal in its findings: “Today’s scientific evidence demonstrates that agroecological methods outperform the use of chemical fertilizers in boosting food production where the hungry live—especially in unfavorable environments.”⁸²

A comprehensive study—covering 208 projects in 52 countries—demonstrates that nine million farmers have successfully adopted sustainable agriculture practices on 29 million hectares in Africa, Asia, and Latin America. Farmers have achieved substantial increases in food production per hectare: 50 to 150 percent for rain-fed crops; five to 10 percent for irrigated crops. Disaggregated data show:

- 1) Average food production per household rose by 1.7 tons per year (up by 73 percent) for 4.42 million small farmers growing cereals and roots on 3.6 million hectares.
- 2) Food production increased by 17 tons per year (up 150 percent) for 146,000 farmers on 542,000 hectares of roots cultivation (potato, sweet potato, cassava).
- 3) Total production rose by 150 tons per household (up by 46 percent) for the larger farms in Latin America (average size 90 hectares).⁸³

An extensive body of research demonstrates that agroecological systems can provide stable food systems. (See *Can Ecological, Organic Farming Feed the World?* for further figures on field studies.)

1.5 Myths That Persist

There are several inaccurate assumptions about agriculture that persist among decisionmakers. To move beyond false dichotomies, it is critical to address some of the persistent myths that enable misguided proposals to gain legitimacy.

1.5.1 Myth One: *Intensive, or High Yield, Food Production Alleviates Levels of World Hunger*

As already discussed in the Green Revolution section, and as many studies have established, intensive food production does not consistently translate into reducing hunger and poverty.

Even though we currently grow enough food to feed the world, more than one billion people still go hungry.

As Nobel laureate Amartya Sen has shown, famine is fundamentally a problem of poverty, food distribution, and inequity. The United Nations General Comment on the Right to Food concurs: “the roots of the problem of hunger and malnutrition are not lack of food but lack of access to available food.”⁸⁴

Even though we currently grow enough food to feed the world, more than one billion people still go hungry. Enough food is available to provide at least 4.3 pounds of food per person a day worldwide: this consists of two and a half pounds of grain, beans, and nuts, about a pound of fruits and vegetables, and nearly another pound of meat, milk, and eggs.⁸⁵

Food availability and accessibility begins with equitable and fair access to land and vital natural resources. A true path toward reducing hunger includes economic reforms, land redistribution to the landless, and sustainable and affordable farm inputs and practices. Ultimately, food security needs to be resolved at the household level. Growing food locally for primarily local populations is a more reliable, stable food system than relying on global markets and import/export models.

While it is significant that organic farming can produce yields competitive to, and at times exceeding, industrial systems, it is critical to go beyond the one-dimensional focus on yield. Agroecological farming provides broader, multifunctional benefits that are not easily measured and quantified but are nevertheless fundamental to providing stable and abundant food systems. An inclusive concept of food systems considers taste, cultural traditions, available biodiversity, the environmental impact of production, as well as working conditions, processes of participation, and remuneration to producers.⁸⁶

Essentially, solving hunger and poverty is a matter of political will and moral fortitude and requires that resources be directed toward strengthening capacity at community levels.

1.5.2 Myth Two: Global Food Production Must Increase By 70 Percent

One of the major push factors to adopt industrial, modern farming as a major adaptation solution is this: in order to feed a projected population increase of nine billion people by 2050, global food production must double current rates and increase by 70 percent.⁸⁷

However, these projected global food production figures reflect the current western dietary pattern based on high meat consumption. The average U.S. citizen consumes a pound of meat per day, in addition to eggs or fish, and milk.⁸⁸ As evidenced by increasing research and health problems related to obesity in northern countries, such as Type II diabetes, it is questionable whether this pattern of consumption should not be the benchmark for health or sustainability.

Almost 40 percent of global grain production is for livestock feed.⁸⁹ The United Nations Environmental Programme (UNEP) estimates that the loss of calories resulting from feeding grain to livestock, instead of humans consuming the grain directly, could provide the annual calories needed for more than 3.5 billion people.⁹⁰ (This figure accounts for the energy value attributed to meat.)

Traditional, nutritious diets in non-western regions of the world tend to be much more diverse and more plant-based than western eating habits. Instead of being carnivorous, most cultures have diets of beans, grains, fruits, vegetables, and only a small amount of animal-derived products. This pattern of consumption uses

fewer resources and has a much lower impact on global warming than a diet of intensive meat consumption. Research tells us that it takes approximately 25 kcals of energy to produce one kcal of meat, compared with 2.2 kcal of energy per one kcal of plant-based foods.⁹¹

Food production systems largely drive consumption patterns. For instance, market incentives and policies favoring intensive meat production will often result in increased meat consumption. It is critical that governments and international bodies move toward policies that more accurately reflect diversity, vibrant traditions, and essential needs.

1.5.3 Myth Three: There Is Waste in Traditional Agriculture Systems

Yield measurement criteria for industrial output is calculated differently than when considering outputs of traditional, diverse crops. To the industrial system, only the commodity part of a crop is viewed to be of value. Everything else is considered "waste." Yield measurement criteria for traditional, diverse crops are different.

Traditional farming systems are multifunctional and therefore the entire plant is of value. These farms produce not only food, but also fodder for animals and fertilizer for soils. Traditional agriculture typically provides a chain of livelihoods for rural communities and also embeds important social and cultural values.

1.5.4 Myth Four: Resource-Poor Subsistence Farming Is the Same as Organic Farming

Resource-poor subsistence farming is not the same thing as actively incorporating agroecological, organic methods. Although some resource-poor farmers engage in "organic by neglect," this is often because farmers do not have access to or have limited access to healthy soils, water, and other natural resources as well as training and educational services. Small farmers often lack access to land due to insecure property rights and illegal land seizures, particularly in many parts of Africa and Asia. Equitable land reform needs to be a central part of any climate change adaptation and food security strategies.

There are different stages of management on the path toward conversion to organic agriculture: a) in-transition from conventional to organic management; b) in-conversion from traditional to organic management; c) organic management based on input substitution; and d) complete shift to an agroecological systems approach.⁹² It is critical to recognize that these various stages require different types of policy and financial supports.

Social conditions and local economic development have been substantially improved in regions where investments were made in re-building natural resources and where land re-distribution programs for landless and land-poor families have occurred. According to the World Bank *2008 World Development Report*, 80 percent of the reason for a decline in poverty rates in developing countries between 1993 and 2002 was due to enhancing rural conditions rather than migrating to cities.⁹³

1.5.5 Genetically Engineered (GE)* Seeds and Crops Are Needed to Feed A Hungry World and Reduce GHG Emissions

Agriculture is emerging as a high profile issue at international climate negotiations, as well as within national strategies addressing global warming. Biotechnology companies and some donor communities are fervently promoting GE seeds and crops as a mitigation solution to GHG emissions. Advocates also claim that GE technologies are a key adaptation strategy to effectively deal with increasing populations and hunger.

Agribusiness seed and chemical corporations are lobbying within national and international arenas to receive funds, via “technology transfer” and other such mechanisms, to introduce and expand GE crops in many developing countries. GE proponents are also advising that GE crops be included in carbon offset schemes.

The industry is strongly positioning itself. Approximately 1,663 patent applications for “climate-ready” crops have been submitted for approval since June 2008 to June 2010.⁹⁴ Three companies—DuPont, Monsanto, and BASF—submitted two-thirds of the proposed patents.⁹⁵

However, claims regarding the capacity of GE crops to mitigate GHG emissions and provide food security are simply not credible, given the performance of GE crops to date and the scientific record. As Bill Freese, science policy analyst at the Center for Food Safety, suggests: “The tremendous hype surrounding biotechnology has obscured some basic facts. Most GE crops feed animals or fuel cars in rich nations, are engineered for use with expensive weed killers to save labor, often have reduced yields, and are grown by larger farmers in industrial monocultures for export. The technology is dominated by multinational firms intent on controlling the world’s seed supply, raising seed prices, and eliminating farmer seed-saving.”⁹⁶

Mitigation claims are based on the supposition that GE crops sequester CO₂ at high rates and reduce pesticide and chemical use. The claim that GE crops result in higher crop yields is used to suggest that they are effective in helping farmers adapt to climate change.

To date, not a single GE crop has been approved for climate-ready traits claimed by the industry. Currently, there are no commercially approved GE crops with higher yield potential, nutritional enhancement, and drought or salt tolerance.

Instead, after decades of research and development and millions of dollars spent, commercialized GE crops provided just two “traits”: 1) herbicide tolerance and/or 2) insect resistance.

Herbicide-tolerant crops are engineered to withstand direct application of an herbicide intended to eliminate nearby weeds. (Herbicides comprise by far the largest category of pesticides, defined as any chemical used to kill plant, insect, or disease-causing pests.)

Approximately 84 percent of global biotech crop acreage is herbicide-tolerant.⁹⁷ The vast majority of these crops are Monsanto’s glyphosate-tolerant, Roundup Ready varieties. Insect-resistant cotton and corn produce their own built-in insecticide(s) derived from a soil bacterium, *Bacillus thuringiensis* (Bt), to protect against certain insect pests.

As an early adopter of these technologies, and the largest grower of GE crops (almost half of the global total), the U.S. experience is particularly instruc-

* Genetically modified (GM) is also a frequently used term

“The technology is dominated by multinational firms intent on controlling the world’s seed supply, raising seed prices, and eliminating farmer seed-saving.”
(Bill Freese)

tive regarding the benefits versus hazards of GE crops. GE crops have been commercially grown in the U.S. since the mid-1990s. As of 2009, 93 percent of soybeans, 93 percent of cotton, 80 percent of corn and 95 percent of the sugar beet grown in the U.S. are GE crops.⁹⁸ Globally, the majority of GE crops are grown in the following countries⁹⁹:

- United States—66.8 million hectares
- Brazil—25.4 million hectares
- Argentina— 22.9 million hectares
- India—9.4 million hectares
- Canada—8.8 million hectares
- China—3.5 million hectares

GE crops are also being adopted in other Latin American and Asian countries, and GE crops are gaining entrance into European and African countries, regions that have historically rejected this technology.

More than half of the world's soybean and 31 percent of corn are GE crops. GE cotton represents 14 percent and GE canola represents 5 percent of the global biotech crop area.¹⁰⁰

Claim #1: GE Crops Reduce Pesticide Usage

Soils degraded by heavy pesticide and other chemical applications associated with industrial agriculture cannot sequester carbon as effectively as non-chemically treated soils. In most areas where GE crops have been introduced, pesticide usage has actually *increased*, as demonstrated by the statistics below.

- The most comprehensive independent study to date, based on U.S. Department of Agriculture (USDA) data, found that GE crops in the U.S. used more than 26 percent more pesticides per acre than non-GE, conventional crops.¹⁰¹
- GE crops increased pesticide usage in the U.S. by 318.4 million pounds from 1996 to 2008.¹⁰²
- At 200 million pounds per year in the U.S. alone (2007), glyphosate, a toxic herbicide, is the most heavily used pesticide the world has ever seen.¹⁰³
- Applications of glyphosate, a toxic herbicide, on GE crops has increased worldwide in the last few years, largely because of the development of super weeds (see below). The rate of application has tripled for cotton, doubled for soybeans, and increased by 30 percent for corn.¹⁰⁴

Super Weeds, Super Problem. Agronomists around the world are alarmed by the growing epidemic of glyphosate-resistant weeds, also known as "superweeds," that have evolved as a result of the intensive use of this herbicide on Monsanto's Roundup Ready crops.¹⁰⁵ More than 10 million acres of cropland in the U.S. are infested with glyphosate-resistant weeds,¹⁰⁶ with a nearly four-fold increase projected by 2013.¹⁰⁷ South American countries where Roundup Ready soybeans predominate are also hard hit.¹⁰⁸ Farmers respond to glyphosate-resistant weeds by increasing their use of herbicides, soil-eroding tillage operations,¹⁰⁹ and in extreme cases by massive manual weeding efforts.¹¹⁰ These resistant weeds are driving a toxic spiral of increased herbicide use, which will be exacerbated by the imminent introduction of new generations of GE crops resistant to ever more toxic herbicides.

In most areas where GE crops have been introduced, pesticide usage has increased.

Superweeds are also causing severe financial hardships for farmers due to increased weed control costs. (The problem has been so acute for farmers that the U.S. Congress recently held hearings on the issue.¹¹¹)

Claim #2: GE Crops Sequester CO₂

Nitrogen Usage: 60 percent of global N₂O emissions is primarily due to the use of synthetic nitrogen fertilizers.¹¹²

Biotechnology companies claim that GE crops can reduce the use of nitrogen fertilizers. However, to date, there is no sound scientific evidence or study demonstrating that GE crops result in a decrease of chemical nitrogen fertilizer usage.

- A 2009 report by the Union of Concerned Scientists evaluated claims by biotech proponents that GE crops reduced the use of synthetic nitrogen fertilizer. In sum, the report found that no U.S. regulatory agency has approved or commercialized any GE crop that has reduced nitrogen fertilizer use.¹¹³
- A 2005 report by the FAO concluded that genetic modification for nitrogen fixing is extremely difficult.¹¹⁴

Claim #3: No-Till Crops Sequester Higher Amounts of CO₂

Biotechnology advocates claim that newer varieties of GE crops do not require as much tilling, or plowing, as conventional crops. The assertion is that "no till" soils and conservation tillage methods sequester more carbon.

However, a landmark review of the scientific literature debunks the notion that found that no-till fields sequester more carbon than plowed fields. GE proponents based their claim on studies that only measured carbon sequestration down to about 30cm. However, the roots of crops—which deposit carbon in the soil—often grow much deeper. After examining carbon changes to soil depths greater than 30cm, most of the studies found no significant difference in carbon sequestration between plowed and no-till fields.¹¹⁵

Additionally, a growing body of research shows that, in certain instances, no-till agriculture may emit more N₂O than crops that are plowed.¹¹⁶

Claim #4: GE Crops Will Increase Yields and Reduce Hunger

Agribusiness corporations declare that GE crops are a vital solution to hunger. It depends who the hungry are. People? Or, livestock and cars? Currently, the majority of GE crops are grown for animal feed and biofuel.¹¹⁷

In the 2007/2008 food crisis, the basic price of food commodities increased due to a convergence of agricultural commodity speculation, former food acres being converted to fuel acres, and a spike in oil prices. This drove more than 40 million people into hunger.¹¹⁸ Monsanto and other biotechnology corporations have leveraged this crisis as an opportunity to more aggressively offer GE seeds and crops as a solution to hunger.

Agribusiness corporations, along with some governments, international aid organizations, and foundations and donors, contend that GE crops will soon have

traits for drought- and salt-tolerance and thus will adapt to the weather vagaries associated with climate change. Yet as Freese observes, "There is not a single GE crop on the market engineered for increased yield, drought-tolerance, salt-tolerance, enhanced nutrition or other attractive-sounding traits touted by the industry. Disease-resistant GE crops are practically non-existent."¹¹⁹

A review of GE soybean and corn crop yields (*Failure to Yield*) found that GE soybeans and corn in the U.S. have not increased intrinsic yields. (Intrinsic yield reflects the potential yield if grown under ideal conditions.) The study did find that GE corn yields, averaged over 13 years, exhibited an operational increase, (i.e., what is obtained under actual conditions).¹²⁰

However, the review found that corn yield increases were due primarily to conventional breeding and not to GE technology. Only 0.2 to 0.3 percent yield increase per year was attributed to the Bt insect-resistant trait in corn since its introduction in 1996. In other words, traditional breeding methods were the major reason for increased yields.

The review also notes that, in contrast to GE technology, traditional breeding (both for industrial seeds and non-industrial seeds) and low-input farming methods have produced tremendous yield increases. This research concurs with other studies noted elsewhere in this report (e.g., *Can Agroecological, Organic Farming Feed the World*), demonstrating that ecological, organic farming produces yields as high as industrial crops, including GE crops. In many cases, organic crops significantly outperformed industrial yields, especially in developing countries.

The USDA, often a proponent of GE seeds, reports that "currently available GM crops do not increase the yield potential of a hybrid variety. ... in fact, yield may even decrease if the varieties used to carry the herbicide-tolerant or insect-resistant genes are not the highest yielding cultivars."¹²¹

Other countries can attest to failures of GE crops. Expansion of GE soybean crops in Brazil, a major cause of further deforestation in the Amazon in recent years, has resulted in an increase in crop failures (mainly as a result of superweeds). (Approximately 59 percent of Brazil's GHG emissions are due to increasing deforestation in the Amazon to make way for GE soybean plantations.) Crops perform especially poorly in southern Brazil during drought conditions. *New Scientist* reports: "...hot climates don't agree with Monsanto's herbicide-resistant soybeans, causing stems to split open and crop losses of up to 40 percent."¹²²

Other Reasons for Concern: Corporate Concentration and Loss of Biodiversity

Corporate Concentration: The problem of rapid consolidation of seed companies (as well as chemical companies) is startling. From thousands of seed companies and public breeding institutions three decades ago, 10 companies now control more than two-thirds of global proprietary seed sales.¹²³ Monsanto controls approximately 70 percent of all GE crops grown worldwide.¹²⁴

The biotech industry often claims that farmers have a choice in deciding whether to purchase GE seeds or not. However, the availability of conventional seeds is steadily reducing with the emergence of GE seeds. This gives farmers little choice. A biotech industry consultant commented: "The hope of the [biotech] industry is that over time the market is so flooded [with GE crops] that there's nothing you can do about it. You just sort of surrender."¹²⁵

Loss of Biodiversity: An additional concern is that GE seeds and crops reduce the very biodiversity that is even more essential in times of climate uncertainty. A recent report, *Gone to Seed*, found that 50 percent or more of the certified non-GE corn, canola, and soybean seed has been contaminated with GE genes. This threatens locally bred, non-GE seeds that are the repositories of centuries of knowledge and technology. Many societies depend on these seeds to respond to radical shifts in weather patterns.



Rice varieties. © shutterstock

Other unintended consequences of GE crops and products on public health and food safety include increased levels of native plant toxins, novel toxins, and reduced nutritional content. Some studies have also suggested that GE foods can cause kidney inflammation and increased levels of white blood cells.¹²⁶

The U.S. EPA has stated that glyphosate use may adversely impact two endangered amphibian species: the California red-legged frog¹²⁷ and the Houston toad.¹²⁸ Two recent studies implicate glyphosate as one of several factors responsible for declining Monarch butterfly populations. Heavy glyphosate use with Roundup Ready crops has decimated populations of milkweed, the Monarch's favorite host plant, in agricultural fields in Iowa, resulting in declining Monarch breeding habitat.¹²⁹ This research and other science demonstrates that it is plausible that glyphosate is reducing populations of many plant species growing near agricultural fields, and adversely impacting the organisms that depend on those plants.

The new era of GE technology is troubling as well. For example, DowAgroSciences is awaiting USDA approval of corn and soybeans resistant to 2, 4-D, a chemical related to Agent Orange, a defoliant used in the Vietnam War and a known carcinogen and endocrine disruptor.¹³⁰

The high cost of GE seeds is another aspect that does not fit into a self-reliant food and farming model. GE maize (corn) seeds were 30 percent higher and soybean seeds nearly 25 percent higher in 2009 compared to 2008.¹³¹ Tech-

nology fees are also a major factor in seed prices. Monsanto earned about \$54 million from GE cotton seed sells to India in 2009—the technology fee was 15 to 25 percent of the seed price.

* * *

Powerful Allies

Some powerful governments, influential foundations and private donors, along with international aid organizations, have swallowed the hype about GE seeds and crops. At the press conference of the Gates Foundation announcing a further \$120 million grant for agriculture in Africa, Bill Gates said, “Biotechnology has a critical role to play in increasing agricultural productivity, particularly in light of climate change.”

The Obama Administration views GE crops to be part of its strategy for reducing world hunger. This was emphasized by a director at the USDA at a recent Congressional hearing: “First I would like to emphasize that at USDA, we support all forms of agriculture—conventional, including the use of genetically engineered [GE] products, and organic—to meet the nation’s and the world’s need for food security, energy production, and the economic sustainability of farms.”¹³²

The Way Forward and Civil Society Response

GE technology is, essentially, an extension of the same industrial agriculture model that has contributed a high amount of GHGs and has failed to feed the world as advertised. GE crops simply perpetuate a failed model of agriculture that is reliant on high-cost inputs, including seeds, pesticides, synthetic nitrogen fertilizers, high amounts of water usage, and fossil fuel-driven farm machines. Additionally, GE crops have cultivated new problems, such as superweeds. Extending this unreliable, expensive technology to poor farmers in developing countries will only exacerbate rural hunger and poverty.

Proprietary dominance of only a few giant GE seed and chemical companies should stimulate robust discussion about the control of seeds and ultimately, food supply. Industry seed concentration, enhanced by global intellectual property rights systems as promoted in the WTO and other international entities, impede local food systems that are desperately needed in developing countries. “Patent monopolies undermine and stymie climate adaptation by African farmers because it constrains the free exchange of and experimentation with crop germplasm—critical activities for the development of African solutions.”¹³³

It is critical that all sectors of civil society recognize that GE seeds and crops are not an effective means to reduce GHG emissions or to feed the world. NGOs may unwittingly give credence to GE crops by supporting “drought and salt tolerant” crops without recognizing that GE proponents have introduced these terms as part of a stealth marketing strategy.

Agribusiness corporations are rapidly advancing the GE agenda within UNFCCC negotiations. Civil society must ensure that UNFCCC bodies undertake a comprehensive, independent social and environmental assessment of the impacts of GE seeds and crops. Instead, policies and financial resources need to be shifted toward resilient, small-scale, multifunctional, and self-reliant farming systems. This

“Patent monopolies undermine and stymie climate adaptation by African farmers.” (African Centre for Biosafety)

includes providing resources for participatory plant breeding programs and farmer extension services. This is a path toward maintaining environmental integrity, human dignity, vibrant livelihoods and rural communities.

1.6 Challenges for Transitioning to Ecological Food Systems

Policy decisions that provide financial and educational resources dictate winners and losers. Transitioning to organic systems presents challenges. However, agroecological food systems require much lower levels of finance and investment than is required by industrial farming.

Organic agriculture has made consistent and significant advances during the last few decades even though governments and other institutions have devoted relatively few funds to the model. "While adoption of green revolution methods has typically increased yields, so has intensification by organic methods," scientists remind us.¹³⁴

Field studies suggest that if resources are directed to organic methods yields can be as high or higher than industrial farming.

Field studies suggest that if resources are directed to organic methods yields can be as high or higher than industrial farming. Researchers confirm: "... there is scope for increased production on organic farms, since most agricultural research of the past 50 years has focused on conventional methods."¹³⁵

Directing resources toward agroecology methods makes particular sense in developing countries where there are millions of farmers with small plots. Much research has found, production per unit area is greater on small farms than on large farms. (This is true in both developed and developing nations.) The greatest constraints faced by many small-scale producers is the lack of access to the latest research, including best practices, access to extension services, and well-developed local markets.

Unfortunately, even with expansive research demonstrating that agroecological methods can increase food supplies, boost farm economies, and reduce GHG emissions, huge investments are being made in a more-of-the-same technological paradigm. For example, the UK government spent £49 million on biotechnology in 2006/2007 compared to £1.6 million on organic farming. As argued by the Special Rapporteur on the Right to Food, real change to improve the livelihoods of rural farmers requires governments to be on board. "States and donors have a key role to play here," he said. "Private companies will not invest time and money in practices that cannot be rewarded by patents and which don't open markets for chemical products or improved seeds."¹³⁶

Civil society movements can spur a powerful shift within climate change arenas by insisting that authentic, sustainable food systems be a central feature of financial and technology transfer mechanisms. Presenting this clarion vision could perhaps re-invigorate momentum in climate change arenas. There is a particular need for movements to review and advocate specific tools and resources needed for research, education, and implementation; and to recommend policies that create incentives for farmers and consumers to engage in sustainable food systems.

* * *

1.7 Status of Agriculture at the UNFCCC

Agriculture emerged as a major issue at the UNFCCC Cancun negotiations. However, the nascent realization of its importance caught many ill prepared—both in government and civil society.

One problem is that there is a critical void of information regarding agriculture mitigation and adaptation measures within the UNFCCC. This needs to be promptly addressed. There is an urgent need for the UNFCCC to facilitate international instruments for agricultural mitigation and adaptation actions to be agreed by the COP. This includes appropriate text on financing, technology development/transfer and mitigation and adaptation measures. Although a negotiating group on “Cooperative sectoral approaches and sector-specific actions” submitted a text on agriculture in Copenhagen, and again in Cancun, no formal action was taken on the submission. The negotiating group, as well as the technical body within the UNFCCC called the Subsidiary Body for Scientific and Technological Advice (SBSTA) will continue working on a text to present at the COP17 UNFCCC meeting to be held in Durban, South Africa, in December 2011.

Agribusinesses have quickly mobilized and moved to control the agriculture agenda. Consequently, many of the proposals for financing through UNFCCC-related institutions and programs are centered on the industrial paradigm of agriculture outlined in this report. For example, GE seeds and crops are being aggressively promoted by agribusiness corporations as both a mitigation and adaptation strategy. As discussed earlier, GE crops perpetuate GHG emissions through the use of toxic herbicides as well as synthetic nitrogen fertilizers (responsible for 60 percent of total global N₂O emissions as noted already in this report). Additionally, claims of increased carbon sequestration and high yields have not borne out.

Carbon markets are a main focus of agricultural mitigation proposals. As already noted, this market-based approach leads to perverse incentives that favor industrial farming practices and have the potential to further marginalize small-scale farmers and vulnerable communities. One of the main concerns is that carbon markets and other such market mechanisms focus too narrowly on carbon as a commodity to be bought, sold, and traded internationally to offset polluting practices in industrialized countries. UNFCCC negotiations thus far gravitate toward expanding the Clean Development Mechanism (CDM), a finance mechanism created to distribute funds to GHG-reducing projects. However, to date, CDM projects have not produced impressive results, and other carbon market schemes have failed to reduce GHG emissions. (See Part II for discussion of the CDM and carbon markets.)

In sum, most of these proposed schemes favor large financial institutions, investors, and industry, and perpetuate industrial agricultural models.

Reduced Emissions from Deforestation and Degradation (REDD) and Other Concerns

The Reduced Emissions from Deforestation and Degradation (REDD) also enters into discussions about agriculture. REDD is a UN effort to create a financial value for the carbon stored in forests by offering incentives for developing countries to reduce emissions by maintaining forested lands and investing in low-carbon paths

to sustainable development. Some have proposed that agriculture should become part of REDD negotiations however, others believe that the carbon market approach of REDD is not the model for food systems to replicate. Also, although REDD has expanded its original mandate and now includes the role of conservation, sustainable management of forests and enhancement of forest carbon, there is concern that if agricultural issues are also included then REDD implementation could be slowed down considerably.

1.8 Changing the Paradigm: Dire Need for Diverse Civil Society Engagement

After years of high-profile international negotiations, media attention, and massive mobilization of government and civil society resources, the spectacular failure of the global climate negotiations have left many uncertain about how to get out of the quagmire of government inaction and civil society discord.

Given this failure, it is clear that the global community must establish a new way forward in order to avert planetary disaster. It is time to reassess the assumption of institutions and policymakers—and even some civil society groups—that expensive, and often still unproven technologies requiring massive capital investment and infrastructure are the primary way to reduce GHG emissions. *Instead, societies need climate solutions that are grounded in ecological and social justice principles and that relate to people's everyday lives and livelihoods.*

Societies need climate solutions that are grounded in ecological and social justice principles and that relate to people's everyday lives and livelihoods.

Within the UNFCCC and national discussions on climate change, civil society has been primarily represented by environmental and climate NGOs which, traditionally, rarely focus on agriculture and often do not have staff with expertise on complex agricultural issues. Climate change issues extends this complexity and therefore requires heightened participation of food and farming NGOs, along with groups working on trade issues. Agricultural issues require expansive, cross-sectoral knowledge of how food issues connect to politically sensitive trade and economic spheres (including intellectual property regimes), development, food security, poverty, livelihoods, human rights, and more. At the same time specific understanding of the wide range of land use and management practices associated with agriculture is also needed.

While the sudden surfacing of agriculture in the run up to and at the Cancun climate negotiations has sparked more engagement among agriculture and food NGOs, along with human rights and indigenous groups, these sectors are still vastly under-represented. A recent survey by the Center for Food Safety reveals the breakdown of NGO sectors currently engaged in climate initiatives as follows: Climate—18 percent; Environmental—52 percent; Agriculture—12 percent; Food/Hunger/Development—10 percent; Indigenous—5 percent; and Trade—3 percent.¹³⁷

Expanding the civil society base to include groups that have expertise and knowledge about agriculture and food systems is essential. At the same time, it is critical to build capacity so that groups can “catch up” on UNFCCC procedures and players. There's an urgent need for amplified civil society engagement and advocacy for models that maintain ecological integrity.

Movements can perform a great service by developing an overall framework for agricultural mitigation/adaptation that includes all of the complex interconnections of agriculture with related sectors and policy goals. At some point this process will be taken up within the UNFCCC, with a high potential for the discussion to be dominated by agribusiness interests, so civil society would be wise to rapidly, yet comprehensively, undertake this agenda.

Building a comity of civil society from diverse sectors could galvanize education and advocacy to ensure that a solution to one is a solution to all key policy goals. In addition to crafting an overall framework for mitigation and adaptation, a global, unified movement could effectively address the following:

- a) Expand knowledge of diverse sectors of civil society about the relationship between climate change and food systems, and associated environmental and social justice issues;
- b) Identify, analyze, and share information about proposed policies within the UNFCCC, including finance mechanisms such as the Clean Development Mechanism (CDM) and the Green Climate Fund (GCF), recently established at the Cancun negotiations.
- c) Craft principals by which to measure proposed solutions;
- d) Develop proposals based on ecological imperatives;
- e) Develop high-profile education and outreach to the media, global leaders, funding organizations and individuals, and the general public.

The following recommendations for attaining these goals are drawn heavily from a recent report by the Special Rapporteur on the Right to Food for the Human Rights Council.

1.8.1 Actions for Nation-States, Donors, and International Institutions

Invest in Agricultural Extension and Research. A guiding principle in developing more educational exchanges for agriculture is to develop participatory programs that bring together farmer's local knowledge and expertise with the latest science and improvements advanced by research institutions and formalized expertise.

Develop Capacity of Public Services. Building successful food security models requires a combination of ecological on-farm practices along with public services and access to markets (emphasizing local and regional markets). Therefore, investment should be directed toward extension services, storage facilities, rural infrastructure, agricultural research and development, and farmer cooperatives. A special focus needs to be given to providing more education and resources (including access to credit) for women.

Recognize Agroecological, Organic Methods Within National and International Strategies. In efforts to mitigate climate change, nation-states are asked to develop national adaptation plans of action (NAPAs) and list nationally appropriate mitigation actions (NAMAs) that countries can undertake. Within these plans, ecological practices must be thoroughly incorporated and acted upon. Successful strategies and actions depend upon decentralized participation of farmers and research and educational centers and should build upon existing networks.

* * *

1.9 Conclusion

Climate change and many planetary natural resource crises have resulted from the treadmill of chemical inputs, high water usage, and energy-dependency implicit in the industrial food model. Social, cultural, and human rights have also been negatively impacted. A UNEP report explains that world food production could be reduced by up to 25 percent by 2050 if societies continue on an agricultural path that reduces biodiversity, soil fertility, forests, and overuses water.¹³⁸

As the late Edward R. Goldsmith, author of seminal environmental books, often stated: "When doing something that causes harm, one must do the exact opposite in order for things to change."

Agroecological farming methods address global warming and other environmental concerns and also advance social and economic equity and justice needs. Policies that move us toward ecological fundamentals are essential if we are to build global food security, especially given the vagaries and unpredictability of global climate change.

Box 5 Environmental Legacy of Industrial Agriculture

The legacy of industrial agriculture is reflected in this summary review of harms to natural resources.

Pesticides

- U.S. Environmental Protection Agency (EPA) research revealed that worldwide pesticide use exceeded 5 billion pounds in the year 2000.¹³⁹
- U.S. pesticide use contributes approximately 20 percent of worldwide total, indicative of the country's historical reliance on pesticides.¹⁴⁰
- Despite the 10-fold increase of insecticide use in the U.S. from 1945 to 2000, total crop losses from insects have nearly doubled, from 7 to 13 percent.¹⁴¹
- The "pesticide treadmill" is exacerbated by the rise of genetically engineered (GE) seeds dominated by herbicide-resistant traits. In particular, glyphosate (Roundup) use on soybeans, corn and cotton in the U.S. has increased 15-fold from 1994 to 2005, tracing both the dramatic rise in Roundup Ready crop acreage and the upsurge in glyphosate-resistant weeds, which require higher doses and/or more potent pesticides.¹⁴²
- Climate change intensifies the complexity of insects and plant diseases which can increase pesticide usage. According to the FAO, "There is evidence that climate change is altering the distribution, incidence, and intensity of animal and plant pests and diseases as well as invasive and alien species."¹⁴³

Fertilizers

- The 2007 IPCC report shows that of the 60 percent of total global nitrous oxide (a GHG 296 times more potent than CO₂), most emissions are attributable to synthetic nitrogen fertilizer.

- Synthetic nitrogen fertilizer production emits around 41 million metric tons of CO₂ per year.¹⁴⁴
- From 1968 to 2008, worldwide fertilizer consumption increased more than 400 percent, rising from 31.6 to 156 million tons.¹⁴⁵
- Fertilizer runoff is a driving factor in the rise of dead zones in the ocean. Identified dead zones have sky-rocketed from 49 in the 1960s to 405 in 2008.¹⁴⁶

Soil

- According to a Cornell University study: "The rate of soil erosion now vastly exceeds soil formation. Soil is washed away ten times faster than it is replenished in the U.S. and 40 times faster in China and India. In some areas of the Great Plains, agricultural topsoil has decreased in thickness from 12 inches to less than four inches. As a result of erosion in the last 40 years, 30 percent of the world's arable land has become unproductive."¹⁴⁷
- The International Soil Reference and Information Centre reports that 46.4 percent of soils are at depletion levels that correspond with decreases in productivity.¹⁴⁸

Water

- Industrial agriculture uses 70 percent of the planet's fresh water.¹⁴⁹
- Industrial agriculture water demand exceeds supply; between 13 and 35 percent of global irrigation withdrawals exceed the supply rate.¹⁵⁰
- According to U.S. EPA, agriculture contributes nearly 75 percent of all water-quality problems in U.S. rivers and streams.
- Many geographic regions are experiencing profound water scarcity, mainly in developing countries, and one-third of the world's population now lives in water scarce countries.¹⁵¹
- Since the Industrial Revolution, half of U.S. wetlands have disappeared and only 2 percent of the rivers and streams remain free-flowing.¹⁵²

Energy

- Industrial food systems require 10-15 calories to produce and distribute one calorie of food.¹⁵³
- Another report shows that OECD food systems require 4 kcal to supply 1 kcal of food in contrast to the one to one ratio of developing countries.¹⁵⁴
- The U.S. food system accounts for around 17 percent of U.S. energy consumption.¹⁵⁵
- In the U.S., 96 billion pounds of food is wasted annually, at the cost of 300 million barrels of oil and 25 percent of the nation's fresh water.¹⁵⁶

Biodiversity

- The Green Revolution resulted in the biodiversity loss of an estimated 75 percent of the seed germplasm for the world's leading crops.¹⁵⁷

- FAO's Leipzig Conference on Plant Genetic Resources concluded that monoculture cropping is the most significant cause of the decline in biodiversity and native seeds. For example:
 - Prior to the Green Revolution, there were around 30,000 rice varieties grown in India; today, there are about ten.
 - China historically boasted 10,000 varieties of rice; by the 1970s, that figure decreased to 1,000.
 - By 2000, Mexico had only 20 percent of its historical maize biodiversity remaining.
 - Historically, there were 7,000 varieties of apples in the U.S.; 6,000 are now extinct.¹⁵⁸
- The U.S. was once considered the "epicenter of freshwater biodiversity" but species extinction rates are rising due to an increase in contaminated water and dead zones in the ocean: 37 percent of freshwater fish risk extinction, 51 percent of crayfish and 40 percent of amphibians are endangered and 67 percent of freshwater mussels risk extinction or are extinct.¹⁵⁹

1.10 Civil Society and Non-Governmental Organizations working on Climate Change, Food/Agriculture and Environmental Issues (partial list)

1Sky
350.org
360 Degrees
A Seed
Accion Ecologica
Action Aid
African Biodiversity Network
Agribusiness Action Initiatives
Alliance for Climate Protection
Asociacion Chihlena de ONGs ACCION
Association de Recherche sur le Climat et L'Environnement
CARE
Center for Food Safety
Centro Ecologico
Chile Sustentable
Christian Aid
Climate Action Network International
Community Food Security Coalition
CSO Mechanism for UN Committee on World Food Security
Diverse Women for Diversity
Earth Island Institute
Earthjustice
Earthwatch Institute
Ecological Farm Association
Econexus
Environmental Defense Fund (EDF)
Eradicate Hunger
ETC Group
Focus on Global South
Food and Water Watch
Food Democracy Now!
Food First/Institute for Food and Development Policy
Friends of the Earth International (regional, national offices)
Funders Network on Transforming the Global Economy
Gaia Foundation
Global Justice Ecology Project
GRAIN
Grassroots International
GREEN Foundation India
Greenbelt Movement International
Greenpeace International (regional, national offices)
Grupo de Reflexion Rural
Heifer International

Heinrich Böll Stiftung
IBON International
IFOAM International Federation for Organic Agriculture Movements (regional and national offices)
Initiative for Policy Dialogue
Institute for Agriculture & Trade Policy
Institute for Ecological Economy Research
Institute for Local Self-Reliance
Institute for Policy Studies
Institute for Public Policy Research (IPPR)
Institute for Sustainable Development (Ethiopia)
Instituto de Ecologia
International Commission on the Future of Food and Agriculture
International Development Economics Associates
International Fund for Agricultural Development
International Institute for Environment and Development
International Society for Ecology and Culture (ISEC)
MASIPAG, Philippines
More and Better
National Association for Nature Conservation
National Family Farm Coalition
Natural Resources Defense Council (NRDC)
Navdanya International
New Economics Foundation
New World Agriculture and Ecology Group International
Oakland Institute
Our World is Not For Sale
Overseas Development Institute
Oxfam International
Pesticide Action Network (International and regional networks)
PICO
Post Carbon Institute
Practical Action
Rodale Institute
Reseau Action Climat-France
Rural Coalition
Save Our Seeds
Sierra Club
Soil Association
South Centre
Sustainable Scale Project
Swedish Society for Nature Conservation
Terra Nuova
The Alliance for Climate Protection
The Cornucopia Institute
The Development Fund/Utviklingsfondet
The Organic Center

Third World Network
U.S. Working Group on the Food Crisis
Union of Concerned Scientists
Via Campesina
Why Hunger
World Development Movement
World Economy, Ecology & Development
World Resources Institute
World Rural Forum
World Wildlife Fund
Worldwatch Institute
Wuppertal Institute

References

- 1 World Bank, "*Climate Smart*" *World Within Reach*, Says World Bank, news release, 9 November 2009, <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:22384188~pagePK:34370~piPK:34424~theSitePK:4607,00.html>.
- 2 World Resources Institute, http://pdf.wri.org/navigating_numbers_chapter6.pdf.
- 3 IAASTD, *Agriculture at a Crossroads: Global Summary for Decision Makers*, Washington, D.C.: Island Press, 2009, p. 8.
- 4 The World Bank, *World Development Report 2008*, 2007, p. 3, http://siteresources.worldbank.org/INTWDR2008/Resources/WDR_00_book.pdf.
- 5 Charles Benbrook, *Impacts of Genetically Engineered Crops on Pesticide Use: The First Thirteen Years*, The Organic Center, November 2009, p. 47 & supplemental table 7, http://www.organic-center.org/science.pest.php?action=view&report_id=159.
- 6 Dipti Thapa and Marjory-Anne Bromhead, *The Hague Conference on Agriculture, Food Security and Climate Change, Opportunities and Challenges for a Converging Agenda: Country Examples*, issue brief, Conference ed., World Bank, 2010, p. 2.
- 7 IPCC, *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, in: B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds.), *Agriculture*, Cambridge University Press: Cambridge, 2007.
- 8 IAASTD, *Summary for Decision Makers of the Global Report*, Island Press, 2009.
- 9 Jacques Diouf, *FAO Director-General Jacques Diouf on Behalf of FAO, World Food Programme and International Fund for Agriculture Development at UNFCCC*, address, UNFCCC COP 13, Bali, Indonesia, December 2007.
- 10 Global Crop Diversity Trust, *Climate Change Statement, Food Security and Climate Change - A Call for Commitment and Preparation*, news release, 18 November 2009, Global Crop Diversity Trust, <http://croptrust.org/main/climatestatemen.php>.
- 11 World Bank, "*Climate Smart*" *World Within Reach*, Says World Bank, news release, 9 November 2009, <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:22384188~pagePK:34370~piPK:34424~theSitePK:4607,00.html>.
- 12 IAASTD, *Agriculture at a Crossroads: Global Summary for Decision Makers*, publication, Washington, D.C.: Island Press, 2009, p. 8.
- 13 International Food Policy Research Institute, *Climate Change: Impact on Agriculture and Costs of Adaptation*, publication, Washington, D.C.: IFPRI, 2009, p. vii.
- 14 Martin Parry, Alex Evans, Mark W. Rosegrant and Tim Wheeler, *Climate Change and Hunger: Responding to the Challenge*, World Food Programme, November 2009.
- 15 FAO, *1.02 Billion People Hungry*, news release, 19 June 2009, Food and Agriculture Organization of the United Nations, <http://www.fao.org/news/story/en/item/20568/icode/>.
- 16 Wendell Berry, *The Way of Ignorance: And Other Essays*, Counterpoint, 2005, p. 131.
- 17 Darrell Addison Posey, *Cultural and Spiritual Values of Biodiversity*, in: *Journal of Agricultural and Environmental Ethics* 14 (1), published by UNEP, 2001.
- 18 *Seed World. On the Rise*, http://www.seedworld.com/index.php?option=com_content&view=article&id=176&Itemid=122, accessed 20 April 2011.
- 19 Jaideep Hardikar, *Crops of Truth*, in: *New Internationalist*, issue 435, 1 September 2010, <http://www.newint.org/features/2010/09/01/seeds-rural-south-india/>.
- 20 ETC Group, *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, publication no. 100, November 2008, http://www.etcgroup.org/upload/publication/707/01/etc_won_report_final_color.pdf.
- 21 Vandana Shiva, *The Green Revolution in the Punjab*, in: *The Ecologist* 21 (2), March-April 1991.
- 22 ETC Group, *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, publication no. 100, November 2008, http://www.etcgroup.org/upload/publication/707/01/etc_won_report_final_color.pdf.
- 23 Vandana Shiva and Kunwar Jalees, *Seeds of Suicide: The Ecological and Human Costs of Seed Monopolies and Globalisation of Agriculture*, New Delhi: Navdanya, 2006.
- 24 *Ibid.*

- 25 EPA, *2000-2001 Pesticide Market Estimates: Usage*, 16 February 2011, United States Environmental Protection Agency, <http://www.epa.gov/opp00001/pestsales/01pestsales/usage2001.htm>.
- 26 Frederick M. Fishel, *Pesticide Use Trends in the U.S.: Global Comparison*, 2009, <http://edis.ifas.ufl.edu/pi180>.
- 27 PAN, *Pesticides 101 - A Primer*, Pesticide Action Network: North America, <http://www.panna.org/issues/pesticides-101-primer>.
- 28 David Pimentel and Hugh Lehman, *The Pesticide Question: Environment, Economics, and Ethics* (New York: Chapman & Hall, 1993), p. 47.
- 29 IFA, *IFA Data*, International Fertilizer Association, <http://www.fertilizer.org/ifa/ifadata/search>
- 30 ETC Group, *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, publication no. 100, November 2008, p. 17, http://www.etcgroup.org/upload/publication/707/01/etc_won_report_final_color.pdf.
- 31 Ibid.
- 32 Daniel Imhoff, *CAFO: The Tragedy of Industrial Animal Farms*, San Rafael, California: Foundation for Deep Ecology/Earth Aware, 2010.
- 33 Jessica Bellarby et al., *Cool Farming: Climate Impacts of Agriculture and Mitigation Potential*, Greenpeace, 2008.
- 34 FAO, *FAO - Water at a Glance - Introduction*, FAO: FAO Home, 2007, <http://www.fao.org/nr/water/art/2007/glance/index.html> (accessed 19 January 2011).
- 35 Water Resources Group, *Charting Our Water Future - Water - Resources - Climate Change - Water*, McKinsey & Company in Conjunction with World Bank, 2009, http://www.mckinsey.com/client-service/water/charting_our_water_future.aspx.
- 36 Maude Barlow, *Access to Clean Water Is Most Violated Human Right*, Guardian.co.uk, Guardian.co.uk, 21 July 2010, <http://www.guardian.co.uk/commentisfree/cif-green/2010/jul/21/access-clean-water-human-right>.
- 37 Bryson Bates et al., *Climate Change and Water*, technical paper, Geneva, Switzerland: IPCC-Intergovernmental Panel on Climate Change, 2008.
- 38 Ibid.
- 39 Aksel Naerstad (ed.), *A Viable Food Future*, Oslo: The Development Fund/Utviklingsfondet, 2010.
- 40 IWMI, *IWMI: Climate Change - Solutions for Adaptation*, International Water Management Institute, 8 February 2010, accessed 21 January 2011, http://www.iwmi.cgiar.org/Topics/Climate_Change/Adaptation.aspx.
- 41 John Hendrickson, *Energy Use in the U.S. Food System: A Summary of Existing Research and Analysis*, Center for Integrated Agricultural Systems, UW-Madison, 2004.
- 42 Brian Reidl, *How Farm Subsidies Harm Taxpayers, Consumers, and Farmers, Too*, Washington, D.C.: Heritage Foundation, 2007, p. 1-2, <http://www.heritage.org/research/reports/2007/06/how-farm-subsidies-harm-taxpayers-consumers-and-farmers-too>.
- 43 Ibid, p. 2.
- 44 Vandana Shiva, *The Violence of the Green Revolution*, Penang, Malaysia: Third World Network, 1991.
- 45 Ibid.
- 46 Greenpeace India, *Chemical Fertilisers in Our Water: An Analysis of Nitrates in the Groundwater in Punjab*, Bengaluru: Greenpeace India Society, 2009, <http://www.indiaenvironmentportal.org.in/files/chemical-fertilisers-in-our-wa-2.pdf>.
- 47 Sudeep Chakravarti, *Laws to Tackle Other Bhopals*, in: LiveMint.com and The Wall Street Journal, 10 June 2010, <http://www.livemint.com/2010/06/09212410/LAWS-TO-TACKLE-OTHER-8216BH.html?atype=tp>.
- 48 E. Frison et al., *Agricultural Biodiversity, Nutrition and Health: Making a Difference to Hunger and Nutrition in the Developing World*, in: Food and Nutrition Bulletin, 27 (2), 2006, p. 167-179.
- 49 Vandana Shiva et al., *Seeds of Suicide: The Ecological and Human Costs of Globalization of Agriculture*, Research Foundation for Science, Technology and Ecology, 2000.
- 50 Tarna Gyuse, *Bring Back a Culture of Sharing*, 2009, <http://ipsnews.net/africa/nota.asp?idnews=46015>.
- 51 Gatonye Gathura, *GM Technology Fails Local Potatoes*, in: The Daily Nation, Kenya, 29 January 2004.

- 52 UNEP-UNCTAD Capacity-building Task Force on Trade, *Environment and Development, Organic Agriculture and Food Security in Africa*, publication, New York: United Nations, 2008, p. xi.
- 53 Jules Pretty et al., *Sustainable Intensification in African Agriculture*, in: *International Journal of Agricultural Sustainability*, 9 (1), forthcoming in 2011.
- 54 O.C. Ajayi et al., *Labour Inputs and Financial Profitability of Conventional and Agroforestry-Based Soil Fertility Management Practices in Zambia*, *Agrekon*, 48, 2009, p. 246-292.
- 55 S.M. Diop, *Management of Organic Inputs to Increase Food Production in Senegal*, in: N. Uphoff (ed.), *Agroecological innovations. Increasing food production with participatory development*, London, Earthscan Publications, 2001, p. 252.
- 56 IAASTD as quoted in *Who Benefits from GM Crops?* FOE International, February 2010, p. 36.
- 57 International Commission on the Future of Food and Agriculture, *Manifesto on the Future of Seeds*, Italy: Arsia-Regione Toscana, 2008, http://commissionecibo.arsia.toscana.it/UserFiles/File/Commiss%20Intern%20Futuro%20Cibo/CLIMA_ING.pdf.
- 58 Vandana Shiva, *War Against Nature and the People of the South*, in: Sarah Anderson (ed.) *Views from the South: The Effects of Globalization and the WTO on Third World Countries*, Oakland, CA: Food First Books, 2000.
- 59 McKinsey & Company, *Pathways to a Low-Carbon Economy: Version 2 of The Global Greenhouse Gas Abatement Cost Curve*, technical paper, McKinsey & Company, 2009.
- 60 Tim J. LaSalle and Paul Hepperly, *Regenerative Organic Farming: A Solution to Global Warming*, Rodale Institute, 2008, http://www.rodaleinstitute.org/files/Rodale_Research_Paper-07_30_08.pdf.
- 61 Christos Vasilikiotis, *Can Organic Farming Feed the World?*, 2000, University of California, Berkeley. L.E. Drinkwater et al, *Fundamental Differences between Conventional and Organic Tomato Agroecosystems in California*, *Ecological Applications*, 5 (4), 1995, p. 1098-1112.
- 62 Vandana Shiva, <http://www.navdanya.org/> (accessed 20 April 2011).
- 63 FAO, *"Climate Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, 2010, p. 22.
- 64 Ibid.
- 65 Christine Negra and Eva Wollenberg, *Lessons from REDD+ for Agriculture*, report no. 4, Copenhagen: CGIAR Research Program CCAFS, 2011, p. 40, http://www.ccafs.cgiar.org/sites/default/files/pdf/ccafs_report_4_web.pdf.
- 66 Ibid, p. 31.
- 67 Ibid, p. 34.
- 68 S. Suppan, *Speculating on Carbon: The Next Toxic Asset*, IATP, 30 November 2009.
- 69 IAASTD, *Agriculture at a Crossroads: Global Report*, publication, Washington, D.C.: Island Press, 2009.
- 70 Eric Holt-Gimenez, *Measuring Farmers' Agroecological Resistance After Hurricane Mitch in Nicaragua: A Case Study in Participatory, Sustainable Land Management Impact Monitoring*, *Agriculture, Ecosystems and the Environment*, 93 (1-2), 2002, p. 87-105.
- 71 J.N. Pretty et al., *Resource-Conserving Agriculture Increases Yields in Developing Countries*, *Environmental Science & Technology* 40 (4), 2006, http://www.icarrd.org/en/ref_doc_down/sust_pretty_final.pdf.
- 72 Christos Vasilikiotis, *Organic Farming Can Feed The World?* College of Natural Resources - UC Berkeley, November 2000, http://www.cnr.berkeley.edu/~christos/articles/cv_organic_farming.html.
- 73 Jakob Lundberg and Fredrik Moberg, *Ecological in Ethiopia*, report, Stockholm: Swedish Society for Nature Conservation, 2008.
- 74 Jules Pretty and Rachel Hine, *Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence*, report, Colchester, UK: University of Essex, 2001.
- 75 M. Jahi Chappell, *Shattering Myths: Can Sustainable Agriculture Feed the World?* report, University of Michigan Department of Ecology and Evolutionary Biology and Food First, 2007.
- 76 Christos Vasilikiotis, *Can Organic Farming Can Feed The World?* College of Natural Resources - UC Berkeley, November 2000, http://www.cnr.berkeley.edu/~christos/articles/cv_organic_farming.html.
- 77 Rachel Hine, Jules Pretty, and Sophia Twarog, *Organic Agriculture and Food Security in Africa*, report, Geneva, Switzerland: UNEP-UNCTAD Capacity-building Task Force on Trade, Environment and Development, 2008.

- 78 Jeanne Roy, *Ten Stresses on the Planet: Loss of Topsoil*, issue brief, Portland, OR: Center for Earth Leadership, 2008. See also: Rachel Hine, Jules Pretty, and Sophia Twarog, *Organic Agriculture and Food Security in Africa*, report, Geneva, Switzerland: UNEP-UNCTAD Capacity-building Task Force on Trade, Environment and Development, 2008.
- 79 Nadia El-Hage Scialabba and Caroline Hattam, *Organic Agriculture, Environment, and Food Security*, Environment and Natural Resources Service Sustainable Development Department, FAO, Rome, 2002.
- 80 Catherine Badgley et al., *Organic Agriculture and the Global Food Supply*, in: Cambridge Journals, June 9, 2006, Introduction, doi:10.1017/S1742170507001640.
- 81 Ibid.
- 82 *Agroecology and the Right to Food*, report presented at the 16th Session of the United Nations Human Rights Council [A/HRC/16/49], 8 March 2011.
- 83 Jules Pretty and Rachel Hine, *Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence*, report, Colchester, UK: University of Essex, 2001, <http://www.essex.ac.uk/ces/esu/occasionalpapers/SAFE%20FINAL%20-%20Pages1-22.pdf>.
- 84 World Food Programme, *Operations List*, <http://www.wfp.org/operations/list>.
- 85 Holly Poole-Kavana, *12 Myths About Hunger*, backgrounder, 12 (2), Oakland: Food First, 2006, <http://www.foodfirst.org/sites/www.foodfirst.org/files/pdf/BG%20SU06%2012%20Myths%20About%20Hunger.pdf>.
- 86 International Commission on the Future of Food and Agriculture, *Manifesto on the Future of Seeds*, Italy: Arsia-Regione Toscana, 2008, http://commissionecibo.arsia.toscana.it/UserFiles/File/Commiss%20Intern%20Futuro%20Cibo/CLIMA_ING.pdf.
- 87 FAO, "*Climate-Smart*" *Agriculture Policies, Practices and Financing for Food Security, Adaptation and Mitigation*, report, The Hague Conference on Agriculture, Food Security and Climate Change, Rome: FAO, 2010, p. ii.
- 88 ETC Group, *Who Will Feed Us: Questions for the Food and Climate Crises*, publication no. 102, November 2009, p. 5, http://www.etcgroup.org/upload/publication/pdf_file/ETC_Who_Will_Feed_Us.pdf.
- 89 Ibid.
- 90 United Nations Environment Programme (UNEP), *The Environmental Food Crisis - The Environment's Role in Averting Future Food Crises*, 2009, p. 27.
- 91 David Pimentel and Marcia Pimentel, *Sustainability of meat-based and plant-based diets and the environment*, in: American Journal of Clinical Nutrition 78 (3), p. 660S-663S, September 2003.
- 92 Nadia El-Hage Scialabba and Caroline Hattam, *Organic Agriculture, Environment, and Food Security*, Environment and Natural Resources Service Sustainable Development Department, FAO, Rome, 2002.
- 93 The World Bank, *World Development Report 2008*, 2007, p. 3, http://siteresources.worldbank.org/INTWDR2008/Resources/WDR_00_book.pdf.
- 94 ETC Group, *Surge in Corporate Patents on "Climate-Ready" Crops Threaten Biodiversity and Signal Grab on Land and Biomass*, news release, 25 October 2010, ETC Group, http://www.etcgroup.org/upload/publication/pdf_file/ETC_ClimatereadyNR251010final.pdf.
- 95 Ibid.
- 96 Bill Freese, *Why GM Crops Will Not Feed the World*, in: Genewatch 21 (5), January/February 2009, p. 6.
- 97 ISAAA *Brief 41-2009*, 2009, http://www.isaaa.org/resources/publications/briefs/41/executive_summary/default.asp (accessed 13 April 2011).
- 98 USDA, *Adoption of Genetically Engineered Crops in the U.S.*, <http://www.ers.usda.gov/Data/BiotechCrops/> (accessed 13 April 2011).
- 99 International Service for the Acquisition of Agri-Biotech Applications, <http://www.isaaa.org/resources/publications/briefs/42/executivesummary/default.asp>.
- 100 ISAAA *Brief 41-2009*, 2009, <http://www.isaaa.org/resources/publications/briefs/41/executivesummary/default.asp> (accessed 13 April 2011).
- 101 Charles Benbrook, *Impacts of Genetically Engineered Crops on Pesticide Use in the United States: The First Thirteen Years*, The Organic Center, November 2009, p. 47 & Supplemental Table 7, http://www.organic-center.org/science.pest.php?action=view&report_id=159.
- 102 Ibid, p. 3.

- 103 U.S. Environmental Protection Agency, *2006/2007 Report*, agricultural use (180-185 million lbs) + home/garden use (5-8 million) + industrial/government/commercial use (13-15 million) = 198-208 million lbs. total (Tables 3.6 to 3.8).
- 104 Charles Benbrook, *Impacts of Genetically Engineered Crops on Pesticide Use in the United States: The First Thirteen Years*, The Organic Center, November 2009, Table 4.1, p. 29, http://www.organic-center.org/science.pest.php?action=view&report_id=159.
- 105 S.B. Powles, *Gene Amplification Delivers Glyphosate-Resistant Weed Evolution*, in: Proceedings of the National Academy of Science 107, 2010, p. 955-56.
- 106 USDA, *Final Environmental Assessment of Petition to Partially Deregulate Sugar Beet Genetically Engineered to be Tolerant to the Herbicide Glyphosate*, USDA Animal and Plant Health Inspection Service, February 2011, p. 123, citing 6% of 173 million acres of corn, soybeans and cotton, http://www.aphis.usda.gov/brs/aphisdocs/03_32301p_fea.pdf.
- 107 Syngenta, *Leading the Fight against Glyphosate Resistance*, 2009, <http://www.syngentaebiz.com/DotNetEBiz/ImageLibrary/WR%203%20Leading%20the%20Fight.pdf>.
- 108 Rosa Binimelas et al., "Transgenic Treadmill": Responses to the Emergence and Spread of Glyphosate-Resistant Johnsongrass in Argentina, in: *Geoforum* 40 (4), 2009, p. 623-633.
- 109 NRC, *The Impact of Genetically Engineered Crops on Farm Sustainability in the United States*, National Research Council, National Academy of Sciences, 2010 (prepublication copy), p. 2-15.
- 110 B. Haire, *Pigweed Threatens Georgia Cotton Industry*, in: Southeast Farm Press, July 6, 2010. <http://southeastfarmpress.com/pigweed-threatens-georgia-cotton-industry>.
- 111 Committee of Oversight and Government Reform, http://oversight.house.gov/index.php?option=com_content&view=article&id=921%3A07-28-2010-domestic-policy-qare-superweeds-an-outgrowth-of-usda-biotech-policy-part-iq&catid=15&Itemid=1.
- 112 Jessica Bellarby et al., *Cool Farming: Climate Impacts of Agriculture and Mitigation Potential*, Greenpeace, 2008.
- 113 Douget Al Gurian-Sherman, *No Sure Fix*, Union of Concerned Scientists, 2009, http://www.ucsusa.org/assets/documents/food_and_agriculture/no-sure-fix.pdf (accessed 13 April 2011).
- 114 Ann Doherty, *Who Benefits from GM Crops?* Friends of the Earth International, September 2010, p. 7, http://www.foeeurope.org/GMOs/Who_Benefits/who_benefits_full_report_2010.pdf.
- 115 Union of Concerned Scientists, *Factsheet: Agricultural Practices and Carbon Sequestration*, 1 October 2009, http://www.ucsusa.org/assets/documents/food_and_agriculture/ag-carbon-sequest-fact-sheet.pdf (accessed 13 April 2011).
- 116 *Comments to USDA APHIS on Environmental Assessment for the Determination of Nonregulated Status for Corn Genetically Engineered for Tolerance to Glyphosate and Acetolactate Synthase-Inhibiting Herbicides*, Pioneer Hi-Bred International, Inc. Event 98140 Corn February 6, 2009 Docket No. APHIS-2008-0094)
- 117 Ann Doherty, *Who Benefits from GM Crops?* Friends of the Earth International, September 2010, p. 7, http://www.foeeurope.org/GMOs/Who_Benefits/who_benefits_full_report_2010.pdf.
- 118 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief, Geneva, Switzerland: United Nations, 2010, p. 1-2.
- 119 Bill Freese, *Why GM Crops Will Not Feed the World*, in: *Genewatch* 21 (5) January/February 2009, p. 6.
- 120 Doug Gurian-Sherman, *Failure to Yield*, Union of Concerned Scientists, April 2009, http://www.ucsusa.org/assets/documents/food_and_agriculture/failure-to-yield.pdf.
- 121 Ann Doherty, *Who Benefits from GM Crops?* Friends of the Earth International, September 2010, p. 7, http://www.foeeurope.org/GMOs/Who_Benefits/who_benefits_full_report_2010.pdf.
- 122 Ibid, p. 11.
- 123 ETC Group, *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, November 2010, http://www.etcgroup.org/upload/publication/707/01/etc_won_report_final_color.pdf.
- 124 Greenpeace, *Monsanto*, <http://www.greenpeace.org/usa/en/campaigns/genetic-engineering/ge-industry/monsanto/> (accessed 13 April 2011).
- 125 Conversation with farmer at FarmAid concert, 2008.
- 126 French Commission on Genetic Engineering, Dr. Gerard Pascal, as quoted in: *Le Monde*, April 22, 2004.

- 127 A.J.D. De Roos, A. Blair, J.A. Rusiecki, J.A. Hoppin, M. Svec, M. Dosemeci, D.P. Sandler, and M.C. Alavanja, *Cancer Incidence among Glyphosate. Exposed Pesticide Applicators in the Agricultural Health Study*, in: *Environmental Health Perspectives*, 113 (1), 2005, p. 49-54.
- 128 N. Benachour, and G.-E. Seralini, *Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells.*, in: *Chemical Research in Toxicology*, 22 (1), 2008, p. 97-105.
- 129 L.P. Walsh, C. McCormick, C. Martin, and D.M. Stocco, *Roundup Inhibits Steroidogenesis by Disrupting Steroidogenic Acute Regulatory (StAR) Protein Expression*, in: *Environmental Health Perspect*, 108, 2008, p. 769– 776.
- 130 Beyond Pesticides, *Chemical/WATCH Factsheet: 2,4-D*, July 2004, <http://www.beyondpesticides.org/pesticides/factsheets/2,4-D.pdf> (accessed 13 April 2011).
- 131 Testimony of Ms. Ann Wright Deputy Under Secretary for Marketing and Regulatory Programs United States Department of Agriculture Before the Subcommittee on Domestic Policy of the House Committee on Oversight and Government Reform, September 30, 2010.
- 132 Greenpeace, *Genetic Engineering Enforces Corporate Control of Agriculture*, publication, 19 July 2010, <http://www.greenpeace.org/international/en/publications/reports/GE-enforces-corporate-control-of-agriculture/>.
- 133 African Centre for Biosafety, *Patents, Climate Change and African Agriculture: Dire Predictions*, 2009, http://www.biosafety-info.net/file_dir/17225619254ac3067689f7a.PDF.
- 134 Catherine Badgley et al., *Organic Agriculture and the Global Food Supply*, in: *Cambridge Journals*, 9 June 2006, doi:10.1017/S1742170507001640, p. 88.
- 135 Ibid, p. 94.
- 136 *Agroecology and the Right to Food*, report presented at the 16th Session of the United Nations Human Rights Council [A/HRC/16/49] (accessed 8 March 2011)
- 137 *Cool Foods Mapping Project*, Center for Food Safety, research conducted 2009-2010, unpublished.
- 138 Aksel Naerstad (ed.), *A Viable Food Future*, Oslo: The Development Fund/Utviklingsfondet, 2010, p. 25.
- 139 U.S. EPA, *2000-2001 Pesticide Market Estimates: Usage - Pesticides - US EPA*, U.S. Environmental Protection Agency, 8 December 2010, <http://www.epa.gov/opp00001/pestsales/01pestsales/usage2001.htm>.
- 140 Ibid.
- 141 David Pimentel and Marcia Pimentel, *Food, Energy, and Society*, Boca Raton, FL: CRC Press, 2008.
- 142 Kevin Golden and Bill Freese, *Comments on the USDA, Animal and Plant Health Inspection Service's Proposed Rules for the Importation, Interstate Movement, and Release into the Environment of Certain Genetically Engineered Organisms*, APHIS Submission, Center for Food Safety, Washington, D.C., 2008.
- 143 FAO, *Climate-Smart Agriculture*, UN Food and Agriculture Organization, 4 January 2011, <http://www.fao.org/climatechange/climatesmart/66303/en/>.
- 144 Gar Smith, *A Harvest of Heat: Agribusiness and Climate Change*, report, Berkeley: Agribusiness Action Initiatives - North America, 2010.
- 145 IFA, *International Fertilizer Industry Association - IFADATA*, International Fertilizer Industry Association, <http://www.fertilizer.org/ifa/ifadata/search> (accessed 21 January 2011).
- 146 David Biello, *Oceanic Dead Zones Continue to Spread: Scientific American*, in: *Scientific American*, 15 August 2008, <http://www.scientificamerican.com/article.cfm?id=oceanic-dead-zones-spread>.
- 147 Lester Brown, *Plan B*, 2006 2 Cornell University, *Soil: Erosion Threatens Environmental and Human Health Study Reports*, 2/23/06 (3) Oregon Sustainable Agriculture Land Trust, January 1996, 4 Cornell, *ibid*.
- 148 Aksel Naerstad (ed.), *A Viable Food Future*, Oslo: The Development Fund/Utviklingsfondet, 2010.
- 149 IWMI, *IWMI: Climate Change - Solutions for Adaptation*, International Water Management Institute, 8 February 2010, http://www.iwmi.cgiar.org/Topics/Climate_Change/Adaptation.aspx.
- 150 Carlos Corvalan, Simon Hales, and Anthony McMichael, *Ecosystems and Human Well-Being: Health Synthesis*, publication, Millennium Ecosystem Assessment, Geneva, Switzerland: WHO, 2005, p. 17.

- 151 Food & Water Watch, *Water Facts*, <http://www.foodandwaterwatch.org/water/interesting-water-facts/> (accessed 21 January 2011).
- 152 Maude Barlow and Tony Clarke, *Blue Gold: The Fight to Stop the Corporate Theft of the World's Water*, New York: New Press, 2002.
- 153 Gar Smith, *A Harvest of Heat: Agribusiness and Climate Change*, report, Berkeley: Agribusiness Action Initiatives - North America, 2010.
- 154 ETC Group, *Who Will Feed Us: Questions for the Food and Climate Crises*, publication no. 102, November 2009, http://www.etcgroup.org/upload/publication/pdf_file/ETC_Who_Will_Feed_Us.pdf.
- 155 *Grain, Stop the Agrofuel Craze*, in: Seedling, July 2007, p. 2-9; http://www.grain.org/seedling_files/seed-07-07-2-en.pdf.
- 156 Jeremy Seifert, *Maria Rodale: Eat Trash, Save the Planet*, in: The Huffington Post, 11 January 2011, http://www.huffingtonpost.com/maria-rodale/eat-trash-save-the-planet_b_807245.html.
- 157 ETC Group, *Who Will Feed Us: Questions for the Food and Climate Crises*, publication no. 102, November 2009, http://www.etcgroup.org/upload/publication/pdf_file/ETC_Who_Will_Feed_Us.pdf.
- 158 Shiva Vandana, *Stolen Harvest: The Hijacking of the Global Food Supply*, Cambridge, MA: South End Press, 2000.
- 159 Maude Barlow and Tony Clarke, *Blue Gold: The Fight to Stop the Corporate Theft of the World's Water*, New York: New Press, 2002.



Woman farmer harvesting matured cowpea pods. © IITA Image Library

PART TWO: MIGRATION AND GENDER ISSUES: LINKS TO CLIMATE CHANGE AND FOOD SECURITY

2.1 Introduction

This section extends the trajectory of climate change and food security to demonstrate how ecological destruction affects not only survival rights but also human rights. Within this context migration and gender issues are discussed.

Environmental shocks and stresses, especially those related to climate change, are pushing millions of people to leave their homes and land. As impacts of climate change worsen, migration density and patterns will escalate. A 2010 report by the International Organization for Migration predicts an explosion in global migrant populations that could reach 406 million by 2050.¹

The resulting mass displacement of people from their homes and land could fuel conflict and competition as access and availability to natural resources become strained. As effects of climate change become more intensified—rising sea levels, unproductive land, flooding, droughts, water scarcity, and more—the additional competition for scarce resources and services will also be intensified. The challenge of how to respond to massive migrations of “climate refugees” is quite nearly as daunting as how to mitigate greenhouse gas (GHG) emissions that contribute to climate change.

This section reviews three categories of human migration and displacement which includes chronic natural resource degradation; catastrophic natural

disasters; and mitigation projects. This report particularly focuses on land use changes related to mitigation projects.

Foreign Land Acquisitions, or Land Grabs

This section focuses mainly on large-scale foreign land acquisitions (FLAs), dubbed “land grabs” by civil society groups. This trend is fast becoming a dominant contributor to massive migrations. Often justified on the basis of enhancing food security or abating global warming, land grabs primarily impact the poorest and most vulnerable communities and can lead to tragic consequences. For example, of the 405 FLA projects reviewed by the World Bank only 37 percent grew food, and many of these projects were owned by foreign entities growing food for domestic populations. The remaining projects were primarily devoted to biofuel crops and cash crops for export, leaving local populations landless and hungry.

Gender Issues

Because women grow as much as 80 percent of food in developing countries while also functioning as primary caregivers for children, the elderly, and the broader community, climate change and food security policies must include comprehensive analyses on gender equality issues.

Climate change and environmental degradation impact women more immediately and keenly in their everyday lives. Warming due to climate change and associated impacts—rise in sea levels, increase in droughts and floods and extreme weather occurrences, and more—impact women in a disproportional way as many provide most of the household food and subsistence and also work as the primary caregiver.

As industrial agriculture and globalization expands, women are increasingly joining the ranks of migrant laborers. Often women are subject to low levels of protection in terms of wage levels, employment security, health and safety, and environmental standards and social security. Women typically earn less than men for the same agricultural work. For example, in Bangladesh, female fry catchers and sorters earn about 64 percent of what male fry catchers and sorters earn.² Additionally, representation of women in traditional labor institutions is weak.

Women play a central role in agriculture and are on the “front lines” experiencing climate change-related impacts on natural resources. Civil society can fulfill a pressing need to incorporate gender issues into climate and agriculture arenas in a comprehensive manner. As author Liane Schalatek points out in a recent report, climate change policies of international institutions, such as the World Bank, currently address gender on a selective integration basis rather than “mainstreaming” gender into all policies and financial tools. Schalatek elaborates: “...addressing climate gender mainstreaming expresses a commitment and fundamental obligation of the international community and its organizations, such as the World Bank, to make gender equality a guiding normative principle throughout their actions and operations.”³

In Bangladesh, women fry catchers and sorters earn about 64 percent of what men fry catchers and sorters earn.

2.2 Migration

*Although there is a growing awareness of the perils of climate change, its likely impact on human displacement and mobility has received too little attention.*⁴ - Antonio Guterres, UN High Commissioner for Refugees

We are already living in an age of consequences when it comes to climate change and its impact on national security, both broadly and narrowly defined.....[Rising sea levels and the disappearance of low-lying coastal lands] could conceivably lead to massive migrations – potentially involving hundreds of millions of people. - The Center for a New American Security

Climate change will continue to provoke major humanitarian and displacement challenges. Already, the effects of global warming are apparent. Over the last two decades, recorded natural disasters have doubled from 200 to more than 400 per year. In 2008, as many as 20 million people may have been displaced by climate-induced, sudden natural disasters according to the Norwegian Refugee Council.⁵ A 2010 report by the International Organization for Migration predicts an explosion in global migrant populations that could reach 406 million by 2050. Beyond the contentious migration into Europe and the U.S., the report notes that South-to-South migration is on the ascendency.⁶

Increasing incidents of dramatic weather events, along with a slow onset of natural resource degradation related to global warming will intensify competition for scarce resources. As the Stern Review Report on Economics of Climate Change has observed: "Climate change will lead to hundreds millions more people without sufficient water or food to survive or threatened by dangerous floods and increased disease."⁷ The IPCC lists climate change impacts (with varying degrees of certainty) as:

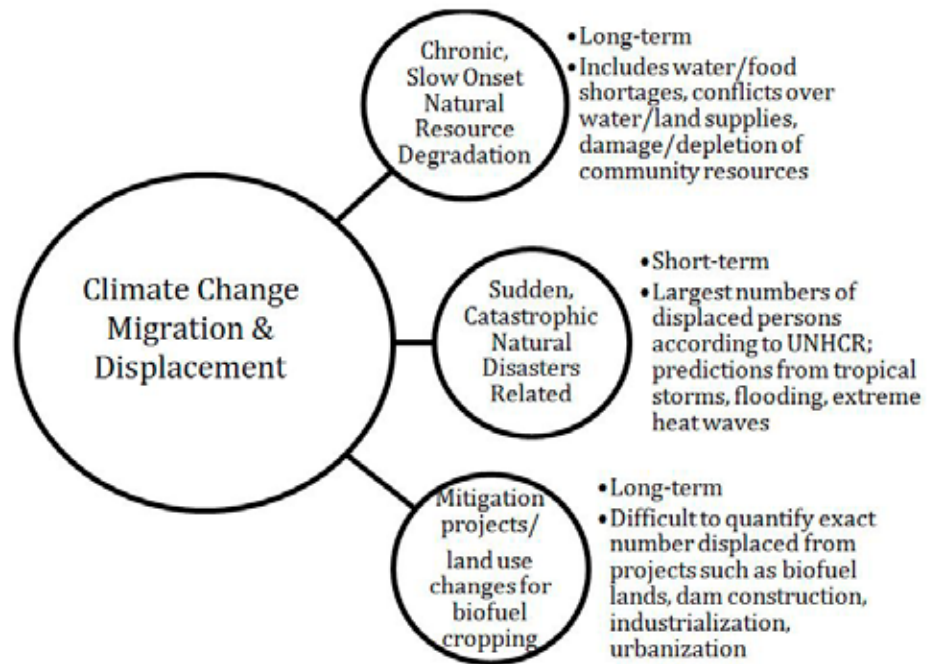
- Melting glaciers
- Melting ice caps
- Melting sheet ice
- Rising sea-levels
- Changing rainfall
- More frequent drought
- More frequent heat waves

Human migration and displacement related to climate change can be identified in three ways:

- 1) Chronic, Slow Onset Natural Resource Degradation: This is brought on by water and food shortages, land availability, and damage and depletion of community resources.
- 2) Sudden, Catastrophic Natural Disasters: According to the U.N. High Commission for Refugees (UNHCR), this category impacts the largest numbers of displaced persons. Recent flooding in Pakistan is an example of a sudden, catastrophic natural disaster.
- 3) Mitigation Projects/Land Use Changes: The number of people forced to migrate due to mitigation projects and land use changes are difficult to

quantify. The factors for displacement include dam construction, expanded industrialization and urbanization, and industrial agriculture projects. Many climate mitigation and adaptation schemes, including FLAs, fall into this category: land use projects such as conversion of lands to food crops to be shipped to foreign lands, biofuels, or “biochar” crops (a term that refers to charcoal used as a soil amendment for agriculture).

Box 6 Climate Migration and Displacement



2.2.1 Chronic, Slow Onset Natural Resource Degradation

Migration due to chronic, slow onset of natural resource degradation is frequently related to mitigation projects/land use changes. However, encroachment of rising sea levels on small island nations is perhaps the most vivid example of the phenomenon of chronic natural resource degradation. Low elevation coastal zones are home to 10.5 percent of the world’s population. At least 146 million people are directly vulnerable because they live at an altitude of less than one meter above sea level.⁸

The Maldives, an archipelago of almost 1,200 coral islands southwest of India, lies just 4.9 feet (1.5 meters) above sea level and is gravely threatened by rising sea levels due to global warming. The IPCC forecasts a rise in sea levels of at least 7.1 inches (18 cm) by the end of the century. In 2009, Maldivian President Mohamed Nasheed and his cabinet donned scuba gear and held a meeting about 16 feet (5 meters) under water to illustrate the challenge for the future of most of the island’s almost 400,000 residents.⁹

Rapid glacier melting, happening at rates faster than scientists had previously projected, are beginning to affect populations in Central America, Sahel, Ganges Delta, Mekong Delta, Nile Delta, Tuvalu, and Maldives. Glacier melts in

the South American Andes may affect 50 million people in 2050.¹⁰ The Inuit, who have lived in the Arctic for centuries have witnessed the effect of climate change for many years as ice is melting at an alarming rate.¹¹ Several coastal villages are actively seeking new locations to move entire communities.¹²

The most startling scenario is in the region downstream from the Himalaya-Hindu Kush mountain ranges, where approximately 50 to 60 percent of the world's population depends on water supplies from that glacier melt.¹³ Although the initial claim that the glaciers would disappear by 2035 if melting continued at present rates was retracted by the IPCC, the situation is still extremely sobering. According to a group of university scientists, the 15,000 glaciers have receded by more than 20 percent in area since the 1960s (due to a combination of global warming and black soot particles due to air pollution).¹⁴

“Without doubt the main driving force behind the rapid melting of Himalayan glaciers and formation of the catastrophic Glacial Lake Outburst Floods (GLOFs) is warming due to climate change. The risk to lives and livelihoods in the fragile Hindu Kush Himalayan region is high and getting higher,” cautions Madhav Karki, the deputy director of the International Centre for Integrated Mountain Development.¹⁵

2.2.2 Sudden, Catastrophic Natural Disasters

A sudden catastrophe is, scientifically, a misnomer as many of the unexpected floods, droughts, and other extreme weather events are the result of cumulative build up of climate change-related conditions that manifest in a sudden event, what is called near-term sudden climate change.¹⁶ When these disasters occur, they seem to appear out of nowhere and the only predictability is that they are unpredictable.

Over the last two decades, the number of natural disasters on record doubled from 200 to 400 per year with nine out of ten of the disasters being climate related. The Norwegian Refugee Council estimates that 20 million people may have been “displaced by climate-induced sudden-onset natural disasters in 2008 alone.”¹⁷

According to a 2010 publication by the Royal Society, changes in the hydrologic cycle, influencing precipitation, drought, and heat waves are likely to have the most profound effects on the near-term sudden climate change events.²⁰ The 2003 heat wave in Europe led to serious health problems and even premature mortality for the young, sick and elderly. Even climate projections that assume very limited controls on GHG emissions rates suggest that the temperatures experienced in 2003 will be considered normal by the end of this century.¹⁹

20 million people may have been “displaced by climate-induced sudden-onset natural disasters in 2008 alone.” (Norwegian Refugee Council)

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2.2.3 Mitigation Projects/Land Use Change

Foreign Land Acquisitions (FLAs) or Land Grabs

Large tracts of land within some of the poorest countries are being purchased by cash-rich countries primarily to provide food or fuel for their domestic populations.

FLAs are rapidly escalating, most notably in Africa, which has about one-

When investors take over the land, local people find themselves without livelihoods and access to basic survival resources.

third of the planet's arable land. A recent World Bank study reported that at least 110 million acres of land was purchased in Africa by foreign entities in 2009 alone. (Prior to 2008, the average rate of land acquisition was 10 million acres per year.) Land acquisitions are continuing at a swift pace. More than 70 percent of these long-term land leases and purchases of land in Africa are concentrated in Mali, Libya, Sudan, Ethiopia, Madagascar and Mozambique.²⁰ At least 20 additional African countries are considering similar schemes.

Dubbed "land grabs" by civil society groups, these land acquisition schemes result in mass displacement of people from their homes and lands. Proponents of FLAs assert that only "marginal," "idle," or "degraded" land is available for acquisition. However, most land claimed to be idle or marginal are collective lands that have been used by local peoples for centuries. Under the guidance of accumulated knowledge of generations, these ecosystems are a vital resource for water, food, medicinal plants and herbs, and other materials. Additionally, these lands are repositories of plants and creatures that have continuously adapted to harsh weather and can serve as a vital reserve for genetic diversity needed for adaptation to drought, disease, and pests expected to increase due to climate change.

The majority of land leased or purchased under FLAs was being used by marginalized people including pastoralists, indigenous and tribal peoples, and small-scale farmers, and had been actively managed by these groups. When investors take over the land, local people suddenly have no access to their traditional land and homes, and find themselves without livelihoods and access to basic survival resources. Land disenfranchisement has particularly detrimental effects on women because the majority of small-scale farmers in Africa are women.

The increased competition for resources needed for daily survival generates social and political conflicts. A recent conference on land grabs organized by the Institute of Development Studies (IDS), LANDac,²¹ and the Society for International Development (SID)—documented many conflicts—over water, land, livelihoods, and more—that are intensifying in regions where land grabs are taking place.²²

Justification for Land Grabs

FLA schemes are often justified under the claim that they provide food security and will lead to a reduction of GHG emissions. However, the majority of FLA projects are growing food and fuel crops that will be exported back to rich nations. These monoculture, industrial crops not only shrink biodiversity but require a high amount of chemical inputs which increase GHG emissions and deplete water, soil, and other natural resources.

Confirming that the majority of land is not used to grow food for local populations, a recent publication by the World Bank *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Benefits?* reports: "Of the 405 projects with commodity data, 37 percent focus on food crops [for populations of rich nations that acquired the land²³], 21 percent on industrial or cash crops, and 21 percent on biofuels, with the remainder distributed among conservation and game reserves, livestock, and plantation forestry."²⁴ The report also found that much of the land is left fallow, apparently purchased as a speculative investment.

Box 7 What are the adverse consequences of FLAs?

False economic benefits

- Target countries are among the world's poorest countries and not in a position to refuse any investment, even if the terms are not ideal.
- Incentives granted to investors negate the claimed benefits.
- Employment of highly mechanized production technologies with limited employment creation effects.
- Dependence on imported inputs.

Displacement, dispossession and impoverishment of small peasants and other marginalized communities

- Investors focus on countries where small farmers do not enjoy strong institutional protection or support. Small farmers lose their land mainly because of weak land governance and land rights protection.
- Limited labor rights and poor working conditions.
- Lack of information and transparency and no free and prior informed consent of affected communities
- Greater burden for women as they grow most of the food and meet household needs, yet have fewer legal protections and limited participation in institutions and political activities.
- Greater food insecurity for affected communities and host country populations.

Foreign investors use most of the farmlands for the production of food, which is then shipped back to their own respective countries

- Other acquired lands are utilized for producing crops mainly for industrial use or producing animal feeds and not for human consumption.
- Food insecurity is made worse when land and water resources are channeled to foreign-controlled farmlands at the expense of domestic smallholders.

Environment degradation

- The foreign farmland rush contributes to deforestation and the conversion of native forests and arable land to monoculture plantations, which leads to greenhouse gas emissions, soil erosion and degradation, water exhaustion, and the loss of biodiversity.

Social and political conflict

- FLAs could drive domestic competition for declining land and water resources, or inflame existing social, ethnic, or political tensions.

Undue foreign political interference and influence

- Foreign control over large swathes of land could translate to undue influence over the host country's internal political processes and economic policies.

Edited from IBON International policy brief *Addressing the Drivers of the Global Rush for Farmland Acquisitions*.

Principle Drivers and Push Factors of Land Grabs

Corporations, foreign governments and investors from cash-wealthy countries are purchasing land at extremely low prices from cash-strapped countries. (For country-by-country information on land grab deals in Africa, see *(Mis)Investment in Agriculture*, published by the Oakland Institute.²⁵) Often investors receive a range of incentives ranging from unlimited water rights to tax waivers. For example, in Mozambique, where up to seven million hectares of land is potentially available for investors, western hedge funds are working with South African businesses to buy vast tracts of forest and farmland for investors in Europe and the U.S.²⁶ Contracts show the government will waive taxes for up to 25 years even though few jobs for local populations will be created.

Land acquisitions are funded through the World Bank's International Financial Corporation (IFC) and the Foreign Investment Advisory Service (FIAS). Barclays Capital (UK), Goldman Sachs (U.S.), and Morgan Stanley (U.S.) are some of the prominent private financial institutions that have already made land deals or are in the process of doing so.²⁷ Hedge fund investors are also major players in the land grab rush. The scarcity of food and water has attracted hedge fund investors and other speculators ready to exploit these dwindling commodities. In 2009 nearly 60 million hectares of African land were purchased or leased by hedge funds and other speculators.²⁸

Box 8 Aspects of Migration

There are many push factors hidden from public discourse that lead to migration. The following cases illustrate two different, yet related, factors that have led farmers from Mexico to the U.S.—global warming-related weather patterns, and the North American Free Trade Agreement (NAFTA). They also reveal opportunities for civil society to coordinate across sectors and connect environmental, economic, and human rights aspects toward a common cause.

Climate: Mayan communities' crops and tropical rainforests in the city of Lazaro Cardenas have suffered great damage by hurricanes Stan and Wilma (2005). At the same time, this region has experienced an unprecedented 10-year drought that has destroyed corn growing. Many farmers have had to look for work in the U.S., either as agricultural day laborers or working odd jobs in urban centers. During the December 2010 UNFCCC gathering in Cancun, Mexico, more than 200 Mayan farmers from this region protested peacefully demanding disaster relief payments promised by the Mexican government.²⁹

NAFTA/Trade Agreements: Between 1990 and 2005, the number of migrants from Mexico and Central America living in the U.S. without authorization spiked from 2 million to an estimated 6.2 million. Many of these migrants could be called "NAFTA refugees." NAFTA, which went into effect in 1994, lifted barriers to "free" agricultural trade between the U.S., Canada and Mexico.

As part of the condition for joining NAFTA, Mexico was required to drastically change its Constitution and abandon the traditional *ejido* system of communal land and resource ownership. This system was created after the

Mexican Revolution to support traditional farming in Mexico. Mexico was also forced to dismantle a system that had provided a guaranteed floor price for corn for Mexican farmers, which had sustained over three million corn producers.

As a result of NAFTA, Mexican farmers suddenly found themselves competing with an influx of cheap agricultural commodities produced by large-scale, heavily subsidized U.S. producers. Corn imports from the North grew 17-fold between 1993 and 2001 and accounted for 25 percent of Mexican corn consumption. This compared to a pre-NAFTA figure of 2 percent. Within a year of NAFTA's passage, Mexican production of corn and other basic grains fell by 50 percent, and millions of peasant farmers lost a significant source of their incomes.³⁰ Today, Mexico imports most of its corn from the U.S.

Facing dire poverty in the Mexican countryside, millions of farmers migrated off their lands and made the wrenching decision to leave behind families and communities and head northward. Once in the United States, these migrants often find jobs in the fields, performing backbreaking work for poor pay and without basic rights. Thousands of others toil in industrial food processing plants, where conditions today resemble those depicted in *The Jungle* by Upton Sinclair at the end of the 19th century.

The World Bank study shows that most of the projects originate from a few countries. These include China, the Gulf States (Saudi Arabia, United Arab Emirates, Qatar, Kuwait, and Bahrain) North Africa (Libya and the Arab Republic of Egypt), Russia, the United Kingdom and the United States. Agribusiness and industry account for the largest share of investors, with agribusiness more specialized in food crops and industry in biofuels. The origins of most investment are investment funds.

Several factors are spurring the sudden increase in FLAs—rising prices of food and food scarcity predictions, increasing demand for biofuels, and growing water scarcity. For example, countries such as Saudi Arabia have been forced to cut back on wheat and rice cultivation on domestic soil because water from aquifers is no longer being replenished. Particularly for the Middle East and North Africa, FLAs serve as both a “virtual water” and food supply investment.

Relationship to Climate Change and the UNFCCC—the Clean Development Mechanism (CDM)

Many governments, industry, and investors view land purchases as a way to build options for growing food and harvesting water in the face of unpredictable shifts in weather associated with climate change. The Clean Development Mechanism (CDM), established to finance adaptation projects and programs in developing countries particularly vulnerable to the adverse effects of climate change, provides incentive for land grab investments.

As the main source of income for the UNFCCC Adaptation Fund, the CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits; each credit is equivalent to one ton of CO₂. These credits can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.

Critics suggest that projects funded by the CDM are a smokescreen for business as usual. Many view the CDM as a subsidy for some of the most polluting industries in the global South while providing a way for industrial countries to receive emission credits without making significant reductions on the home front. To illustrate, industries and governments from the North can earn CER credits by purchasing land in developing countries for biofuel crops and other projects. Such projects tend to expand and intensify energy- and chemical-intensive production methods that result in further GHG emissions and harm natural resources such as soil and water. Social harms also ensue.

The CDM's broad, and many would say inaccurate, definition of "degraded and degrading lands" opens up most of the world's crop land, including most of Southeast Asia's carbon rich peatlands, for land grab deals. As already noted, often "degraded" lands are collective lands used by local peoples for centuries.

Currently, the CDM and other proposed climate adaptation and mitigation mechanisms provide perverse incentives that favor FLAs. These land grab projects contradict ecological fundamentals and contravene human rights. Most land grab deals protect and extend excessive energy, food, and water consumption patterns of a few rich countries. Instead, climate change and food policies should be geared toward providing resources for ecological regeneration so that food and water can be nurtured on local lands and utilized by local populations.

The Role of Trade and Globalization

Although not often included in discussions of land grabs, trade and financial liberalization policies also drive this practice. For example, in response to globalization policies and pressures, many developing countries have created "Special Economic Zones" (SEZs). Under SEZs, foreign governments and individuals enjoy generous economic advantages such as tax exemptions; reduced or eliminated duty payments for import/export goods; and more. Similar to FLAs, local populations are forced off their land in order to make way for SEZs.

In India, the situation is particularly dire. Hundreds of thousands of farmers are being forced off their ancestral lands because of SEZs. (In order to comply with WTO rules, the Indian government changed previous laws requiring Indian representation in business operations within India and adopted a regulation in 2005 to allow foreigners to bid on business projects in India without having local partners.³¹) SEZs are being converted from small-scale farms and businesses to massive sugar industry operations, textile factories, contract farming, and other enterprises. The large-scale uprooting of farmers due to SEZs has displaced thousands of families and resulted in violence. Throughout India, government police forces have routinely assaulted and even killed some farmers and tribals protesting to defend their land.³²

Winners and Losers

Land grabs around the globe are a tragic reminder of Gandhi's axiom: "Nature can look after the needs of people. It cannot look after the greed of people."

Foreign investors promised that jobs, food security, and economic development would result from FLAs; however, these benefits have not been delivered and

"Nature can look after the needs of people. It cannot look after the greed of people." (Gandhi)

instead have intensified social and environmental problems in the poorest countries. The following case descriptions illustrate how these deals have resulted in a chain of loss of human rights, livelihoods, gender displacement, and other adverse social and environmental effects. (The following are quotes from field reporters' contribution to the 2007 annual report of the Foreign Investment Review Board.³³)

Liberia-Rice Project: "Economic problems caused investors to encroach on fertile wetlands, in contravention of agreements reached with the community (which cannot be enforced), displacing 30 percent of the local population. Compensation is not offered to all who lost rights. Four hundred full-time jobs have been created for unskilled workers (mostly ex-combatants) but there is concern about hiring foreigners who are willing to work for lower wages. As a result of deforestation, more than 50 hectares of swamp have been silted from the first year of operations."

Mozambique-Sugarcane Project: "Only 35 to 40 [people] were employed full time plus some 30 on a seasonal basis [despite investor's promise of 2,650 jobs]. ... Local people lost access to forest for fuel wood, game meat, and fish. Investors use the local water supply and roads without compensation; thus negatively affecting women who gather water." Due to increasing food riots, Mozambique has subsequently put a hold on land deals as further investigations revealed that land slated for acquisition included land vital to local communities' basic needs.

Land Grab Scheme Moves Forward

Despite the host of problems identified in the World Bank report already cited, the Bank continues to promote FLAs and argue that "win-win" scenarios can be created by establishing principles for responsible investment. This view has gained allies by the investment community, host governments, foundations, and international institutions such as the Food and Agriculture Organization of the United Nations (FAO), the World Bank Group, United Nations Conference on Trade and Development (UNCTAD), and the International Fund for Agriculture and Development (IFAD).

The newly minted *Principles for Responsible Agricultural Investment that Respect Rights, Livelihoods and Resources* created by international agencies are touted as guarantors that past harms will be corrected. However, *the principles are completely voluntary and unenforceable*. Even if these principles were strictly followed, many FLA projects contravene ecological principles. Many contend that it is not credible to proclaim climate mitigation benefits from planting crops that require chemical and fossil fuel inputs. This results in further GHG emissions and causes other environmental harms, including a loss of biodiversity via monocropping practices.

GRAIN, an international NGO focused on farmers and food systems, provides a summary regarding food security, livelihoods, and social justice aspects: "There is no possibility of a 'win-win' from what is fundamentally a transfer of lands from local communities to corporations and a transformation of small farms to industrial plantations. No matter how it is framed, today's land grab is in complete contradiction with the movement for food sovereignty—the only meaningful way to ensure that everyone has safe and affordable food while providing decent livelihoods for the three billion or so food producers and food workers on the planet."³⁴

No matter how it is framed, today's land grab is in complete contradiction with the movement for food sovereignty.

2.2.4 Way Forward

Migration is often the survival strategy of populations whose human security is threatened. While the UNFCCC is pursuing mitigation solutions, it is clear that harmful consequences due to global warming cannot be avoided in the short-term; therefore, international institutions and governments need to identify safe havens for those who are most vulnerable to changes in climate and the environment in the near future and craft a long-term strategy to address migration in all forms. IBON International recommends the following actions to address the underlying drivers of land grabs:³⁵

- Re-establish or strengthen people's control over resources: People's access to and control over productive resources is the foundation of food sovereignty.
- Prioritize the use of land and water resources for agricultural production geared toward meeting domestic food needs.
- Boost institutional and financial support for smallholder, locally based, bio-diverse forms of agriculture.

Additionally, there are a few key activities that civil society can engage in more fully:

- Work toward creating a Climate Refugee Protection and Resettlement Fund under auspices of the United Nations.
- Promote resources and capacity toward sharing information and developing climate-related risk plans.
- Ensure that access to basic rights of land, food, water, social justice, and equity are addressed in climate change policy proposals. Such proposals should include migration provisions as elaborated in all human rights agreements such as the UN Declaration on Human Rights, the International covenants on Civil and Political Rights and on Economic, Social and Cultural Rights, and other such consensus documents.

Box 9 Principles for Responsible Agricultural Investment that Respects Livelihoods and Resources (FAO, IFAD, UNCTAD and the WBG)³⁶

- 1. Respect land and resource rights.** Existing rights to land and associated natural resources are recognized and fully respected.
- 2. Ensure food and security.** Investments do not jeopardize food security but strengthen it.
- 3. Ensure transparency, good governance, and a proper enabling environment.** Processes for acquiring land and other resources and then making associated investments are transparent and monitored, ensuring the accountability of all stakeholders within a proper legal, regulatory and business environment.
- 4. Consultation and participation.** All those materially affected are consulted, and the agreements from consultations are recorded and enforced.
- 5. Responsible agro-investing.** Investors ensure that projects respect the rule of law, reflect industry best practice, are economically viable, and result in durable shared value.
- 6. Social sustainability.** Investments generate desirable social and distributional impacts and do not increase vulnerability.
- 7. Environmental sustainability.** Environmental impacts of a project are quantified and measures are taken to encourage sustainable resource use while minimizing and mitigating the risk and magnitude of negative impacts.

2.3 Impacts on Gender

As Jacques Diouf, director general of FAO proclaimed at a recent press conference in Rome: "Gender equality is not just a lofty ideal, it is also crucial for agricultural development and food security."³⁷

Rural women are the backbone of agriculture throughout much of the developing world. They produce half of the world's food, and in some developing countries women produce as much as 80 percent of the food.³⁸ It is estimated that women's agricultural work produces 35 to 45 percent of gross domestic product (GDP) in developing countries.³⁹

Gender impact is still frequently ignored in policy designs and programs. The Committee on World Food Security acknowledged that women farmers receive only 5 percent of agricultural extension services worldwide.⁴⁰ Although women dominate agricultural production, they earn only 10 percent of world income and own less than 1 percent of the world's property. Approximately 70 percent of the people who are chronically hungry in the world are women and girls.⁴¹



Rice farmer in the Phillipines. © IRRI Images.

Much of women's work, including agricultural labor, is part of the informal economy and remains unpaid. The value of this "care economy" is often unrecognized within international policies and agencies and not considered when undertaking climate change mitigation and adaptation measures. In order for women to achieve full equity and benefits, and to thoroughly normalize gender equality within climate change and agriculture policy circles, it is necessary to acknowledge and integrate unpaid sectors of work.

Because women's work in the informal sector is not measured as an economic contribution, the only measure of women's "progress" is based on an economic growth paradigm that brings women into the formal, paid sector. Many development policies, including those addressing climate change and food security,

Depletion and lack of access to natural resources makes it harder to maintain agricultural productivity and increases women's workloads.

are geared toward creating wage jobs, often within a narrow, export-led globalization paradigm. The view is that economic indicators, such as increases in GDP and/or wage jobs, are an improvement for women's rights and standards of living.

However, this is not uniformly the case, and the full impacts on women, children, and communities need to be more fully examined. For example, there have been serious implications for family and social life, women's health, and exposure to violence and sexual harassment in the workplace in many developing regions that have industrialized and resulted in wage jobs for women.⁴²

While the western world views industrial systems as progress, this outlook often reflects a western disconnect from nature and the environment. Those in the global North frequently do not understand how patenting seeds or building a dam has anything to do directly with women. However, as authors Dr. Vandana Shiva and Maria Mies write in their book *Close to Home*, "For women in the global South..., the 'environment' is the place where they live, and it encompasses everything that affects their lives."⁴³

Depletion and lack of access to natural resources makes it harder to maintain agricultural productivity and increases women's workloads, which can negatively impact their health, reduce time to participate in decision-making processes, and add extra stress to caring for children and the elderly. Warming due to climate change and associated impacts—rise in sea levels, increase in droughts and floods and extreme weather occurrences, and more—impact women in a disproportional way as many provide most of the household food and subsistence as well as being the primary caregiver. Along with vagaries in weather, polluted oceans and rivers, scarcity of water, and degraded soils affect the income-generating capacity of vulnerable populations, creating more strain on women. These multifaceted roles of women require comprehensive analyses on gender equality issues when addressing climate change and food security initiatives.

2.3.1 Women's Role in Agriculture

Women are involved in all aspects of agriculture including crops, livestock, agroforestry, and aquaculture. They are seed savers and breeders, growers, producers, processors, and marketers. Women are also the primary guardians of traditional knowledge. As noted, women produce more than half of the world's food. In sub-Saharan Africa women represent 70 percent of agricultural labor. About 60 percent of people engaged in farming in South Asia are women. In the Middle East, more than twice as many women work in agriculture as men. Women also dominate the agricultural landscape in many countries of the Caribbean and Central America.⁴⁴

Work in agriculture takes on various forms of "income"—on-farm family labor, paid-in-kind (barter or labor exchange), self-employed (marketing of one's produce), or wage labor (migrant or factory work). According to the 2010 to 2011 FAO report, *The State of Food and Agriculture 2010-2011: Women in Agriculture: Closing the Gap for Development*, women farmers have unequal access to and use of a wide range of agricultural resources. The FAO assessment found that, in varying degrees, women lack access to land, livestock, mechanical tools, farm inputs and financial and extension services such as agricultural credits and technical

training in every region of the planet. The pattern of gender inequity is repeated throughout different national, cultural, political, and religious conditions.⁴⁵

Gender disparity is due to a variety of factors that include the growing demand for flexible and cheap farm labor, increasing pressures on and conflicts over natural resources, and the transfer of economic resources from small-scale farms to large agricultural enterprises. Other factors that contribute toward women's disenfranchisement include increased exposure to natural disasters and environmental changes—often related to climate change—along with lack of access to water, and an upsurge in occupational and health risks.

It is estimated that if women had the same access to agricultural assets, inputs, and services as men they could increase yields on their farms and could raise total agricultural output in developing countries by roughly 2.5 to 4 percent. This growth could lift 100 to 150 million people out of hunger, or 12 to 17 percent of people going hungry today.⁴⁶

Unpaid Labor and On-Farm Contributions

Most of women's labor on family or community farms is unpaid, which in itself is not necessarily harmful to women. Many societies value and honor the contribution of women's work toward family and community. However, women rarely have control over farm income and often patrilineal inheritance customs place women in vulnerable positions by denying them access to land ownership. Also, because women's contributions to family and community agriculture are part of the informal, non-wage economy women do not receive proper recognition for their economic contributions and thus are excluded from decision making arenas, legislation, and policy constructs.

In the majority of patrilineal societies, a woman's right to land expires automatically in the case of divorce or death of her husband. In North Africa, inheritance laws allow women to claim only half the amount endowed to men. Due to familial or societal pressures, women often forgo their right to land in favor of their brothers. In some countries, legislation affirms a woman's right to own land; however, customary practices restrict their ability to buy or inherit agricultural lands.

This lack of control over and impaired entitlement to land often implies restricted access to loans and social services, including agricultural extension services and technical education. This limits autonomy and decision making and, critically, curtails the ability to achieve food security.

In an attempt to remedy gender inequality, some countries, such as South Africa and Kenya, have begun to recognize the independent land rights of women, but reforms must be enacted more rapidly and comprehensively across a broad spectrum of nations.

Women are the safety nets and last resort for ensuring the survival of their families. Given increasing threats associated with climate change, along with growing food insecurity, it is likely that women's unpaid work responsibilities will further intensify, especially in low-income, poor households. This confluence of conditions only heightens the urgency to address the gender imbalance regarding women's rights to ownership of land.

Women are the safety nets and last resort for ensuring the survival of their families.

Wage Labor in Agriculture

It is often assumed that women will gain equality and a higher standard of living if they enter the formal, paid agricultural economy—as day laborers, food processing workers, or if they engage in global economic value chains. However, the relationship between women’s formal, paid employment and unpaid work is a two-way street. Paid employment can often provide critical household income, but can also subject women to exploitation in terms of poor pay, hazardous work conditions, and sexual harassment. Also, engaging in employment outside of the home while still remaining as primary caretakers within the home can place additional physical and emotional burdens on women. When household income increases as a result of women taking on a paid, wage job, this does not necessarily mean that the individual situation of a woman improves.

For instance, a study in Kenya shows that increased participation of women in sugar production brought about significant income gains in overall household income and food consumption. However, increases in women’s personal income were associated with decreases in their body mass index, because additional work and greater energy intensity of activities exceeded the concurrent increase in their caloric intakes.⁴⁷

In some industrialized countries, and in many developing regions, women’s labor has shifted away from small-scale, localized farming systems toward large export-oriented agricultural enterprises. This “feminization” of agricultural wage work is tied to global policies and trends that consolidate large-scale, export-oriented farming operations and increase demand of cheap labor.

Concurrently, globalization pressures and trends have resulted in the demise of trade unions. A 2006 ILO report observes that “... deregulation, globalization, and competitive pressure ... have been influential in, or have accompanied, the erosion of trade unionism and traditional forms of collective action...”⁴⁸

Migrant Labor

As agriculture industrializes and globalization expands, migrant labor is increasing. Under the banner of “competition” and “comparative advantage,” there is a downward pressure on wages and an increase in more informal, “flexible,” employment contracts.⁴⁹ The rapid expansion in Chile of contract labor on fruit export industrial farms resulted in more than a 20 percent increase in women agricultural workers between 1968 and 1994.⁵⁰ Women are prominent in horticulture, floriculture, aquaculture, pig, and poultry sectors. The labor force at shrimp processing plants in Argentina, Bangladesh, India, and the Pacific Islands is mainly comprised of women. In Brazil, women are the main workers in poultry processing factories. In some regions, male migration has been largely responsible for the feminization of agriculture. In China, high levels of male migration have increased the female proportion of the agricultural labor force.⁵¹

Most of the employment terms for industrial agricultural operations are temporary and often through third party contractors. Under such conditions, women are subject to low levels of protection in terms of wage levels, employment security, health and safety, environmental standards and social security. Representation of women in traditional labor institutions is weak.

Women are subject to low levels of protection in terms of wage levels, employment security, health and safety, environmental standards and social security.

Existing data indicate that migration patterns seem to have gender characteristics with men migrating more frequently than women, especially when it is cross-border migration. However, globalization trends affecting migration patterns of men are also affecting women. For instance, in Sri Lanka and the Philippines, female migrants are about 74 percent and 55 percent of total outflows, respectively.⁵² It appears that the number of women migrating as independent workers is steadily increasing in other countries as well.

Wage Gap

Typically, women earn less than men for the same agricultural work. In Bangladesh, women fry catchers and sorters earn about 64 percent of what their male counterparts earn.⁵³ Acknowledging that data on wage gaps is difficult to gather, an FAO report says, "It is interesting to observe that 90 percent of the wage gap between men and women in developed or developing countries is unexplained: in other words, it is attributed to gender discrimination."⁵⁴

In addition to contending with significant wage discrimination, women wage workers in agriculture are subject to higher rates of job instability than men and comprise the majority of low paid workers. For instance, in South Africa, women represent 69 percent of temporary workers and in Tanzania, women comprise 85 percent of casual, low-wage workers planting, harvesting and grading on flower farms, while men occupy managerial positions.⁵⁵

Violence, Health, and Safety

The high prevalence of women in low-paid employment with limited security leads to abuse. Violence and sexual harassment in the workplace are more frequent under these conditions. Men are usually supervisors and studies have shown that women often are forced to trade sex for job security and other employment benefits.

Women's health is severely compromised in many low-wage, industrial agricultural jobs. As an example, women who work in fish- and shrimp-processing experience arthritis and other negative health effects due to standing or sitting in wet, cold environments for 10 to 12 hours a day. A study of the fish and shrimp industry in Argentina revealed that the majority of women had no medical or social coverage in these often seasonal or temporary jobs.

Women are the predominant workers in horticulture, where it is estimated that 170,000 agricultural workers die every year in workplace accidents and 40,000 of these deaths are due to pesticide exposure. Inadequate training, lack of protective gear, poor hygienic conditions, arduous physical demands, and long hours contribute to numerous health problems for women working in these fields.⁵⁶

Child Labor and Education

In many areas, gender displacement and discrimination overlaps with child labor. The ILO estimates that around 70 percent of child labor occurs in agriculture.⁵⁷

According to the ILO's *Global Report on Child Labour* (2010), 60 percent of the 215 million child laborers work in agriculture. It is estimated that 120 million of these children are between the ages of five and 14.⁵⁸ Farming and rural sys-

tems are often outside of regulatory and review processes so existing regulations on child labor can be easily ignored.

Often women working in temporary or contract agricultural jobs do not have childcare options, so children are brought with them to the workplace. When there is no income to send children to school, the only option is to send them to work. Often when household incomes are small, educational opportunities tend to go toward boys as they are viewed to have the best potential for earning income in the future.

The situation for girls in agriculture seems to vary according to the cultural, religious and ethnic traditions of the country. In some cases, they may be discriminated against from the early stages of life, throughout their childhood and into adulthood.⁵⁹ However, the precise magnitude of this discrimination is difficult to estimate because girls' work in agriculture (like that of female adults) is often invisible, and their contribution is not given any specific economic value nor recognized as work.

Effects of Trade Liberalization

Globalization policies, such as those promoted in WTO rules, have led to reduced benefits for workers and increased job instability in what many in civil society refer to as a "race to the bottom." As already noted, a high proportion of newly created jobs are low-wage, temporary or seasonal contract jobs that do not provide any healthcare, and often there are no on-site medical facilities.⁶⁰

In many regions, women-centered trades have been displaced as a result of trade policies.

Additionally, globalization policies favor industrial farming systems, which reduce the number of laborers needed. Disappearing traditional farm work often forces women to move to overcrowded urban centers in search of low-paying, often degrading work. Economic and trade liberalization and privatization of public goods and services have also led to the dismantling of many marketing services that were previously available to farmers. Women farmers have been severely impacted by this loss. The decline in investment in rural infrastructure, such as farmer marketing cooperatives, affects women's access to markets.

In many regions, women-centered trades have been displaced as a result of trade policies. For example, in Zimbabwe, a reduction in tariffs on imported clothing closed the domestic industry, which employed mainly women. This rapid shifting of corporate and factory locations based on finding the lowest wage base and environmental standards continues to create instability for many women in wage-laborer jobs.⁶¹

Many believed that trade liberalization would open global markets that would benefit developing nation economies, but several studies and economic indicators demonstrate that this has not been the case. Most developing country farmers cannot compete with cheap, highly subsidized foreign food imports that have flooded their domestic markets. (See Part III, *Developing Country Indicators* for more information on globalization's impacts on developing country agriculture markets.) Women are especially vulnerable as agribusiness and commodity traders continue to consolidate and grow larger, and as developing country domestic markets are having to compete with cheap, highly subsidized foreign food imports.

Already faced with lack of access to credit, technologies, extension centers; restricted ability to land tenure, poor infrastructure, and increasing destruction of

natural resources such as water and land, women are facing greater pressures and are often forced to migrate to crowded urban centers for low-wage jobs, or to work as migrant laborers. In the Philippines, a study reports that large agribusiness operations are pushing female farmers into increasingly less fertile land or being displaced to cities and tourist zones, where they may work as domestic workers or sex workers.⁶²

Even if women's husbands are able to successfully sustain a commercial, export-led farming operation, women often work unpaid on these commercial farms in addition to performing household work. Any benefits of expanding into agricultural exports may not assist women. There is evidence that even when a crop is traditionally female intensive, commercialization results in men taking over the production of that sector. This was the case for groundnuts in Zambia, rice in The Gambia, and leafy vegetables in Uganda.

2.3.2 Way Forward

When women have more resources, the education, health, and nutrition of the whole family are positively enhanced.⁶³ Many studies have shown that, in the hands of women, food is more likely to reach needy children.⁶⁴ Equitable food distribution is not the only benefit that can be harnessed from increasing women's access to resources and title. Studies demonstrate that providing women with proper resources can lead to better environmental stewardship. For instance, in Ghana it has been shown that giving women land ownership rights is an incentive for them to adopt agroforestry, which is beneficial for environmental management.⁶⁵

It is essential that gender analyses be taken into account when formulating policies intended to reduce GHG emissions, increase food security, and address human rights. Effects of flooding, drought, yield losses, decreasing water availability, and other harms caused by global warming will mean extra hardship for farming and food provisioning activities, of which women play a central role. Climate change intensifies the burden on women's work—in both wage and non-wage contexts—and reduces their capacity to retain family structures and caretaking.

In climate change arenas, where many significant policies will be implemented, civil society can help to more highly profile gender issues. Women must be given more representation in decision making about climate change adaptation and mitigation strategies in the public and private sector. Organizations focused on gender issues need capacity and resources to become more engaged in climate issues.

As a 2010 Heinrich Böll Foundation report by Liane Schalatek states: "Women and men, due largely to their gender roles and respective rights (or lack thereof), have differing vulnerabilities to climate change as well as differentiated capabilities to mitigate emissions, adapt to and cope with climate change impacts. These differences need to be taken into account by creating gender-aware climate financing mechanisms and gender-equitable fund disbursement guidelines and criteria."⁶⁶

Finally, often unrecognized within a gender context, Intellectual Property Rights (IPR) schemes of trade agreements such as the WTO usurp women's science, knowledge, and technologies relating to indigenous and traditional plant varieties and cultivation. (See Part I, *Seeds Are Hope* for more information on IPRs.) Women have been the ancestral seed and plant breeders and savers for centuries

Studies demonstrate that providing women with proper resources can lead to better environmental stewardship.

and gender analyses must include documentation and recognition of women's agricultural knowledge and safeguard their innovation. Some recommendations of issues for civil society engagement include:

- Design gender-equitable agricultural labor programs and projects.
- Give priority to women's access to education, information, science and technology and extension services.
- Improve women's access, ownership and control of economic and natural resources through legal measures.
- Prioritize technological development policies targeting rural and farm women's needs and recognize women's specific knowledge, skills and experience in the production of food and the conservation of biodiversity.
- Support public services and investment in rural areas in order to improve women's living and working conditions and rural employment opportunities,
- Extend legal rights frameworks for women agricultural laborers.
- Assess the effects of farming practices and technology, including pesticides on women's health, and measures to reduce use and exposure.
- Reduce wage gaps and strengthen women's participation within labor institutions.
- Improve social protections, health, security, and safety.
- Extend access to credit and agricultural extension services.
- Reform land rights and ownership practices.
- Include informal, unpaid work of women when developing policies and principles.
- Ensure that gender equality is a guiding normative principle throughout actions and operations of international institutions.
- Strengthen the capacity of public institutions and NGOs to improve the knowledge of women's involvement in farm activities.
- Strengthen women's ability to benefit from market-based opportunities by market institutions and policies giving explicit priority to women farmers' groups.

2.4 Civil Society and Non-Governmental Organizations Working on Human Rights, Gender Issues, and Migration (partial list)

Action Aid
African Biodiversity Network
Agribusiness Action Initiatives
AID/WATCH
Amazon Alliance
Amazon Environmental Research Institute
Amazon Watch
Americans for Financial Reform
Amnesty International
CARE
Center for Alternative Development Initiatives
Center for Economic and Political Research
Centro Ecologico
Center for Food Safety
Christian Aid
Council of Canadians
CSO Mechanism for UN Committee on World Food Security
Diverse Women for Diversity
Eradicate Hunger
Eurodad (European Network on Debt & Development)
European Cross-Networking Space
Europeans for Financial Reform
Focus on the Global South
Food First/Institute for Food and Development Policy
Funders Network on Transforming the Global Economy
GenderCC – Women for Climate Justice
Global Justice Ecology Project
GRAIN
Grassroots Global Justice
Grassroots International
Greenbelt Movement International
Grupo de Reflexion Rural
Heinrich Böll Foundation
IBON International
Indigenous Women's Network
Institute for Agriculture & Trade Policy
Initiative for Policy Dialogue
Institute for Policy Studies
Institute for Sustainable Development (Ethiopia)
International Development Economics Associates
International Fund for Agricultural Development
International Institute for Environment and Development
International Labor Union

Jobs with Justice
Jubilee USA Network
Kiva
More and Better
National Community Reinvestment Coalition
National Day Laborer Organizing Network
National Domestic Workers Alliance
National Family Farm Coalition
National People's Action
Navdanya International
New Economics Foundation
New Rules for Global Finance Coalition
New Way Forward
New World Agriculture and Ecology Group International
Oakland Institute
Our World Is Not For Sale
Overseas Development Institute
Oxfam International
PICO
Polaris Institute
Practical Action
Rural Coalition
SocialWatch
Solidago Foundation
South Centre
Survival International
Tebtebba Foundation
Terra Nuova
The Development Fund/Utviklingsfondet
Third World Network
U.S. Working Group on the Food Crisis
Via Campesina
Why Hunger
Women's Environment and Development Organization
World Development Movement
World Economy, Ecology & Development
World Resources Institute
World Rural Forum
Worldwatch Institute

References

- 1 International Organization for Migration, *About Migration*, <http://www.iom.int/jahia/Jahia/about-migration/lang/en> (accessed 20 April 2011).
- 2 USAID, *USAID Women in Development (WID): Value Chain Analysis by the Women's Economic Growth Greater Access to Trade Expansion*, U.S. Agency for International Development, 11 March 2009, Wage Differentials, http://www.usaid.gov/our_work/cross-cutting_programs/wid/eg/gate_valuechain.html.
- 3 Liane Schalatek, *More than an Add-on: The Centrality of Gender Equality for Development and Climate Solutions. A Look at Gender at IDA 16*, Heinrich Böll Foundation North America.
- 4 António Guterres, *Millions Uprooted*, in: *Foreign Affairs*, September/October 2008, <http://www.foreignaffairs.com/articles/63572/ant%C3%A3nio-guterres/millions-uprooted>.
- 5 UNHCR, *Climate Change, Natural Disasters and Human Displacement: A UNHCR Perspective, report*, Geneva, Switzerland: UNHCR, The United Nations Refugee Agency, 2009, p. 3.
- 6 Chee Yoke Ling, *TWN*, Third World Network, <http://www.twinside.org.sg/> (accessed 21 January 2011).
- 7 Nicholas H. Stern, *The Economics of Climate Change the Stern Review*, Cambridge: Cambridge University Press, 2009, p. 92.
- 8 Etienne Piguet, *New Issues in Refugee Research: Climate Change and Forced Migration*, report no. 153, Geneva, Switzerland: UNHCR, The United Nations Refugee Agency, Policy Development and Evaluation Service, 2008, p. 7-8.
- 9 *From Underwater, Maldives Sends Warning on Climate Change*, CNN, 17 October 2009, http://articles.cnn.com/2009-10-17/world/maldives.underwater.meeting_1_maldives-climate-change-sea-levels?_s=PM:WORLD.
- 10 Frank Biermann and Ingrid Boas, *Protecting Climate Refugees: The Case for a Global Protocol*, publication, *EnvironmentMagazine.com* 50 (6), 2008.
- 11 Arctic Council, *Impacts of a Warming Arctic*, Arctic Climate Impact Assessment, 24 November 2004, <http://www.acia.uaf.edu/>.
- 12 John Vidal, *When Davi Kopenawa Yanomami Leaves Home, You Know the World Is in Trouble*, in: *Guardian.co.uk*, 13 June 2009, <http://www.guardian.co.uk/environment/2009/jun/13/davi-yanomami?intcmp=239>.
- 13 Frank Biermann and Ingrid Boas, *Protecting Climate Refugees: The Case for a Global Protocol*, publication, *EnvironmentMagazine.com* 50 (6), 2008.
- 14 *Black Soot May Speed Himalayan Glacier Melt: Discovery News*, in: *Discovery News*, 15 December 2009, <http://news.discovery.com/earth/black-soot-himalayas-glaciers.html>.
- 15 UNEP Newsdesk, *Glaciers in Southern South America and Alaska Melting Faster than Those in Europe, Says New UNEP Report*, UNEP/GRID-Arendal, December 7, 2010, <http://www.grida.no/polar/news/4473.aspx>.
- 16 Drew Shindell, *Estimating the Potential for Twenty-first Century Sudden Climate Change*, *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 365, 30 July 2007, doi:10.1098/rsta.2007.2088.
- 17 UNHCR, *Climate Change, Natural Disasters and Human Displacement: A UNHCR Perspective, report* (Geneva, Switzerland: UNHCR, The United Nations Refugee Agency, 2009), p. 3.
- 18 Drew Shindell, *Estimating the Potential for Twenty-first Century Sudden Climate Change*, *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 365, 30 July 2007, doi:10.1098/rsta.2007.2088.
- 19 Ibid.
- 20 Neil MacFarquhar, *Fears over New Scramble for Africa - Scotsman.com*, Scotsman.com - Scottish News, Sport & Business Headlines Direct from Scotland, 26 December 2010, <http://www.scotsman.com/news/Fears-over-new-scramble-for.6671644.jp?articlepage=1>.
- 21 *The IS Academy on Land Governance for Equitable and Sustainable Development (LANDac) is a Partnership Between IDS Utrecht and the Netherlands Ministry of Foreign Affairs*, African Studies Centre, Disaster Studies of Wageningen University, Royal Tropical Institute, Agriterra, HIVOS and Triodos Facet.
- 22 *The Global Land Rush, What's Real and what are the Myths? Rushing for Solutions*, Seminar and Launch of a Special Issue of *Development Utrecht*, 24 March 2011.

- 23 Bracketed text added by author.
- 24 Klaus Deininger (et al.), *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Benefits?* The International Bank for Reconstruction and Development/The World Bank, 2011, p. 51.
- 25 Daniel Shepard, *(Mis)investment in Agriculture: The Role of the Finance Corporation in Global Land Grabs*, Oakland, CA: The Oakland Institute, 2010, http://media.oaklandinstitute.org/sites/oaklandinstitute.org/files/misinvestment_web.pdf.
- 26 *Understanding Land Investment Deals in Africa*, Oakland Institute, May 2011.
- 27 Daniel Shepard, *(Mis)investment in Agriculture: The Role of the Finance Corporation in Global Land Grabs*, Oakland, CA: The Oakland Institute, 2010, http://media.oaklandinstitute.org/sites/oaklandinstitute.org/files/misinvestment_web.pdf.
- 28 Ibid.
- 29 Author's personal conversations while attending the UNFCCC Climate Conference in Cancun, Mexico, December 2010.
- 30 All figures from: Debbie Barker, *The Rise and Predictable Fall of Globalized Industrial Agriculture*, report, San Francisco: International Forum on Globalization, 2007.
- 31 *Indian Land Grab*, in: Bloomberg BusinessWeek, 19 September 2005, http://www.businessweek.com/magazine/content/05_38/b3951154.htm.
- 32 Vandana Shiva, *From Corporate Land Grab To Land Sovereignty (Bhu Swaraj)*, Countercurrents.org, 17 February 2007, <http://www.countercurrents.org/shiva100207.htm>.
- 33 Foreign Investment Review Board, *Foreign Investment Review Board Annual Report 2006-07*, 2008, http://www.firb.gov.au/content/Publications/AnnualReports/2006-2007/_downloads/2006-07_FIRB_AR.pdf
- 34 Shepard Daniel, comp., *(Mis)Investment in Agriculture: The Role of the International Finance Corporation in Global Land Grabs*, publication, ed. Anuradha Mittal, Oakland, CA: Oakland Institute, 2010, p. 30.
- 35 *Addressing Drivers for the Global Rush to Farm Land Acquisitions*, IBON.
- 36 IFAD, FAO, UNCTAD, and WBG, *Principles for Responsible Agricultural Investment that Respect Rights, Livelihoods and Resources*, 25 January 2010.
- 37 FAO, *Closing the Gender Gap in Agriculture: FAO Report Makes Strong Business Case for Investing in Women*, news release, 7 March 2011. <http://www.fao.org/news/story/en/item/52011/icode/>.
- 38 *Women Thrive Worldwide: The Effect of the Food Crisis on Women and Their Families*, report, September 2008, <http://www.womenthrive.org/images/food%20crisis%20%26%20impact%20on%20women.pdf>.
- 39 Sabiha Ibrahim, *Dismantling Poverty and Building Economic Security Fact Sheet on Data & Policy: A Survey of Women's Funds Programs*, Women's Funding Network, 2009, http://www.womensfundingnetwork.org/sites/wfnet.org/files/WomensFunds_Survey_HumanSecurity.pdf.
- 40 *Women Organising for Change in Agriculture and NRM*, Women Leaders' Dialogue, 36th session of the Committee on World Food Security, 13 October 2010.
- 41 CARE, *Ending Poverty - Why Empower Women and Girls?* CARE, <http://www.care.org/getinvolved/advocacy/pdfs/whyempowerwomen.pdf> (accessed 20 January 2011).
- 42 World Bank, FAO and IFAD, *Agriculture and Rural Development: Gender in Agriculture Sourcebook*, Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank, 2009, <ftp://ftp.fao.org/docrep/fao/011/aj288e/aj288e.pdf>.
- 43 Vandana Shiva, *Close to Home: Women Reconnect Ecology, Health and Development Worldwide*, Philadelphia, PA: New Society Publishers, 1994.
- 44 World Bank, FAO and IFAD, *Agriculture and Rural Development: Gender in Agriculture Sourcebook*, Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank, 2009, <ftp://ftp.fao.org/docrep/fao/011/aj288e/aj288e.pdf>.
- 45 The State of Food Agriculture 2010-2011, *Women in Agriculture: Closing the Gender Gap for Development*, FAO, Rome, 2011.
- 46 Ibid.
- 47 FAO, IFAD, International Labour Office, *Gender Dimensions of Agricultural and Rural Employment: Differentiated Pathways out of Poverty. Status, Trends and Gaps*, Rome, 2010, p. 22, <http://www.fao.org/docrep/013/i1638e/i1638e.pdf>.

- 48 World Bank, FAO and IFAD, *Agriculture and Rural Development: Gender in Agriculture Sourcebook*, Washington, D.C.: The International Bank for Reconstruction and Development/ The World Bank, 2009, p. 318, <ftp://ftp.fao.org/docrep/fao/011/aj288e/aj288e.pdf>.
- 49 Ibid. p. 317.
- 50 Ibid, p. 317.
- 51 FAO, <http://www.fao.org/docrep/009/a0493e/a0493e04.htm>.
- 52 Nicola Piper, *Feminized Migration in East and Southeast Asia: Policies, Actions and Empowerment*, 15 December 2005.
- 53 USAID, *USAID Women in Development (WID): Value Chain Analysis by the Women's Economic Growth Greater Access to Trade Expansion*, U.S. Agency for International Development, 11 March 2009, Wage Differentials, http://www.usaid.gov/our_work/cross-cutting_programs/wid/eg/gate_valuechain.html.
- 54 *The State of Food Agriculture 2010-2011, Women in Agriculture: Closing the Gender Gap for Development*, press release, FAO, Rome, 2011.
- 55 Haji Hatibu Haji Semboja Rhoda Mbelwa and Charles Bonaventura, *The Cut-flower Industry in Tanzania*, International Labour Office Geneva, March 2000.
- 56 All figures under Violence, Health and Safety from: World Bank, FAO and IFAD, *Agriculture and Rural Development: Gender in Agriculture Sourcebook*, Washington, D.C.: The International Bank for Reconstruction and Development/ The World Bank, 2009, p. 318, <ftp://ftp.fao.org/docrep/fao/011/aj288e/aj288e.pdf>.
- 57 ILO, *IPEC - Child Labour by Sector: Agriculture*, International Labour Organization, <http://www.ilo.org/ipecc/areas/Agriculture/lang--en/> (accessed 20 January 2011).
- 58 *Global Report on Child Labour*, ILO, Geneva, May 2010.
- 59 Bernd Seiffert, *FAO Focal Point for Child Labour Prevention in Agriculture*, November 2010.
- 60 World Bank, FAO and IFAD, *Agriculture and Rural Development: Gender in Agriculture Sourcebook*, Washington, D.C.: The International Bank for Reconstruction and Development/ The World Bank, 2009, p. 318, <ftp://ftp.fao.org/docrep/fao/011/aj288e/aj288e.pdf>.
- 61 Ibid.
- 62 A. Beviglia Zampetti and A.-N. Tran-Nguyen, *Gender Aspects of the Trade and Poverty Nexus: A Macro-Micro Approach*, edited by Maurizio Bussolo and Rafael E. De Hoyos, Palgrave Macmillan, World Bank, April 2009.
- 63 *Women Thrive Worldwide: The Effect of the Food Crisis on Women and Their Families*, report, September 2008, <http://www.womenthrive.org/images/food%20crisis%20%26%20impact%20on%20women.pdf>.
- 64 Sabiha Ibrahim, *Dismantling Poverty and Building Economic Security Fact Sheet on Data & Policy: A Survey of Women's Funds Programs*, Women's Funding Network, 2009, http://www.womensfundingnetwork.org/sites/wfnet.org/files/WomensFunds_Survey_HumanSecurity.pdf.
- 65 *Women Thrive Worldwide: The Effect of the Food Crisis on Women and Their Families*, report, September 2008, <http://www.womenthrive.org/images/food%20crisis%20%26%20impact%20on%20women.pdf>.
- 66 Liane Schalatek, *A Matter of Principle(s): A Normative Framework for a Global Compact on Public Climate Finance*. Washington, D.C.: Heinrich Böll Foundation North America, 2010.



Smallholder farmers. © FAO/Walter Astrada

PART THREE: ECONOMIC AND FINANCE SYSTEMS: LINKS TO CLIMATE CHANGE AND FOOD SECURITY

3.1 Introduction

The intersections among finance, economic and trade policies, climate change, and food security are deeply intertwined, yet these issues are too often segmented into separate governmental and policy arenas. As a result, policies and proposals frequently fail to encompass a broad systemic analysis, and at times, actions in one arena can thwart or contradict actions within another.

This section begins by discussing the fundamental contradiction between promoting an economic growth paradigm reliant on intensive resource extraction for intensive consumption and export, and the urgent need to reduce our hyper consumption and resource destruction in order to lower GHG emissions. For example, the *raison d'être* of international economic and trade entities such as the WTO is to stimulate and increase economic activity. This goal is at odds with the UNFCCC goal of reducing actions that lead to global warming. Currently, these two goals are on a serious collision course.

In our disconnected reality, consumptive societies function under the assumption that humans operate the planet instead of the planet being operated by the laws of nature. However, the laws of nature always remind us who is in control,

or rather, who is not in control. Powerful hurricanes, changing hydrological patterns, eroding soils and increased pestilence are indicators that nature is ultimately in control. To think societies can live apart from the laws of nature is not only hubris, it jeopardizes the future of humans and other creatures. Within this context, two aspects of the tension between paradigms are discussed:

- 1) The role of economic and trade institutions, and
- 2) The role of the "casino economy."

Tensions Between Economic Growth and an Ecological Debt

Notions of economic growth, including sustainable growth are discussed in this section. The economic growth mantra repeated by most government and business leaders is based on current consumption and production patterns that are detached from the reality that we live on a planet of finite natural resources. Almost two decades ago, in 1992, the sustainable development plan adopted at the Rio Earth Summit observed: "The major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in industrialized countries."¹

World energy consumption has increased since 1992 and is expected to grow at a rate of 2 percent a year until 2020.

Despite this warning, societies have continued to consume. World energy consumption has increased since 1992 and is expected to grow at a rate of 2 percent a year until 2020. Even the development of more efficient energy sources has not abated consumption or slowed down global warming. Although the European Union achieved substantial economic growth in the 1990s without significant increases in its consumption of fossil fuel, these gains in efficiency were offset by an increase in the volume of goods consumed and discarded.²

Further, contrary to popular perceptions, the economic growth paradigm has not provided equity or raised living standards for all—the proverbial "lifts all boats" claim has not come to pass. Although per capita income has increased 3 percent annually in 40 countries since 1990, more than 80 countries have per capita incomes lower than they were two decades ago. Consumption for the average African household is 20 percent less than it was 35 years ago.³

Current rates of consumption and production within our finite sources suggest the need to re-evaluate policies pursued in venues such as the UNFCCC and the WTO. A central challenge is how to provide development space for poorer countries while reducing consumption in the North (sometimes referred to as "de-developing"). Civil society has an essential role to play in advancing a transition toward economies and systems that respect and live within our planet of finite resources.

Financial Markets and Speculating on Food Security

The policies and speculative aspect of financial markets have a dramatic influence on food security and poverty. Gambling on food commodities was a major factor leading to the 2007/2008 food crisis that resulted in the rise of extreme poverty levels by 130 to 150 million people. According to the UN Special Rapporteur on the Right to Food, Olivier De Schutter: "A significant portion of the increases in price and volatility of essential food commodities can only be explained by the emergence of a speculative bubble."⁴

This section will review the relationship between the volatility of food prices and deregulation of financial markets that has occurred during the last few decades. A discussion on how global trade rules constrain the ability of domestic governments to appropriately regulate their own financial sectors is also included.

The Global Economy and Trade Policies

Globalization, as already noted and as expressed through the WTO and other trade agreements, intensifies economic activity that is at odds with reducing global warming. Current economic rules and policies favor, and enforce, patterns of increased consumption and energy use. Societies need instead to construct economic and trade frameworks that align with the planet's ecological and social imperatives.

Economic and trade regimes also greatly affect food security and rural development. These policies have extended an industrial agriculture system that has shifted societies from growing diverse food crops for primarily local consumption to now being dependent on the import/export global market. To illustrate—prior to the adoption of liberalized trade policies, Haiti grew all of the rice needed for its population for many decades. Today, it imports the majority of its rice. An International Monetary Fund (IMF) report states: “Trade liberalization has contributed to a large increase in imports of rice. At the same time, domestic production has gone down substantially.”⁵ The consequences of reliance on rice imports were tragically evident after the 2010 earthquake. The lack of local food stocks resulted in increased hunger and malnutrition.

Way Forward

The connections among climate, food, and economic and finance policies provide unique opportunities for civil society to build a diverse movement to work toward common solutions on issues that seem disconnected from one another. For example, NGOs working on climate change fronts may benefit from more closely aligning with trade groups.

Similarly, civil society sectors campaigning on hunger and poverty can work with movements working for critical financial reforms. Such campaigns could include advocating a different set of financial rules and standards for essential commodities, such as food, than for non-essential goods.

3.2 Tensions Between Economic Growth and Ecological Credit Debt

Growth is touted as the universal economic cure-all, yet there is a fundamental tension between promoting economic growth and the need to reduce GHG emissions as well as maintain ecological harmony. As author and environmental advocate Jerry Mander wrote recently in *The Guardian*: “Whether it’s the political left or right, Obama, or Cameron, or Sarkozy, or Putin, or Wen, or Harper, or Miliband, or Gingrich, or Palin, or any political candidate for any office, they’re all talking about the necessity to stimulate growth. ... But there’s a missing link in the discussion, ignored by nearly everyone in the mainstream debate: nature.”⁶

There is a fundamental tension between promoting economic growth and the need to reduce GHG emissions as well as maintain ecological harmony.

Based on figures from 2005, global biodiversity has declined by nearly a third since 1970.

Economies are linked to a finite amount of natural resources, yet most political leaders and societies carry on as though economic activity is not connected to any other reality—the reality that we live on a planet with finite resources.

We are using up natural resources at a voracious rate. “We are liquidating the earth’s natural assets to fuel our consumption,” says Lester Brown, founder of the Worldwatch Institute.⁷ A recent *Living Planet* report calculates that humans are using 30 percent more resources than the planet can replenish each year.⁸

Earth Policy Institute research reveals that lead and tin will last around another 25 years based on current extraction rates. Copper, iron ore, and bauxite will remain perhaps another half a century. Two centuries of extraction have resulted in a planet where forests, oceans, marine life, minerals, and biodiversity in every sector is gravely depleted and, in some cases, on the brink of extinction.

Based on figures from 2005, global biodiversity has declined by nearly a third since 1970. Forests are disappearing at a rate of 13 million acres per year. Four-fifths of oceanic fisheries are fished at capacity or perilously near collapse.¹⁰

These are only a few examples of the many forms of environmental breakdown of the planet’s ecosystems and the depletion of life-sustaining resources. Clearly, societies are out of sync with a basic economic and market fundamental—our demand is exceeding our supply.

Whether negotiating terms of trade or setting GHG emission targets, political leaders might promote different policies under the realization that the world is heading for an “ecological credit crunch” far worse than the current financial difficulties. Instead of linking human welfare to rates of linear consumption and crude indicators of economic growth, such as the Gross National Product (GNP), our very survival depends upon our ability to give proper measure to the ecological integrity and distributional equity of commercial systems.

Inequitable distribution of wealth is sowing seeds of social division. Considering that the richest fifth of the world consumes 86 percent of all goods and services, while the poorest fifth consumes just over 1 percent, it is clear that parity has not been achieved by our current economic systems.

The U.S. Central Intelligence Agency (CIA) acknowledges the tensions: “The rising tide of the global economy will create many economic winners, but it will not lift all boats. ... [It will] spawn conflicts at home and abroad, ensuring an even wider gap between regional winners and losers than exists today. ... [Globalization’s] evolution will be rocky, marked by chronic financial volatility and a widening economic divide. ... Regions, countries, and groups feeling left behind will face deepening economic stagnation, political instability, and cultural alienation. They will foster political, ethnic, ideological, and religious extremism, along with the violence that often accompanies it.”¹¹

* * *

Not so long ago talk of a gross national happiness (GNH) indicator, which measures quality of life or social progress in a more holistic manner than gross domestic product (GDP), was a laughing matter in most policy circles, but some leaders are considering this measurement of prosperity. For example, French President Nicolas Sarkozy recently urged other government leaders to join a “revolution” in the measurement of economic progress according to the GNH indicator.¹²

In his November 2008 coronation address, Bhutan's King Khesar, delivered a message rarely, if ever, heard by the head of a nation-state: "Yet we must always remember that as our country, in these changing times finds immense new challenges and opportunities, whatever work we do, whatever goals we have...ultimately without peace, security and happiness we have nothing." As part of the quest to follow the Happiness Indicator, the government of Bhutan is currently converting all of its agricultural production to agro-ecological systems.¹³

What About Sustainable Growth?

The economist Herman Daly takes the critique of economic growth theories to another level by stating that even "sustainable growth" is impossible. "To delude ourselves into believing that growth is still possible and desirable if only we label it 'sustainable' or color it 'green' will just delay the inevitable transition and make it more painful."¹⁴

Daly points out that sustainable development is *not* the same as sustainable growth and that any serious discussion about reducing poverty or environmental harms must address redistributing consumption, and access to and use of natural resources (i.e., wealth redistribution). Daly illustrates this point by insisting that the very concept of "sustainable growth" is an oxymoron in the context of the real world, with its finite ecosystem. True sustainable development, on the other hand, is not stasis. It relies upon qualitative growth (versus quantitative growth)—leading the economy to adapt and improve in knowledge, organization, wisdom, social institutions, and technical efficiencies, while keeping within the scale at which the ecosystem can function and regenerate.

What Does This Mean for Climate Change Negotiations?

Climate change discussions relate to development issues and concepts of economic growth. In order to reduce emissions to requisite levels, industrial societies need to stop consuming the majority of the planetary resources and developing countries need to raise standards of living in a sustainable manner. A vision of global equity and sustainability must somehow emerge between the two processes.

A primary area of contention at the UNFCCC negotiations revolves around the refusal of industrial nations to recognize their historical contributions to global warming. From 1900 to 2004, with less than 20 percent of the global population, industrial countries emitted nearly 76 percent of GHG gases, with the U.S. leading by a substantial amount.¹⁵ Developing countries contend that any CO2 emissions targets must take this into account. In other words, rich countries should pay for their considerable past contributions to climate change.

Within this context, development is a "difficult issue." Industrial countries must re-align their development model given that they are responsible for three-quarters of historical GHG emissions. As Martin Khor, director of South Centre, succinctly puts it: "The North has to show an example by changing its unsustainable patterns of resource use, production, and consumption, and assist the South in a joint quest for sustainable development."¹⁶

However, developing country governments are often following the same extractive, economic growth model that inevitably leads to more GHG emissions and

From 1900 to 2004, with less than 20 percent of the global population, industrial countries emitted nearly 76 percent of GHG gases.

further destruction of natural resources. A report by the South Centre summarizes the challenge: “Developing countries are faced with the enormous challenge of maintaining their ambition for socio-economic development and yet significantly reducing their emissions growth. This has to be done by a radical paradigm shift in production systems, in economic and business models, that have yet to be tested or even devised.”¹⁷

Discussions permeating all international negotiations, whether on climate change or economic and trade issues, are currently operating from a framework that normalizes—rather than eliminates—global overuse and pollution of nature. This “developmentalist” framework serves to concentrate efforts on “rationing what is left out of nature.”¹⁸ Civil society can fill an essential policy need to construct and advance new paradigms of development and sustainability.

What Does This Mean for Food Security?

In the case of food systems, expanding the industrial agricultural model as a mitigation and adaptation strategy maintains primacy in many policy circles largely because it fits into the dominant economic growth paradigm.

Most proposed solutions to climate change are based on providing market “incentives”—i.e., investment opportunities for financial and industry markets. However, a multi-functional farming system provides limited prospects for massive financial return on investments. These small-scale and diverse systems—designed to be self-reliant and function with few external inputs—do not fit the current notion of economic growth. This represents a challenge to international financial institutions striving for universal development programs. As author and development specialist Wolfgang Sachs has observed, “Development experts have myopia: They do not see a society that has an economy but a society that is an economy.”¹⁹

3.2.1 The Way Forward—The Role of Civil Society

The familiar refrain that economic growth equals wealth creation, increased standards of living, and environmental stewardship is believed with religious fervor. To speak of “limits” or to question the growth ideology is a political death knell and remains the road less traveled by government leaders. As non-political actors, civil society can play an extremely beneficial role by challenging notions of “sustainable growth” and providing new constructs.

Of particular value, providing frameworks that develop principles for sustainable development in the South and for reducing consumption in the North based on ecological imperatives and planetary limits would be a significant task for movements to undertake.

3.3 The Casino Economy: Speculating on Food Security

The mantra of modern-day markets is that financial markets allocate resources, or money, for the greater common good of society. The theory is that stock markets better distribute risks and benefits of financial investments. Traditionally, market fundamentals—supply and demand—set commodity prices. However, the market,

then and now, fails to account for the supply side of finite natural resources.

Economic markets could get away with this miscalculation for awhile. During the market-era of the Industrial Revolution, our planet was a resource-rich world, and there was seemingly an endless supply of wealth creation.²⁰ In this "full" world, standards of living, in some regions of the world, rose dramatically.²¹

Today, however, we are facing a dramatically different situation of dwindling natural resources and a potential collapse of planetary ecological systems. While the market claims to be the best indicator for determining pricing, the market does not account for the indirect costs, and perhaps even some of the direct costs, of natural resource extraction. In the real world and in real time, when waterways run dry and groundwater is sucked up at a rate faster than can be replenished, people and the planet suffer. In the market world, diminishing water resources is often viewed as an opportunity for investment.

The 2007/2008 dramatic rise in food prices that led to riots in the streets in vulnerable regions of the world illustrates how markets do not accurately reflect the truth about supply and demand, and how markets can simultaneously stimulate and then profit when the survival of millions of people is threatened.

Gambling On Food

The global food crisis of 2007/2008 is a prime illustration of how survival for millions of people is affected by financial speculation and markets. According to the World Bank, global food prices rose by 83 percent from 2005 to 2008.²² In a UN report, Olivier De Schutter, concludes that "a significant portion of the increases in price and volatility of essential food commodities can only be explained by the emergence of a speculative bubble." He reports that the increases in prices of basic food commodities and oil resulted in the rise of extreme poverty levels by 130 to 150 million people. "At least 40 million people around the world were driven into hunger and deprivation as a result of the food price crisis."²³

De Schutter notes: "...supply and demand are insufficient to explain the full extent of the increases and volatility in food prices." For instance, the price of rice rose by 165 percent between April 2007 and April 2008, a magnitude difficult to explain by market fundamentals alone, especially given that rice supplies were not unusually low during this period.²⁴ Nor is it feasible that food price increases were the result of per capita income growth that led to high demand for meat and related animal feeds in China, India, and other emerging economies as the International Monetary Fund (IMF) purported. FAO data shows that grain stocks had increased significantly and that China and India exhibited falling aggregate and per capita food grain consumption.²⁵

Deregulatory policies are an important backdrop when reviewing the recent food crises and volatility of agricultural commodity pricing. Following the Wall Street Crash in the 1930s, regulations were introduced that limited speculation on food (Commodities Exchange Act of 1936). Traditionally, most financial actors in agricultural commodities were interested parties in agricultural products. This changed with the introduction of a series of deregulations, notably the Commodities Future Modernization Act (CFMA) of 2000, which opened the door to a new influx of speculators who had no direct connection to agricultural commodities.

The global food crisis of 2007/2008 is a prime illustration of how survival for millions of people is affected by financial speculation and markets.

In recent testimony before Congress, hedge fund manager Michael Masters explained that institutional investors (pension funds, university endowments, sovereign wealth funds, etc.) increased their investments in commodities futures from \$13 billion in 2003 to \$317 billion in July 2008, and the prices of 25 commodities rose by an average of 183 percent in those five years.²⁶ “Commodities futures prices are the benchmark for the prices of actual physical commodities, so when ... speculators drive futures prices higher, the effects are felt immediately in ... the real economy,” according to Masters.²⁷

De Schutter, Masters, and others who have examined the crisis determined that driving factors behind the sudden speculation were, in large part, due to the entry of large institutional investors such as hedge funds, pension funds, and investment banks into derivative markets comprised of food commodities. Some market analysts propose that the food bubble was created when large numbers of hedge funds and other institutional speculators entered the commodity markets in search of new investment opportunities after the U.S. subprime crisis and the Wall Street crash. Analysts note that in 2007 trade in agricultural derivatives increased by 32 percent. Morgan Stanley estimated that the number of outstanding contracts in maize futures increased from 500,000 in 2003 to almost 2.5 million in 2008. A Lehman Brothers study just prior to its bankruptcy revealed that the volume of index fund speculation increased by 1,900 percent between 2003 and 2008.²⁸

Most experts agree that unless market and financial reforms are made, the cycle will repeat itself. Similar incidents have happened in single commodities. In July 2010, the manager of Armajaro, a London-based hedge fund, acquired US \$1 billion worth of futures contracts for 241,000 tons of cocoa. This represented approximately 7 percent of the world’s annual output of cocoa. But more staggering is that the contracts were for delivery, meaning that Armajaro owned *nearly all* the cocoa beans sitting in warehouses throughout Europe.²⁹

A UNCTAD report in 2009 observed: “The trend towards greater financialisation of commodity trading is likely to have increased the number and relative size of price changes that are unrelated to market fundamentals.”³⁰

3.3.1 The Way Forward—The Role of Civil Society

As recent food crises have demonstrated, financial markets can have a significant impact on food security. They can determine the very survival of people around the globe who live thousands of miles away from Wall Street, Bond Street, and powerful financial centers of the world.

Examining policies that determine the immense power of financial services and markets is of critical importance to environmental and survival and human rights issues. Bursting financial bubbles, stock market downfalls, and the general volatility of world financial markets of the last decade has emboldened several coalitions of labor, consumer, and other groups to work for reforms. To find out more about the range of efforts and coalitions working on financial regulatory reform, see the list of organizations at the end of this section.

3.4 World Trade Organization (WTO) Economic Trade Agreement—Economic Growth *Uber Alles*

The objective of international economic and trade entities such as the WTO is to stimulate and expand economic activity. This goal is completely at odds with the UNFCCC goal of reducing actions that lead to global warming. Even assuming that an ambitious, fair, and equitable UNFCCC agreement to reduce emissions is achieved, the goals would be breached by trade and finance agreements that continue natural resource exploitation and commerce, further increasing emissions and environmental destruction.

To begin with, the balance of power clearly tips toward international economic entities such as the WTO, the World Bank and the IMF as they have meaningful enforcement mechanisms. Unlike other international bodies, including the United Nations, the WTO has extraordinary enforcement powers. It has the ability to demand compliance from its members, and to coerce and force compliance where necessary by means of a variety of disciplines, penalties, and trade sanctions that can be so economically severe that even the largest nations must yield.

Similarly, the World Bank and the IMF have numerous tools—including the imposition of certain conditionalities upon borrower nations (known as “structural adjustment” programs)—that effectively enable the international finance community to serve as an enforcement vehicle for the interests of lending nations. This presents a significant problem for most developing countries. Many wish to address the crisis but may be hampered by certain World Bank and IMF policies, bilateral free-trade agreements, the WTO, or aid conditionality.³¹

The UNFCCC, however, lacks effective enforcement mechanisms, especially in light of the move by developed countries to shift away from the Kyoto Protocol’s binding regime of emission reduction commitments toward a voluntary system in which each country makes pledges to reduce their emissions by a certain amount.

Relationship Between Trade Regimes and Climate Change

As noted already, one of the primary obstacles to achieving a meaningful UNFCCC agreement is that industrial countries are not addressing their historical responsibility for GHG emissions when setting reduction targets. Northern governments point to increasing emission rates in developing countries as a way to shift the responsibility of targets and timelines for GHG reductions.

However, developing country governments point to the tremendous increase during the last few decades of “outsourcing” pollution and GHG emissions. WTO and other trade agreement policies encourage this trend as they inhibit the ability of member nation-states to set product and environmental standards. This has generated a “race to the bottom” in which multinational corporations can now pit countries against one another to produce cheap goods with the predictable result of lowering environmental and labor standards. It should be no surprise that GHG emission rates are increasing in low-wage, developing countries, and worldwide, given this trade and economic model.

Of particular note, *the WTO provides a mechanism by which nation-states can challenge policies aimed at reducing GHG emissions.* To illustrate: Mitsuo

Industrial countries are not addressing their historical responsibility for GHG emissions when setting reduction targets.

Matsushita, a member of the WTO tribunal that ruled against the U.S. Clean Air Act in the WTO's first dispute resolution case in 1996, notes that by signing the WTO, governments have already empowered the WTO to "allow Member Nations to challenge almost any measure to reduce greenhouse gas emissions enacted by any other Member."³²

Box 10 Minimum Access Requirements

The WTO "minimum access rule," part of the Agreement on Agriculture, illustrates how this trade rule both dictates an industrial agriculture paradigm that contributes to increasing GHG emissions while also inhibiting a country's ability to transition to climate and food security adaptation measures.

This rule dictates that member nations must accept imports of up to 5 percent of the volume of domestic production in each commodity (based on 1986-88 quota levels). For example, a country like the Philippines, which is self-sufficient in its staple food—rice— is forced to open its market to cheap, highly subsidized U.S. rice exports because of the minimum access rule. Such policies destroy the livelihoods of Filipino farmers and their communities and at the same time, impacts the country's food security and self reliance. This practice also renders American farmers more vulnerable to the volatility of the global pricing system. In both the Philippines and the United States, the bias should invariably be to strengthen local production for local consumption and to reduce long-distance food shipments.

Relationship Between Trade Regimes and Food Security

While the speculation in agricultural commodities certainly contributed to a dramatic increase in hunger, the policies of institutions such as the WTO, the World Bank and the IMF have tremendous implications for food and livelihood security and rural economies.

Structural adjustment programs (SAPs) of the World Bank and the IMF, begun in the 1970s, dismantled many agricultural programs and practices in developing countries that engendered local self-sufficiency. SAPs forced countries to convert to import/export-oriented agricultural production by requiring governments to reduce tariffs, dismantle government support programs for farmers, reduce or eliminate food reserves, and other similar measures. SAPs provided the prologue to a global industrial food system, but the WTO and other trade agreements further drove, and enforced, the import/export nail into the food coffin. Established at the Uruguay Round negotiations in 1995, the WTO greatly expanded the traditional scope and power of previous trade agreements over agriculture.

The predecessor to the WTO, the General Agreement on Tariffs and Trade (GATT), had a very narrow mandate: to set quotas and tariffs for agriculture products. Other matters remained under the purview of national governments. Though not without flaws, the GATT system allowed countries more flexibility to protect domestic markets from predatory "dumping" of subsidized items from foreign countries, and price gouging by a handful of corporate commodity traders. The creation of the WTO changed all that.

The WTO's expanded power over agriculture limits the authority of member governments to set appropriate national farm and food policies that protect their own farmers, consumers, and natural resources. These limits, under the banner of dismantling "trade barriers," have greatly expanded industrial farming in developing countries and compelled them to shift production away from food for local needs to production for export crops. This has resulted in a loss of livelihoods for farmers, depressed rural communities, and increased food insecurity, environmental destruction from industrial farming practices, social breakdown, and more.

Food security has been greatly impacted by WTO agricultural rules that forced developing countries to give up their few remaining national farm and food policies that provided livelihoods and domestic food security. For instance, prior to the WTO, developing countries grew 90 percent of the food they consumed domestically.³³ Today, 55 percent of developing countries are net food importers.³⁴ (See *Developing Country Indicators* for more data.)

There are several WTO agreements that directly affect food production, food security. In effect, these policies determine who benefits and who loses from the global system. The agreements include: The Agreement on Agriculture (AoA); the Agreement on the Application of Sanitary and Phyto-Sanitary Standards (SPS); and the Agreement on Trade Related Intellectual Property Rights (TRIPs).

Other WTO agreements have indirect effects on agriculture, such as the Agreement on Technical Barriers to Trade (TBT), the Agreement on Trade Related Investment Measures (TRIMs); the General Agreement on Trade in Services (GATS); and WTO basic principles: "Most Favored Nation" and "National Treatment."

It is not within the purview of this report to review how each of the WTO agreements affect agriculture; however, in sum, these agreements enforce and bolster a global industrial food system that intensifies GHG emissions, environmental harms, and food and water vulnerability. At the same time, economic and trade policies have disallowed many appropriate policy tools that can protect regional and communal food systems. (See *Minimum Access Requirements* as one example of a WTO policy that impacts food self reliance.)

Economic and trade policies have also led to the consolidation of multinational agribusinesses. As of 2005, the top 10 commercial seed companies controlled more than 67 percent of global commercial seed sales.³⁵ Five grain trading companies control 75 percent of the world's cereal commodity market and its prices. The top 10 agrochemical companies control 80 percent of global pesticide sales.³⁶ This increasing consolidation greatly affects food security as countries that were formerly food self sufficient now find themselves at the whim of global markets.

This consolidation has affected climate discussions as agribusiness wields a powerful influence within the UNFCCC. Many of the same agro-industry actors who crafted WTO rules are driving climate change solutions toward industrial agriculture systems.

As of 2005, the top 10 commercial seed companies controlled more than 67 percent of global commercial seed sales.

Box 11 Developing Country Indicators

The following developing country indicators³⁷ illustrate the destructive effects of trade and neoliberal economic policies imposed by the WTO, IMF, and other international financial bodies:

- An estimated 43 percent of the rural population of Thailand continues to live below the poverty line even though agricultural exports grew an astounding 65 percent between 1985 and 1995.
- In Bolivia, by 1990, following a half of a decade of the most spectacular agricultural export growth in its history, 90 percent of the rural population earned less than a dollar a day.
- It's estimated that over 350,000 rice and corn farmer livelihoods in developing countries are being destroyed due to a conversion of acreage devoted to cut flowers for export to western markets.
- The Chinese government estimates that 10 million farmers will be displaced by China's implementation of WTO agriculture rules. (Another 200 million Chinese peasant farmers are estimated to also lose livelihoods as a result of other implementations of trade liberalization and agriculture industrialization.)
- Kenya was self sufficient in food until the 1980s; it now imports 80 percent of its food. Conversely, 80 percent of its exports are agricultural.
- In Nigeria, Ethiopia, Sudan, Kenya, Tanzania, and the region that was formerly Zaire, which account for 60 percent of the population of sub Saharan Africa, there has been a 33 percent decline in cereal output per capita and 20 percent decline in overall food per capita in less than a decade. At the same time, all these countries saw rising agricultural exports per capita along with declining food output, and food consumption per capita.
- India spent 1.37 billion rupees for foreign exchange for promoting floriculture exports, while a mere .32 billion rupees were earned. Export earnings from floriculture are only sufficient for India to buy one-fourth the food it could have grown.

Relationship Between Trade Policies and Financial Regulations

In times of financial crisis, governments face even more pressure to exploit natural resources recklessly for short-term revenues and often short-change investments in greener technologies and other climate programs.

And efforts to re-regulate financial sectors to prevent such abuses have moved slowly, with modest results. A U.S. financial reform bill enacted in July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, made some steps forward in certain areas, such as protecting consumers from financial sector fraud and abuse and in increasing the transparency of derivatives markets. But much unfinished business remains. A key example is that policymakers haven't even discussed the need to rollback the financial deregulatory rules in trade agreements.

This problem was noted by the United Nations Commission of Experts, chaired by Nobel Prize winning economist Joseph Stiglitz: "The framework for financial market liberalization under the Financial Services Agreement of the GATS under the WTO and, even more, similar provisions in bilateral trade agreements may restrict the ability of governments to change the regulatory structure in ways which support financial stability, economic growth, and the welfare of vulnerable consumers and investors."³⁸

Most financial analysts view the Basel III banking rules, along with G-20 and G-7 bodies, to be the pre-eminent arenas when it comes to setting global finance policies and rules. However, many working in the market sphere are unaware of the shadow influence that trade agreements have on domestic financial regulations. A press briefing that took place at the White House in 1997 reveals the close connection: "The financial services talks are a little bit unusual in the way we pursue trade talks, in that this is essentially a joint venture between USTR [U.S. Trade Representative] and the Treasury Department. [...] We had a joint negotiating team in Geneva with Deputy USTR Jeff Lang and Assistant Secretary Timothy Geithner from the Treasury Department."³⁹

Also, while many view the primary function of the financial services rules in the WTO and other trade agreements as mechanisms to open up new markets in the South for banks, insurance companies, and other financial firms based in the global North, these rules may also constrain the ability of governments in the global North to re-regulate their own financial sectors. Here are a few examples of how trade rules apply toward efforts for financial reform:

- 1) **U.S. trade agreements and bilateral investment treaties prohibit the use of capital controls**, even though these policy tools have been used effectively by numerous countries to prevent or mitigate financial crisis. In the wake of the global financial crisis, there has been a resurgence in the use of capital controls and similar prudential capital account regulations in emerging markets as they attempt to cope with a mass influx of capital inflows and subsequent currency and asset appreciation.

Authoritative research recently published by the National Bureau of Economic Research, the IMF, and elsewhere has found that limits on the inflow of short-term capital into developing nations can stem the development of dangerous asset bubbles and currency appreciations and generally grant nations more autonomy in monetary policymaking. However, under U.S. trade agreements and bi-lateral investment treaties, foreign investors can sue governments in international court to demand compensation for alleged violations of these prohibitions on capital controls.⁴⁰

- 2) **The WTO's financial services agreement places expansive limits on domestic financial regulation.** According to Public Citizen's Global Trade Watch, these rules not only guarantee foreign financial firms and their products access to U.S. markets, but also include numerous additional rules that limit domestic regulation.

Certain forms of regulation are banned outright, whether or not they discriminate against foreign firms. For example, by signing on to a broad array of financial services, the U.S. government committed to not setting limits on the size of financial firms, the types of financial service one entity may provide or the types of legal entities through which a financial service may be

provided. These WTO rules conflict with countries' efforts to prevent banks from becoming "too big too fail" or erecting "firewalls" between different financial services to limit the spread of risk. More than 100 countries have made WTO financial services commitments. As noted already, WTO agreements are legally binding and have strong enforcement capability.

- 3) **Safeguard clauses for financial stability measures in the GATS and U.S. trade and investment treaties are weak.** In the GATS, for example, this clause starts by noting that countries shall not be prevented from establishing financial service regulatory policies for "prudential reasons," but then continues by stating: "Where such measures do not conform with the provisions of the Agreement, they shall not be used as a means of avoiding the Member's commitments or obligations under the Agreement." Many legal experts, such as Professor Robert Stumberg, director of the Harrison Institute for Public Law at Georgetown University, have argued that the two sentences are self-cancelling (e.g., the second cancels the first).⁴¹

Few legislators, market experts or NGOs realize the extent of trade rules requiring deregulation and liberalization of financial services. Civil society can play a valuable role in bridging this disconnect of information and more closely align domestic financial reform work with relevant WTO and related policies.

3.4 The Way Forward—Building New Civil Society Coalitions

Markets and Civil Society—Essential and Non-Essential Commodities Campaign

**"Food—like water—is not an optional product that consumers may choose to purchase: food is the basis of life."
(Lori Wallach)**

A salient aspect of the WTO and other trade agreements is that food is treated as a non-essential commodity rather than as an essential good that is crucial for the survival of all humans. As Lori Wallach, director of Public Citizen's Global Trade Watch, puts it: "Food—like water—is not an optional product that consumers may choose to purchase: food is the basis of life. People without food die, while people without cars or tires walk, and people without ore use local materials."⁴²

Movements can play a unique role by advocating that a different set of financial rules and standards should apply for essential commodities than should apply for non-essential goods. While this potential campaign may not be an appropriate starting point for an "inside," legislative reform strategy, it could be an effective "outside" theme that begins to push the margins of reform possibilities going forward.

Aligning Trade and Climate Goals

A broader array of civil society movements need to become engaged in UNFCCC and other international fora policy discussions on funding mechanisms and policies for mitigation and adaptation measures that involve agriculture. Civil society can play a central role in ensuring that funded projects maintain ecological, social, and cultural integrity. In conjunction, a pioneering alliance of climate change, food and farming, and trade NGOs can establish principles that align economic and trade interests with the need to reduce global GHG emissions.

Financial Reform Initiatives

Recently, numerous NGOs have joined forces in the U.S. and around the world to organize and advocate for financial reforms in response to global financial and economic crises. The initiatives range from bank accountability, financial taxes, commodities speculation and international finance institutions.⁴³

Going forward, it will be important to extend these alliances to include more representatives from climate, environmental, human rights, trade and social justice sectors. Highlighting the direct link between financial and economic policies to basic human rights, such as the right to food and water, can be a powerful global campaign. Economic reform is not just a matter of enhancing standards of living, it is a matter of survival for most of the planet's inhabitants.

3.6 Civil Society and Non-Governmental Organizations Working on Trade and Economics (partial list)

Action Aid
Agribusiness Action Initiatives
Americans for Financial Reform
BankTrack
Center for Alternative Development Initiatives
Center for Economic and Political Research
Center for Food Safety
Citizen's Trade Campaign
Econexus
ETC Group
Eurodad (European Network on Debt & Development)
European Cross-Networking Space
Europeans for Financial Reform
Focus on Global South
Food and Water Watch
Food First/Institute for Food and Development Policy
Friends of the Earth International (regional, national offices)
Funders Network on Transforming the Global Economy
Grassroots Global Justice
Grassroots International
Heinrich Böll Foundation
IBON International
Initiative for Policy Dialogue
Institute for Agriculture & Trade Policy
Institute for Ecological Economy Research
Institute for Local Self-Reliance
Institute for Policy Studies
International Commission on the Future of Food and Agriculture
International Development Economics Associates
International Forum on Globalization
International Fund for Agricultural Development
International Institute for Environment and Development
Jobs with Justice
Jubilee USA Network
Kiva
National Community Reinvestment Coalition
National Day Laborer Organizing Network
National Domestic Workers Alliance
National People's Action
Navdanya International
New Economics Foundation
New Rules for Global Finance Coalition
New Way Forward
Oakland Institute

Our World is not For Sale
Overseas Development Institute
Oxfam International
PICO
Public Citizen's Global Trade Watch
SocialWatch
Solidago Foundation
South Centre
The Development Fund/Utviklingsfondet
Third World Network
U.S. Working Group on the Food Crisis
World Development Movement
World Economy, Ecology & Development
World Resources Institute
Worldwatch Institute

References

- 1 *Facts About Consumption and Production Patterns*, World Summit on Sustainable Development, Johannesburg, SA, August-September 2002.
- 2 Ibid.
- 3 Ibid.
- 4 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief, Geneva, Switzerland: United Nations, 2010, p. 1-2, http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf (accessed 18 January 2011).
- 5 International Monetary Fund, *Haiti: Selected Issues*, IMF Staff Country Report, No. 01/04, Washington, DC: IMF Publication Services, 2001.
- 6 Jerry Mander, *Climate Change v. Capitalism*, in: [Guardian.co.uk](http://www.guardian.co.uk), 15 October 2010, <http://www.guardian.co.uk/music/2010/oct/15/climate-change-economic-growth-capitalism>.
- 7 Lester Russell Brown, Chapter 1, in: *World on the Edge: How to Prevent Environmental and Economic Collapse*, New York: W.W. Norton, 2011, p. 6.
- 8 Chris Hails (ed.), *Living Planet Report 2008*, Gland, Switzerland: WWF–World Wide Fund For Nature, 2008, p. 1-2, http://assets.panda.org/downloads/living_planet_report_2008.pdf.
- 9 Lester Russell Brown, *Plan B 3.0: Mobilizing to Save Civilization*, New York: W.W. Norton, 2008, p. 3-20.
- 10 Chris Hails (ed.), *Living Planet Report 2008*, Gland, Switzerland: WWF–World Wide Fund For Nature, 2008, p. 1-2, http://assets.panda.org/downloads/living_planet_report_2008.pdf.
- 11 *Global Trends 2015*, US CIA, 2000.
- 12 Emma Vandore, *France to Use Happiness as Economic Indicator*, 14 September 2009, http://www.huffingtonpost.com/2009/09/14/france-to-use-happiness-a_n_285600.html.
- 13 Vishal Arora, *In Buddhist Bhutan, Happiness Counts*, 20 March 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/03/19/AR2010031903939.html>.
- 14 Herman E. Daly and Kenneth N. Townsend, *Valuing the Earth: Economics, Ecology, Ethics*, M. I. T. P., 1993, p. 267.
- 15 Adam Vaughan, *A History of CO2 Emissions*, in: [Guardian.co.uk](http://www.guardian.co.uk), 2 September 2009, <http://www.guardian.co.uk/environment/datablog/2009/sep/02/co2-emissions-historical>.
- 16 Martin Khor, *Personal Statement for Helsinki Process Report*, Malaysia: Third World Network, 2008, http://www.helsinki.fi/netcomm/ImgLib/24/89/hp_contribution_khor.pdf.
- 17 Martin Khor, *South Centre Statement at the UNFCCC Climate Conference (COP16, CMP5)*, Organizational Statement, 10 December 2010, http://unfccc.int/files/meetings/cop_16/statements/application/pdf/101210_cop16_hls_south_centre.pdf.
- 18 Wolfgang Sachs, Chapter 2, in: *Planet Dialectics: Explorations in Environment and Development*, Halifax, N.S.: Fernwood Publication, 1999, p. 38.
- 19 Wolfgang Sachs, *The Economist's Prejudice*, Interculture XXIII, no. 4, May 1991, [http://www.networkcultures.net/47-48-49/Economists' Prejudice.html](http://www.networkcultures.net/47-48-49/Economists%27Prejudice.html).
- 20 Herman E. Daly, *Economics in a Full World*, *Scientific American*, 293 (3), September 2005, http://sef.umd.edu/files/ScientificAmerican_Daly_05.pdf, p. 100-107.
- 21 Lester Russell Brown, Chapter 1, in: *World on the Edge: How to Prevent Environmental and Economic Collapse*, New York: W.W. Norton, 2011, p. 7.
- 22 Ana Revenga, *Rising Food Prices: Policy Options and World Bank Response*, issue brief, April 2008, http://siteresources.worldbank.org/NEWS/Resources/risingfoodprices_backgroundnote_apr08.pdf.
- 23 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief (Geneva, Switzerland: United Nations, 2010), p. 1-2, http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf (accessed 18 January 2011).
- 24 Ibid, p. 3.
- 25 Economic and Social Development Department, *Crop Prospects and Food Situation, No. 5*, FAO Corporate Document Repository, December 2010, *Global Cereal Supply and Demand Brief*, <http://www.fao.org/docrep/011/ai476e/ai476e04.htm> (accessed 18 January 2011).
- 26 Michael W. Masters and Adam K. White, *The 2008 Commodities Bubble: Assessing the Damage to the United States and Its Citizens*, issue brief, February 4, 2009, <http://stopgamblingonhunger.com/wp-content/uploads/2010/02/2008-Commodities-Bubble-090204.pdf> (accessed 18 January 2011).

- 27 Testimony of Michael W. Masters Managing Member/ Portfolio Manager Masters Capital Management, LLC, Committee on Homeland Security and Governmental Affairs United States Senate, 110th Cong., 4 (2008), http://hsgac.senate.gov/public/_files/052008Masters.pdf.
- 28 Olivier De Schutter, *Food Commodities Speculation and Food Price Crises*, issue brief Geneva, Switzerland: United Nations, 2010, p. 3, http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en.pdf (accessed 18 January 2011).
- 29 Third World Network, *Financial Speculation and the Food Crisis: Policy Responses*, Third World Resurgence, no. 240/241, August/September 2010, <http://www.twinside.org.sg/title2/resurgence/2010/240-241/cover02.htm>.
- 30 United Nations, *UNCTAD Trade and Development Report 2009*, report, Chapter II: The Financialization of Commodity Markets, http://www.unctad.org/en/docs/tdr2009ch2_en.pdf.
- 31 Martin Khor, *Interview with Martin Khor — Alliance Sud*, Alliance Sud, 13 October 2009, <http://www.alliancesud.ch/en/policy/other/interview-martin-khor>.
- 32 Public Citizen, *Energy and Climate Change*, <http://www.citizen.org/Page.aspx?pid=2131>.
- 33 Sophia Murphy, *Managing the Invisible Hand: Markets, Farmers and International Trade*, Minneapolis: Institute for Agriculture and Trade Policy, 2000.
- 34 Trade InvestSA Staff, *SA Should Become a Net Exporter of Food Again*, TradeInvestSA, Business, Trade and Investment Opportunities in South Africa, 8 August 2008, <http://www.tradeinvestsa.co.za/news/709828.htm>.
- 35 *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, ETC Group, November 2008, p. 11.
- 36 Ibid.
- 37 All figures from: Debbie Barker, *The Rise and Predictable Fall of Globalized Industrial Agriculture*, report, San Francisco: International Forum on Globalization, 2007.
- 38 Public Citizen's Global Trade Watch, *Trade Agreements Cannot Be Allowed to Undermine Needed Financial Service-Sector Reregulation*, issue brief, <http://www.citizen.org/documents/FinanceReregulationFactSheetFINAL.pdf> (accessed 18 January 2011).
- 39 Dan Tarullo, White House press briefing, <http://clinton6.nara.gov/1997/12/1997-12-13-financial-services-briefing.html>.
- 40 Kevin P. Gallagher, *Policy Space to Prevent and Mitigate Financial Crises in Trade and Investment Agreements*, report no. 58, Geneva, Switzerland: UNCTAD, 2010.
- 41 Robert Stumberg, *Reform of Investor Protections*. Testimony: House Committee on Ways & Means, Subcommittee on Trade, Washington, D.C., 14 May 2009.
- 42 L. Wallach and P. Woodall, *Whose Trade Organization: A Comprehensive Guide to the WTO*, New York: New Press, 2004.
- 43 Sarah Anderson, *Civil Society Responses to the Global Financial and Economic Crisis*, Funders Network on Transforming the Global Economy (FNTG), November 2010, <http://fntg.org/whitepaper2010.php>.



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