

***Presentations and Discussion in the Food Resilience Sessions  
Association for Environmental Studies and Sciences  
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Transcription from session voice recordings by Regina Gregory

**At the end of 2012 a “food resilience” working group was organized in the Association for Environmental Studies and Sciences (AESS) to explore and frame food resilience – the capacity to prevent or deal with possible crises in food supply – in a way that points to what environmental scientists and teachers can do through research, education, community action, or other means to help make the North American food system more resilient. The working group’s first “product” was three sessions on food resilience at the AESS annual conference. The document below is a complete record of the presentations and discussions in those sessions.**

**Presentation Panel: American food security – Improving the resilience of our food supply**

**Panel description:** The resilience of our food system is declining as global demand for food approaches limits for sustainable production. The risk of shortfalls in food supply – whether due to failure in production or failure in distribution, whether on a local scale or a larger (possibly global) scale, and whether for a short period or a long period – is of genuine concern. Cities are particularly dependent and vulnerable. Decline in food storage throughout the system has eroded the capacity to buffer perturbations such as large-scale crop failure or an influenza pandemic. It’s difficult to get a clear grip on this topic because the food system is so complex, and failure could take forms never seen before. It’s easy for wishful thinking to prevail, but the stakes are high. This session will address the following questions:

- What are the main lines of risk in the food system?
- What are leverage points for reducing the risks?
- What is already being done by government, civil society, and the private sector to reduce the risks?
- What can environmental scientists and teachers do through research, education, community action, or other means to reduce the risks?

**This document provides presentation texts and PowerPoint slides for the following presentations:**

**Session one: Conceptual framework and historical perspective**

- Gerry Marten, "An overview of American food resilience"
- Alesia Maltz, "The Dismantling and Reconstruction of the Food System: Lessons of Food Resilience from Two World Wars" (presented by Sasha Adkins)
- Bryan McDonald, "Growing a Global Food System: Agriculture, Environment and Power in America, 1945-1995"
- Peter Jacques, "Global Fishery Collapse: Theory and Potential Variables"
- Mohammed F. Rabbi, "Perspectives on Global Climate Change and Food Security"

**Session two: Specific lines of risk and case studies of risk amelioration**

- Krystyna Stave, "Thinking in Systems Terms about Food Security"
- Brian Thomas, "The Social Distribution of Risk in Conventional and Alternative Food Systems"
- Kip Curtis, "Food System Counter-Interventions: Addressing the Impacts of Poverty in Inner City St. Petersburg"
- *Todd LeVasseur, "Hubs of Resilience? Cultivating Food Sheds via Food Hubs: A Case Study of GrowFood Carolina"*
- Teddie Phillipson-Mower, "Food Resilience and Community Building"

**Session three: Where do we go from here?**

This discussion symposium session is a follow-up on the two Presentation Panels on food security during the previous days. The focus for this session is on planning for an AEISS working group whose mission is defined by the questions listed above. Working group products will include contributions to the Journal of Environmental Studies and Sciences and proposals for action to address the food resilience issue.

The last part of this session features a question-and-answer period with agroecologist Steve Gliessman (University of California, Santa Cruz), who attended the conference to receive an AEISS Lifetime Achievement Award.

## **Gerry Marten, “An overview of American food resilience”**

ABSTRACT. Unexpected failures in food production or distribution could conceivably be so severe or long-lasting that they disrupt the food supply. What are the risks and how serious are they? What can be done to reduce the risks or cope with failures if they occur? This presentation will offer a preliminary examination of these questions, along with a resilience perspective that could help to explore the questions in greater depth. It will explore briefly what is already happening in government, civil society, and the private sector and what environmental professionals can do to help deal with this issue.

Late last year a working group of AESS members was formed to address the food resilience issue. Difficult-to-predict disturbances such as large-scale crop failure, influenza pandemic, or energy crisis could conceivably disrupt food production or distribution severely enough to set in motion a breakdown in food supply leading to hunger or even starvation. Cities are particularly dependent and vulnerable. It's difficult to get a clear grip on the risks, because the food system is overwhelmingly massive and complex, and failure could take forms never seen before, but the stakes are high. The working group chose to place its initial focus on the United States because the prospect of food crisis in the United States has received relatively little attention. The bounty of food in America could be deceptive.

Food resilience is related to food security, but the two are not identical. Food security is broader. Food security is about everyone's access to adequate food for a healthy life. Social justice is important. Food resilience is about one aspect of food security – the ability to withstand disturbances that could lead to a failure in food supply.

I think of food resilience from an “EcoTipping Points” perspective. The website [www.ecotippingpoints.org](http://www.ecotippingpoints.org) features success stories from around the world about turning environmental and social decline to a course of restoration. It shows how vicious cycles drive decline and offers lessons from the stories about what it takes to leverage a turnabout from decline to restoration. America's capacity to withstand disturbances that could disrupt its food supply may have declined substantially in recent decades. The challenge is to restore that capacity.

I want to use the story of New Orleans and Hurricane Katrina to show what I mean by resilience. In August 2005, Katrina transformed half the city of New Orleans into a ghost town in a single day. I lived in New Orleans before Katrina. The house in which I lived is still an empty shell eight years after the hurricane, and so are most of the houses for miles around it. There is still not a single supermarket, shopping mall, or other substantial retail outlet in an area extending for miles. I know that right up until Katrina, the main thing that hurricanes meant to people in New Orleans was hurricane parties. How could they be so mistaken about the risks? What went wrong? The New Orleans story is about gradual decline in resilience that led to sudden disaster.

New Orleans was able to withstand numerous hurricanes during its earlier history because until the middle of the Twentieth Century houses were built only on high ground where flooding was unlikely. If there was any risk of flooding, the houses were built well above the ground so flood water would pass underneath. New Orleans was also protected from storm surges by miles of wetland between the ocean and the city. There had been powerful hurricanes every ten to twenty years, but no lasting damage. The city always recovered quickly. [Demonstration by tilting a cereal box to show that it tips over (i.e., “collapses”) only when pushed past a threshold. If the disturbance is relaxed short of that threshold, the box returns to its original position (i.e., “recovers”). This is resilience.]

Vulnerability to hurricanes gradually increased during the last half of the Twentieth Century because people had a false sense of security from the flood-control levees. Like so much of America, New Orleans embarked on rapid suburban expansion. Subdivisions were built on low-lying, floodable ground, and houses were built right on the ground. Even a few feet of floodwater could make it necessary to rip out all the walls, ruined by mold. At the same time, the levees were gradually deteriorating, no longer providing the absolute protection that everyone assumed was there. And most important was deterioration of the wetlands that protected the city from coastal storm surges. In fact, as a consequence of changes in wetland ecology brought on by levees, Louisiana has been losing a football field of coastal wetland every ten minutes for the past fifty years. [Demonstration using a cereal box with a much narrower base than the first box, showing that it’s much easier to tip over the box. The second box represents greater vulnerability to the same disturbance as before (i.e., a loss of resilience).]

The working group is framing the food resilience issue by addressing four key questions:

- What are the main lines of vulnerability in the food system (production and distribution)? How are the risks changing through time?
- What is the significance of globalization, multinational corporations, agricultural technology, local food systems, and other key dimensions of the food system for food resilience? What are leverage points for improving resilience?
- What is already being done by government, civil society, and the private sector in support of food resilience?
- What can environmental scientists, teachers, and other environmental professionals do through research, education, community action, or other means to improve resilience?

With regard to the first question above, it’s easy to list sources of risk:

- First is the ***diminishing gap between global food production capacity and the food needs of a growing human population***. The ability to meet food needs when things go wrong is greater when food production capacity comfortably exceeds feed needs. Unfortunately, that cushion is eroding as agricultural land is lost to urban expansion, erosion, salinization, and other abuses, while aquifers (providing irrigation water on which so much of the increase in agricultural production during recent years has depended) are rapidly being depleted. At the same time, the increase in demands on the land from an exploding human

population has been exacerbated as people around the world have increased the percentage of animal products in their diet.

- **Natural disasters** such as hurricanes and earthquakes can disrupt food supplies to people rendered helpless and dependent. Natural disasters are significant because they are so common. Past experience and current preparedness offer institutional lessons.
- **Crop failures due to extreme weather**, which are expected to become more frequent and severe due to global climate change. I recently read an article about perceptions of Nigerian farmers regarding weather changes they have experienced during recent decades (particularly drought). Their perception is simple. Eventually, they expect to die of starvation if the trend continues.
- **Failures in food production due to introduction of a devastating crop or livestock disease.** Scientists at the University of Minnesota have conducted a simulation that shows how a single handkerchief laced with hoof-and-mouth disease placed in a cattle stockyard can spread the disease around the entire region before anyone realizes what is happening, making it necessary to slaughter all the cattle in the region. This could happen as an act of terrorism or by chance, as happened with the introduction of Mad Cow Disease to Britain several years ago.
- **An energy crisis disrupts food processing and distribution as well as inputs for agricultural production.** Modern agricultural production and food processing, refrigeration, and transport are highly dependent on fossil fuels. An electricity failure in the Beijing region several years ago shut down trains bringing food to the city, leading to a panic run on food retail outlets.
- **Major volcanic eruption** can cloud the atmosphere, dramatically reducing crop production by reducing sunlight and putting sulfuring acid into rain. This kind of eruption has happened every few centuries, disrupting plant growth on a regional or global scale for months or in some cases for years. It appears that volcanic eruptions in Iceland (and possibly other parts of the world) were responsible for mass starvation in Europe (and death of malnourished people by disease) during the Sixth Century, Fourteenth Century ("The Great Famine" of 1314-1317, which killed approximately half the population of northern Europe), and Eighteenth Century.
- **Agribusiness, multinational corporations, globalization, and international trade.** A few international conglomerates control the food system, exercising enormous political influence on a national and international scale for trade rules, intellectual property rights, and other legal conditions that favor their profitability – a business model that can be in conflict with a reliable food supply for their customers, as well as the ability of farmers and laborers in the production, processing, and distribution of food to earn enough to feed themselves. Particularly alarming has been the marketing of genetically modified crops by way of "terminator seeds" that force farmers to purchase new seeds each year. This dependence is a surefire formula for disaster, as seen with BT-cotton which was widely adopted in India during the years following 2005. Shortages of BT-cotton seed and soaring prices for the seed during the past two years have triggered an epidemic of high production costs, crop failure, farmer despair, and suicides. On the American scene, food retailing

corporations have displayed their callousness by pulling out of poor urban neighborhoods, creating “food deserts” that make it difficult to purchase decent food at a decent price.

- **Social conflict.** Starvation has often been associated with war and is still a prominent feature of civil wars around the globe. Another “war” has been large-scale agricultural land grabs in poor countries by multinational agribusiness in recent years. China, for example, is buying multi-million acre chunks of farmland across Africa, typically paying government officials to whom the land does not even belong. People who occupied the land for generations are displaced with no legal recourse and the prospect, at best, of being poorly-paid laborers. Similarly, rainforest dwellers have been pushed off their land in Southeast Asia to make way for rubber and oil palm plantations that have expanded dramatically under the impetus of foreign markets and foreign investment. Turning to a national scene in Europe a few years ago, the British government had to shut down a truckers strike to prevent starvation in London.
- **Food commodity futures,** which originated as a form of insurance for buyers and sellers to deal with uncertainties about future prices, have deteriorated into a gambling operation controlled by a handful of large corporations that manipulate the market speculatively for profit and to the detriment of stability in food supply.
- The **decline of household and government food storage** has weakened stored food stocks as a buffer against fluctuations in food supply – undermining a strategy that has been a mainstay of human survival throughout history. Governments have cut costs by scraping food storage depots, and the food supply chain business model of rapid turnover leaves little scope for filling the gap when something goes wrong. This is an example of the conflict between efficiency and the redundancy necessary for resilience. Global food storage, which forty years ago was enough to feed the world for several years, is now down to 2 months, and the rapid turnover of food in American cities has reduced storage in all forms to about a week’s food supply.
- **Excessive and dysfunctional social complexity** can paralyze the capacity to deal with challenges. Social complexity has exploded with globalization and the ascendance of computers, permeating every aspect of contemporary society. Joseph Tainter’s book *The Collapse of Complex Societies* (1989) examined dozens of cases of past civilization collapse and found two common threads. First, collapse of food storage and food supply was a major part of the story as things fell apart – often a central driver of collapse. Second, social complexity increased over the centuries as a civilization grew and developed. The complexity was useful until it passed a point where the “overhead” costs of maintaining the complexity exceeded the benefits. A cultural value for social complexity continued as decline set in, and complexity continued to increase until dysfunction rendered the civilization vulnerable to any serious challenge that happened to come along at that time and place (e.g., environmental deterioration, military threat, or infrastructure failure). Today’s social complexity could be a serious obstacle to strengthening resilience.

The food crisis of 2007-2008 provides an example of how food supply can fail under contemporary conditions. The prices of food commodities (e.g., wheat, rice, corn, and soy) doubled during 2007-2008, causing food riots in approximately 60 nations. The prices have stayed high since then. How did this happen? The initial price increase in 2007 was triggered by

(1) poor harvests in Europe and Australia (due to drought) and (2) diversion of grains to biofuel production. At the same time, an increase in the price of petroleum added to transport costs and ultimately the cost of food. In response to international food price increases, some of the key grain-exporting nations restricted exports to protect their domestic food prices and food supplies. The diminishing food supply on the international market drove up international food prices even more, creating a vicious cycle that caused food-exporting nations to further restrict exports. Additionally, the increase in food price was accelerated by a low “stock-flow ratio” (i.e., low wholesale food storage). On top of this, the subprime mortgage crisis in 2007, and recession that followed, reduced international credit, reducing the ability of nations with food shortages to buy food from abroad. The recession also created unemployment that undermined the ability of consumers to purchase food. Then commodity futures trading came into the picture. The recession led to a decline in the U.S. dollar, which led investors to shift from conventional investments (e.g., stocks) to commodities (including food commodities), leading to a stimulation of higher food prices, and a vicious cycle in which investors were further attracted to food futures, driving food prices even higher.

Turning to the second working-group question above, here are some very preliminary takes on leverage points for improving resilience. While it makes sense to address identifiable sources of risk, reducing those risks wherever possible, this strategy also has some conspicuous limitations. Many sources of risk (e.g., multinational corporations controlling food supply chains and food commodity markets) are too massive, complicated, and powerful to realistically expect much scope for leveraging change. Moreover, because failure could occur for reasons that we haven’t even thought of, it’s important to think of strategies that can apply across a broad spectrum, regardless of the source of breakdown. Food storage is a prime candidate for improving resilience because it can fill the gap for just about any failure in food supply. While far from easy, food storage may be more amenable to change than many other interventions that come to mind. Social safety nets could also have a role, and reduction in dysfunctional social complexity may be absolutely essential for improving resilience. While substantial changes in social safety nets and social complexity could be impossibly difficult in many ways, there may be some possibilities at the local level. In general, local autonomy and self sufficiency seem to offer the most promise for improving resilience because a relatively small number of people can do what makes sense regardless of what’s happening in the rest of the world.

Turning to the third question above, what’s currently happening? The attention of academics and nonprofit organizations such as the United Nations, WorldWatch Institute, and Earth Policy Institute is directed primarily toward chronic food problems in poor countries. In the U.S., the focus is also on chronic problems such as social justice, nutritional quality, and health consequences such as obesity. While this is not the central focus of food resilience, the misfortunes of disadvantaged people can be relevant as “canaries in a coal mine” for what could someday happen to the rest of us.

I’ve begun to survey perceptions and activities of government agencies. The U.S. government has been concerned primarily with natural disasters and threats of terrorism rather than intrinsic vulnerabilities in the food system. So far, my progress in discovering further-reaching

connections of government to food resilience has been limited. It has been difficult to get through to people who are both knowledgeable and willing to speak about it candidly. The common reaction is “Somebody else may be dealing with it.”

Investigating ongoing preparedness for natural disasters (including “mass feeding”) could be a way to learn about the existing role of government, nonprofit organizations, and private-sector food providers in food resilience. However, disaster preparedness plans are often official documents not available for public distribution, and the plans that I’ve managed to see contain little concrete detail about what will actually happen. They mainly list what agency will be responsible for what, without describing concretely how it will be done or requiring designated agencies to actually make the preparations to do it.

I’ve learned the most from several people in Hawaii State Civil Defense, who have told me about disaster preparation from their perspective. Hawaii is an extreme case because of its isolation, but the isolation and dependence of cities everywhere may in fact be similar. During a disaster, government in Hawaii is responsible for transporting food from wherever it’s available (e.g., grocery stores, warehouses, harbor, or airport) to places such as shelters if conventional transport breaks down. However, government is not responsible for the supply of food, whether the mass-feeding requirement is relatively short-term (e.g., after a hurricane) or long-term (e.g., during an influenza pandemic). The supply of food in any disaster will be whatever the private sector provides.

How about food storage in Hawaii? Assuming a worst case such as a direct hit by a severe hurricane, most of Oahu’s one million inhabitants could be homeless and in need of food for a month. Assuming just one meal per person per day, as many as 30 million meals could be needed for the entire period. FEMA has 35,000 MREs (Meals Ready to Eat) in warehouse storage on Oahu – a token quantity. The quantity of “on the shelf” storage in grocery stores and their warehouses is estimated to be enough for five days, though much of it may not be in a form that is easily consumed and much of it may be lost because warehouses are located near the harbor and are therefore subject to storm-surge damage. Food will also be lost due to lack of refrigeration. (Electrical power could take 6-12 months to restore fully.) Military food storage is not for civilians, though the airport and harbor should be functioning within a week after a hurricane, when the military could fly in a limited quantity of food. Military food assistance by sea could be forthcoming in about two weeks.

Turning to the last question above, what can environmental professionals do? One approach is to ask practitioners what they need. I asked Hawaii Civil Defense, and they told me that for anyone asking this question their most important need is to get more people to store more food for emergencies. Civil Defense advises the public to store a week’s supply of food and water that they can take with them to a shelter on very short notice, but it’s not really happening.

There are myriad other ways that environmental professionals can help. For example, they can help to make sense of the food system’s overwhelming complexity. Network analysis could help



to provide some insights. How does the spread of failure through a system depend on system structure? Is a modular structure more resilient than the highly connected structure so characteristic of our national and globalized food system? Environmental professionals can also help to put food resilience issues into relief by showing how apparently separate issues are connected through the food system and how they connect to drivers of vulnerability. Consider, for example, the issue of expanding export of dairy products from California to China, which is expected to multiply its consumption of dairy products as much as 20-fold during the next fifteen years. California dairy farmers want to respond to this expanding market. However, they will no longer be feeding soy meal to their cows because the price of soy has tripled in the past few years, so they are turning to locally grown alfalfa, which requires a lot of irrigation water. This raises the issue of whether so much of California's precious water should be passed to China in the form of dairy exports, or used in some other way to serve local needs.

These are only a few examples. There are hundreds of ways that environmental professionals can help to clarify issues and step into key domains of the action arena to enhance American food resilience. Presentations in the food resilience sessions at this conference will begin to lay a foundation for sketching out some of those possibilities.

## Introduction to the session on American Food Resilience

Gerry Marten  
EcoTipping Points Project  
([www.ecotippingpoints.org](http://www.ecotippingpoints.org))  
and East-West Center (Honolulu)

### Food resilience issue

- Vulnerability to a relatively sudden and severe interruption of food supply (leading to hunger or starvation).
- Example: A severe influenza pandemic disrupts food production and transport.

## Food security vs. Food resilience

- Food security – Access to adequate food.
- Food resilience – Ability to withstand disturbances that could set in motion a serious disruption of food supply.

## EcoTipping Points Perspective [www.ecotippingpoints.org](http://www.ecotippingpoints.org)

- Success stories from around the world about turning environmental/social decline to a course of restoration.
- Show how vicious cycles drive decline.
- Offer lessons about what it takes to leverage a turnabout to restoration.

## Slow increase in vulnerability (New Orleans and Katrina)

- Half the city was transformed to a ghost town in one day.
- Houses were resilient to hurricanes until the Mid-Twentieth Century.
  - Built houses on high ground.
  - House construction resistant to flooding (e.g., raised off the ground).

- Vulnerability to hurricanes increased during last half of Twentieth Century (with a sense of security from levees).
  - Built houses on low ground (floodable).
  - House construction vulnerable to flooding (not raised off the ground).
  - Levees deteriorated.
  - Deterioration of wetland buffer → strong surge during hurricane.

## Key research questions about food resilience

1. What are the main lines of vulnerability in the food system (production and distribution)? How are the risks changing through time?
2. What are leverage points for reducing the risks?

3. What is already being done by government, civil society, and the private sector to reduce the risks?
4. What can environmental scientists, teachers, and other environmental professionals do through research, education, community action, or other means to reduce the risks?

## Sources of vulnerability in the food system

- Diminishing gap between food production capacity and the food needs of a growing human population. (e.g., agricultural land loss, aquifer depletion, diet changes).
- Natural disasters such as hurricanes, earthquakes, and tsunamis.

- Global climate change and crop failures due to extreme weather.
- Introduction of a devastating crop or livestock disease.
- An energy crisis disrupts inputs for agricultural production and food processing/transport.
- Major volcanic eruption that reduces photosynthesis and crop production.

● Agri-business/multinational corporations

- A few international conglomerates control the food system.
- Political influence – Lobbying for favorable trade conditions and intellectual property rights.
- GMO marketing (“terminator seeds”).
- “Food deserts.”

● Social conflict – Civil wars, land grabs, British truckers strike.

● Food commodity futures (speculation)

● Decline of household and government food storage.

● Excessive and dysfunctional social complexity (globalization and much more) paralyzes the capacity to deal with challenges. (Joseph Tainter – *The Collapse of Complex Societies*)

## An example of how food supply failure can happen

- Food commodity prices doubled in 2007-2008 (and have stayed high).
- Food riots in 60 nations.
- Triggered by (1) poor harvests in Europe and Australia (drought) and (2) diversion of grains for biofuel.
- Increase in oil price → Increase in food production and transport cost.

- Many grain-exporting nations restricted exports to protect domestic food prices and supplies (vicious cycle).
- Increase in food price accelerated by low “stock-flow ratio” (wholesale food storage).
- Subprime mortgage financial crisis → Recession → (1) Less international credit to buy food and (2) unemployment (so less consumer purchasing power).



- Commodity futures trading:  
Decline in U.S. dollar →  
Investment switch to commodities →  
Higher food prices (vicious cycle).
- Prior commodities deregulation →  
Domination of food commodities  
market by a few large investors →  
market manipulation that accelerated  
increase in food price.

## Leverage points for reducing risks

- Address specific risk factors.
- Increase food storage.
- Social safety nets.
- Reduce dysfunctional social complexity.
- Local autonomy and self sufficiency.

## What's happening to reduce the risks?

- Books, articles, nonprofit organizations: Mainly chronic food problems in poor countries.
- In the U.S., chronic problems of the poor and quality of nutrition.
- Chronic problems for disadvantaged may be a “canary in a coal mine” for the rest of us.

- Federal government focuses on terrorism or natural disasters rather than intrinsic vulnerabilities in the food system.
- Government and private sector not paying much attention to vulnerabilities in food system per se: “Somebody else may be dealing with it.”

- Government plans

- Often not public information.
- Plans limited to what agency is responsible for what.

## Hawaii Civil Defense

- Government responsible for coordinating food transport immediately after a natural disaster.
- Otherwise, food supply for any kind of disaster will depend on existing food supply system. No plan for government to step in.
- Enough food storage in Hawaii for about five days.

## What can environmental professionals do?

- Hawaii Civil Defense – Get more people to store more food.
- Making sense of the complexity
  - Network analysis – How does the spread of failure through a system depend on system structure?

- Show how various issues are connected through the food system and how they connect to drivers of vulnerability.
  - Example: Export of dairy products to China's expanding market and competition of dairy farmers with others water users in California.

**Alesia Maltz, “The Dismantling and Reconstruction of the Food System: Lessons of Food Resilience from Two World Wars” (presented by Sasha Adkins)**

ABSTRACT. “Plant a Victory Garden: Our Food is Fighting” is a well-known slogan from the Victory Garden posters of World War I. That slogan was taken quite literally by the US, German and British military, who developed strategic plans to win the war by restricting access to food and destroying the civilian food system. The British government organized a naval blockade to import food for its citizens and restrict food and supplies to German and Austria Hungary. People barely survived on less than 1,000 calories a day, and by the end of the war, there was widespread famine in Germany and Austria. The food blockade was maintained for eight months after the war. It is estimated that three quarters of a million German people died from malnutrition and starvation. Germany’s vulnerability led to long-term fears of food insecurity had dramatic implications for the German people and the rest of the world. Historians are radically reinterpreting the cause of the Second World War in terms of the collapse of the food system in WWI, focusing on the role that the German famine of WWI played in Hitler’s plans to invade rural areas in Eastern Europe and the Soviet Union. The urgency of feeding urban populations in war led to invasion of agricultural populations around the world. The food policies emerging after World War II established a food system that has long-term influence today. This paper investigates food justice in the World Wars to examine how food systems are destroyed or maintained under threat of collapse and how they are reconstructed.

Slide 2. World War I was won when Germany lost the battle for food security. Using propaganda posters of the day, this presentation examines how food systems were strengthened, how they were destroyed, and what was required to reconstruct them. The high ideals of local wartime food production, as expressed in posters of “victory gardens” and “freedom gardens,” were integrally tied to the wartime blockade and ensuing tragedies of mass starvation. The collapse of the German national food system during World War I led directly to World War II. The story of food security in World War I delineates circumstances under which food systems are, and are not, resilient. A key lesson of World War I is that, when food systems fail, nations must rely on the ideals and actions of other nations to achieve food justice.

3. Much of the modern urban food movement has been built upon the mid- nineteenth century German grassroots movement of *kleingärtens*, or children’s gardens. *By 1900, Austria-Hungary had 18,000 school gardens, Sweden had 4,670, and Boston became the forerunner of “vacation gardens” in the US.* The public initiated the movement and then pressured government to support it. The movement expanded significantly during the war. *By 1917, the US Commissioner of Education formed the School Garden Army with the intent of enrolling six million children. The National Emergency War Garden Commission encouraged home gardening and food preservation.* In 1918, 5 million gardeners produced \$520,000,000 worth of food, enabling a surplus to be shipped abroad. (*Ostenfeld*).

4. On the domestic front, in the US, Great Britain and France, the food system was strengthened by WWI. During wartime, people ate more nutritionally dense fresh foods than they did during peacetime. It is inspiring to know that so many Americans were growing food everywhere—and to see images of liberty gardens on the Boston Commons.

This garden movement, which at the time was associated with patriotism, now resonates as an exemplar of modern food justice practices. WWI “freedom gardens” are also a model of food resilience. Posters to encourage food production in WWI are still inspiring to people interested in revitalizing urban food systems and enhancing local food production. Food was key to the war effort on the home front.

5. Food was also a key military strategy. By 1916, when a severe worldwide drought reduced agricultural yield, the US, French, and British Allied forces developed strategic plans to win the war with food at home and on the battlefield. They established Ministries of Food and restricted Germany’s access to food. The French also imported food, and saw a dramatic increase in food consumption.

6. Germany’s submarine campaign was designed to sink food supply ships and starve the British into surrender. Likewise, the Allies deliberately set out to destroy Germany’s military food system, as well as its civilian food system. The British government organized a naval blockade to import food for its citizens and restrict the transport of food and supplies to Germany.

7. At the beginning of the war, the German government did not think the war would last long, and so did not establish a food strategy. *However, food consumption patterns had changed since the last war. As Germans shifted from a 75% plant-based diet in the 18<sup>th</sup> century to a 60% meat-based diet in the 19<sup>th</sup> century, farm efficiencies went down.* By the beginning of the twentieth century, Germany produced 70-80% of its own foods, mostly meats and potatoes, and relied on local farms and a robust transportation system. *At the outset of war, it imported 20-30% of its food and almost all of the nitrogen and phosphates it used for fertilizer.*

During the war, a shortage of agricultural labor and limited access to fertilizer further reduced local food production.

By the end of the war, the German people barely survived on less than 1,200 calories a day. The food system had completely collapsed: *fats fell to 12%, and meat to 18%, of prewar levels.* When the potato crop failed in 1916, turnips became the staple food. In the “turnip winter” of 1916-17, three quarter of a million people died of malnutrition. Germany was a nation-state in crisis, staggering between anarchy and starvation.

8. At the beginning of the war, Great Britain was growing half of its food and importing the other half. Allied countries had a large international network of food producers to

rely upon—including their own colonies—provided they could keep their supply ships coming. In 1916, Great Britain developed a national food policy and the Ministry of Food, which encouraged garden allotments and organized rationing. In the United States, the public was taught how to substitute perishables for non-perishables and to preserve food.

*9/10 This is a comparison of the rations that soldiers were supposed to receive in the trenches. The rations of the British soldiers were significantly more nutritious than the German soldiers. (click to slide 10) As the war progressed, the nutritional needs of German soldiers were given precedence over the needs of civilians, who were forced to survive on diminished local agricultural production, foraging for wild foods, and the black market.*

11. Shortly after the war began, Germany invaded Belgium. Herbert Hoover intervened to help Belgium avert a food crisis. He volunteered to lead the Committee for Relief of Belgium, launching a campaign to collect, transport, and distribute food for between one million and 11 million civilians a day. *His organization developed many innovations, such as a nutrient rich cookie, which was designed to be freely distributed to children and served with milk.*

12. The committee forged a particularly charitable self-image for the United States. This work laid the foundation for CARE packages, and framed US food aid programs throughout the twentieth century.

13. When the US entered the War in 1917, Hoover was appointed the US Food Administrator. He encouraged voluntary food conservation by establishing an elaborate system of wheatless and meatless days. When the war ended, Hoover was placed in charge of food distribution in post-war Germany.

14. Wilson said, “The example of American must be the example not merely of peace because it will not fight, but of peace because peace is the healing and elevating influence of the world and strife is not. There is such a thing as a man being so right it does not need to convince others by force that it is right.” By the end of the war, the US had emerged from an isolationist role to adopt an idealist role in the international sphere. Wilson and Hoover were not effective in persuading the Allies to come to an agreement about Germany. The diplomatic ideals of these two men were off-putting to the French and English leaders. Lloyd George referred to Hoover as “that Salvation Army man.” Despite his successes in Belgium and the US, Hoover could not secure an Allied agreement to transport and distribute food in Germany.

15. While the Allies argued about what the final peace treaty would look like, they maintained a food blockade for eight months. *Germans were required to deliver livestock to the Allies, further depriving children of milk. Fishing was severely curtailed. Berliners exchanged potato peelings for firewood. Meanwhile, American food was*

*rotting in Rotterdam.* Between the Armistice and the signing of the Treaty of Versailles, at least 900,000 died of starvation. The turning point in Allied deliberations came when Lloyd George, urged on by an angry Hoover, warned the Supreme Council of the Allies that the: “memories of starvation may one day turn against them....The Allies were sowing hatred for the future; they were piling up agony, not for the Germans, but for themselves.” (Hoover page, Vincent).

16. The collapse of the German food system had dramatic *short and long-* term consequences. *In November of 1918, a loaf of bread cost one mark. Due to the hyperinflation, by November of 1923, it cost 200 billion marks. In the long term,* Germany’s lingering fears of food insecurity played a major role in the rise of Nazism. Hitler thought that Germany needed to go to war to expand *lebensraum*. “It’s a battle for food,” he said, “a battle for the basis for life...” Some of the worst atrocities of WWII were committed as a result of Nazi agrarian policies. Herbert Backe, Germany’s Minister of Food, hatched a plan to deliberately exterminate 100 million Russians, Jews, and Eastern European people through starvation. *Historians such as Lizzie Collingham are radically reinterpreting the cause of the Second World War to show that food was at the heart of the conflict.*

17. The food policies of World War I still influence the world’s food system today. *For example, to avoid the challenges that Hoover experienced in WWI, the US decided at the end of WWII to give food away rather than engage in international politics that restricted the flow of emergency food distribution and could harm US farmers.* The US took on a new mantle as breadbasket of the world.

**18. CONCLUSION.** The process of dismantling and rebuilding the German food system provides many lessons about food system collapse. World War I was a war about food security. The food system became a tool, and casualty, of war. World War II was a direct outgrowth to the collapse of the food system during the previous war. The biggest lesson of World War I is the necessity of acting upon principles of food justice when local food sovereignty fails.

19. **This episode in history suggests that small-scale farming does not necessarily contribute to a resilient system.** While victory gardens tell a story that supports the value of local food production, the locally based, small-scale German farms were not resilient during a time of crisis.

20. **Germany’s return to a steady state was a illusion that led to more dramatic forms of collapse.** Germany suffered from many physiological, psychological, and economic perturbations that led to WWII. During the Second World War, at least 20 million people died from starvation and malnutrition, a number equal to the 19.5 million military deaths. When we consider what resilience means, and what the return to a steady state means, we need to take into account an intergenerational time scale and long-term consequences.



- 21. Quick, decisive and effective international humanitarian action is key to maintaining resilience and food security.** The stories of Belgium and Germany represent a strong contrast in resilience. Hoover's initiatives with the Belgian Relief Committee show that interventions that target the most vulnerable groups, such as children, have the greatest impact on food resilience and security. Again, the biggest lesson of World War I is the necessity of upholding principles of food justice when local food sovereignty and security fails.
- 22. META-QUESTIONS OF THE SESSION. "What were the main lines of risk in the food system?"** For Germany, the main lines of risk for breakdown of the food system include:
- 23. The duration of World War I.**
- 24. Locally-based food production.** The small-scale farms that produced 80% of Germany's food tended to be backward, inefficient, and wallowing in debt. They could not function with a loss of fertilizer and agricultural labor. Gardens were much more productive.
- 25. Failed infrastructure for food distribution.** Before and after the war, high protectionist tariffs removed Germany from international markets. During the war, rural and urban systems for food production and storage proved insufficient. The people experienced a breakdown of transport, social networks, and other food distribution systems.
- 26. Allied diplomacy,** which blocked Hoover's ability to distribute food to Germans during the Armistice.
- 27. "What were the leverage points for reducing the risks in Germany?"**
- 28. Efficient systems of local production and consumption** of nutritionally dense foods that provide sufficient micro and macronutrients, that reduce waste, encourage local knowledge and knowledge of nutritional substitutes.
- 29. A national food strategy** to coordinate local production and distribution and provide nutritional information to the public. This strategy was the first line of risk reduction in the US, France, and Great Britain, but it came two years into the war.
- 30. International co-operation.** When the Belgian and German food systems became severely stressed, and local and national measures failed, it was necessary to import foods from the colonies and countries not directly engaged in warfare to meet the immediate nutritional needs of the people.
- 31. Local food security and resilience is heavily dependent on peace.**

# The Dismantling and Reconstruction of the Food System: Lessons of Food Resilience from Two World Wars

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*Presented by Sasha Adkins and Alesia Maltz*



WWI USDA, <http://www.rare-posters.com/usother.html>



WWII, [www.zazzle.com/vintage\\_victory\\_garden\\_wwii\\_art\\_post\\_cards](http://www.zazzle.com/vintage_victory_garden_wwii_art_post_cards)

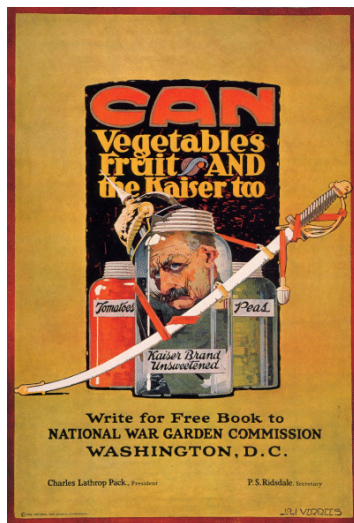


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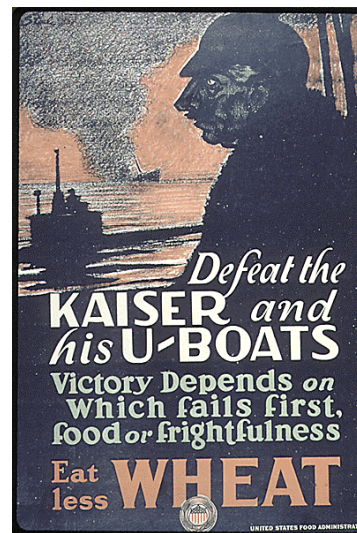


ON HISTORIC GROUND  
Boston Commons was selected with having one of the first demonstration war gardens in the United States in 1918. This shows the quarter-acre section given over to potatoes, with Girl Scouts assisting in the cultivation. The gardens were planted by the Women's City Club, with experts on hand to give instruction and advice to visitors.

War garden on Boston Commons, 1918. <http://sidewalksprouts.wordpress.com/history/vg/>

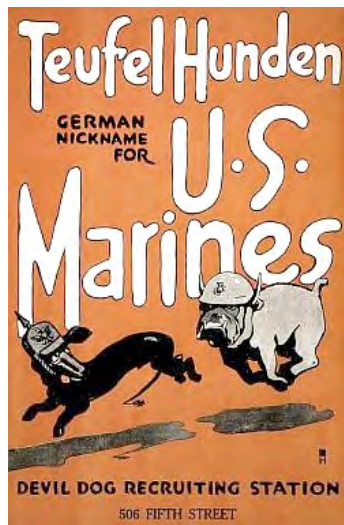


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<http://www.smithsonianmag.com/multimedia/photos/95110939.html?c=y&page=4>



USFA, <http://www.rare-posters.com/usother.html>





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<http://www.ourarchives.wikispaces.net/World+War+I+Posters#Food%20Conservation>

## THEORETICAL DAILY RATIONS

### BRITISH SOLDIER

20 ounces bread	½ ounce salt
1/10 gill lime if	1 pint porter
vegetables not	instead of rum
issued	1/36 ounce
16 ounces flour	pepper
instead of above	4 ounces dried
½ gill rum	fruit instead of
3 ounces cheese	jam
maximum 20	1/20 ounce
ounces tobacco	mustard
5/8 ounces tea	4 ounces
1/3 chocolate –	butter/margarine
optional	8 ounces fresh
4 ounces jam	vegetables or
4 ounces oatmeal	2 ounces dried
instead of bread	vegetables

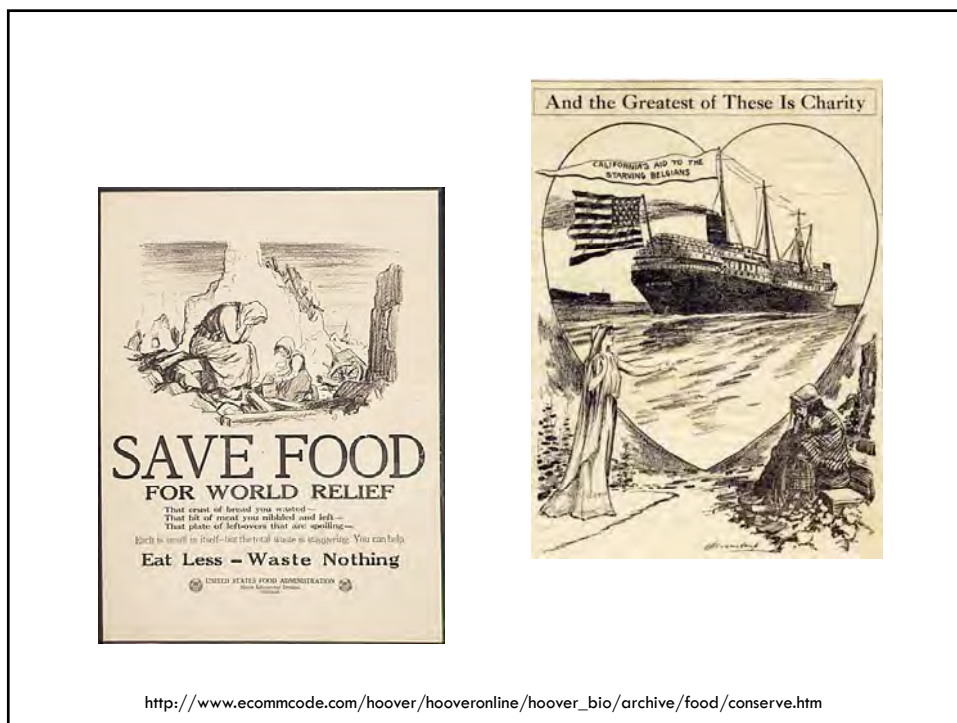
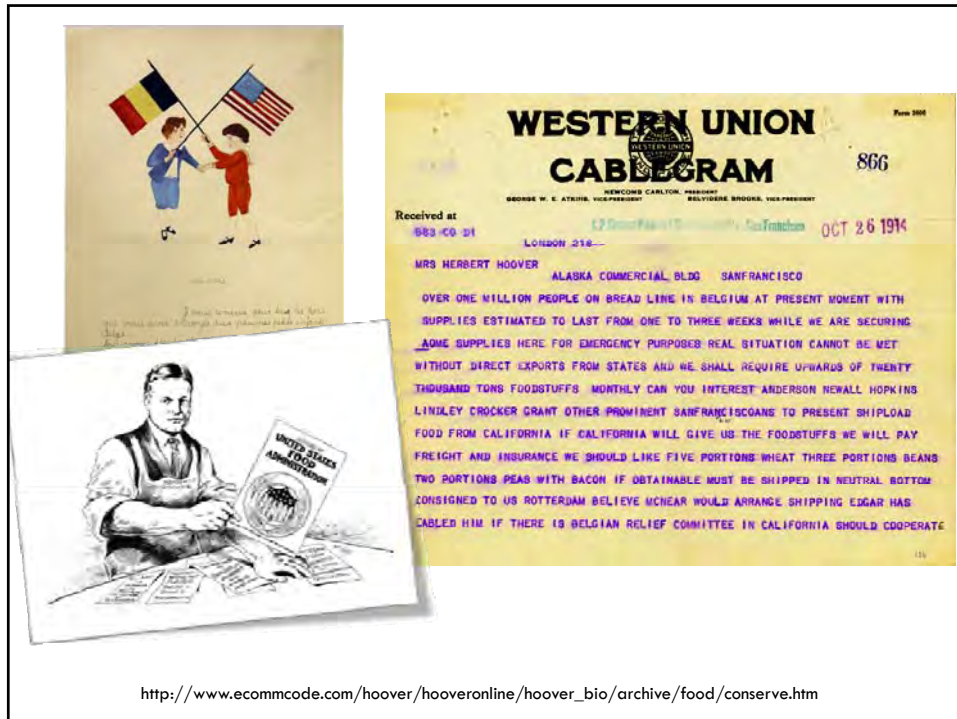
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3 ounces cheese	jam
maximum 20	1/20 ounce
ounces tobacco	mustard
5/8 ounces tea	4 ounces
1/3 chocolate –	butter/margarine
optional	8 ounces fresh
4 ounces jam	vegetables or
4 ounces oatmeal	2 ounces dried
instead of bread	vegetables

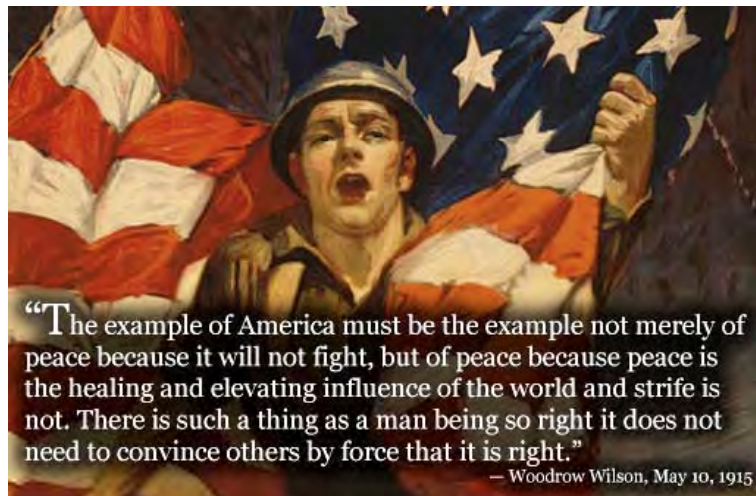
### GERMAN SOLDIER

26 ½ ounces bread or
17 ½ field biscuits or
14 ounces egg biscuit
53 ounces potatoes
4 ½ ounces vegetables
2 ounces dried vegetables





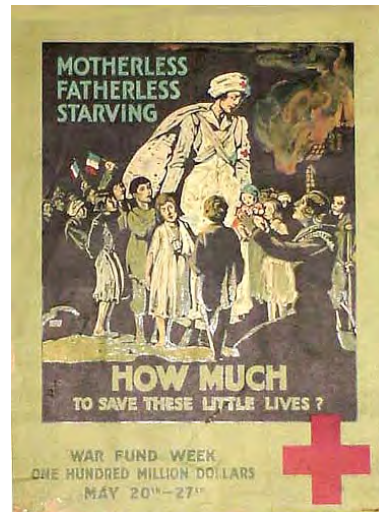
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<http://www.the-forum.com/posters/images/>







<http://www.vintageadbrowser.com/propaganda-ads-1940s/>

## CONCLUSIONS

The process of dismantling and rebuilding the German food system provides many lessons about food system collapse. World War I was a war about food security. The food system became a tool, and casualty, of war. World War II was a direct outgrowth to the collapse of the food system during the previous war. The biggest lesson of World War I is the necessity of acting upon principles of food justice when local food sovereignty fails.

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- Quick, decisive and effective international humanitarian action is key to maintaining resilience and food security.

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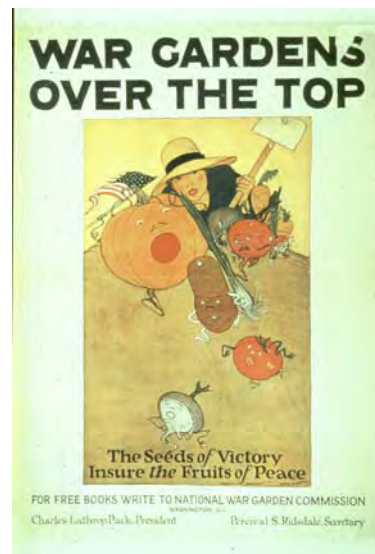
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- A national food strategy
- International co-operation

Food security and resilience is heavily dependent on peace.

**Thank You!**



<http://www.ww1propaganda.com/ww1-poster>

## **Bryan McDonald, “Growing a Global Food System: Agriculture, Environment and Power in America, 1945-1995”**

ABSTRACT. The American food system—a complex network that links farm to fork—underwent substantial changes in the latter half of the twentieth century. The years after 1945 saw unprecedented increases in the productivity of American agriculture and the amount of food available to Americans. These gains helped strengthen the economy and improve health at home while also solidifying America’s power and prominence in global trade and world affairs. But there were also downsides to the strategy. For example, productivity gains led to increased dependence on synthetic chemical inputs and non-renewable resources like fossil fuels as well as not easily renewable resources like topsoil and fossil water. While a cluster of developments in science and technology—from synthetic pesticides and fertilizers to new breeds of plants and animals—were crucial preconditions for changes, equally as important were the efforts by American politicians, scientists and philanthropists to examine how they might explicitly shape the politics of peace and security by linking the nations of the world into a global food system that would promote prosperity and stability. Using changes in the ways food was grown, processed and sold, this paper explores how food was strategically deployed by the U.S. to promote peace and stability at home and around the world. Conversely, food also became a central element of alternative modernization strategies that arose in response to intensification efforts, as Americans sought to craft food systems they felt were more sensitive to goals including social and environmental aims. This paper examines the 20<sup>th</sup> century origins of the increasingly complex global network of food systems and argues that efforts to achieve key 21<sup>st</sup> century food security goals, including maintaining productivity and improving environmental sustainability, will be enhanced through better understanding of the key people and moments in the origins of the global food system.

Food security is not something that comes up much in the modern era. There are a few moments in the 1970s during the world food crisis where presidents and secretaries of state are talking about this issue, but it generally recedes from first-order politics, things that presidents and generals and secretaries of state talk about. It’s handled at a ministerial or technical level. In the last few years that’s changed, and we’ve seen growing interest in this question of food and food systems, not just from consumers but also from policy audiences, driven by things like high rates of hunger and overweight, tainted food episodes, unrest fueled in part by high food prices and high food price volatility, and impact of climate trends on food production.

One of the conclusions that many in the policy community have come away with is that these events mean .... that food is no longer just an issue of concern for agriculture and health officials, but is something that has a direct effect on the national security and national interest of the United States, especially in the next 20-30 years, which is the time horizon for much of our security and intelligence organizations. Food is a major driver of land use and land modification, a major user of water and energy. It is also a major consumer of water. A lot of energy production uses a lot of water, but that water can be returned and reused; much of the water that is used in food production is encapsulated in the food and moved around. Food is also important want and important need for human flourishing.

So today I'm going to talk about three things: I'm going to discuss the challenge of food security in an age of global change, a little bit about how food security now and going forth a little bit different than it has been historically. I'm going to talk about the modern origins of the food system post World War II moving forward, and then examine the challenge of resilience in relation to world food problems.

So, I spoke about how food security, which is this broad idea (there are more than 200 definitions of it, according to FAO) ... the general idea is that people have the food they need to live active and healthy lives. The reason there are over 200 definitions is you get into a lot of debate about what is an active and healthy life, what sort of caloric targets—you can go anywhere from 1,000 to 2,500. Part of it depends on who is the person? Is it a child, is it an agricultural laborer? Sometimes an agricultural laborer can eat as much as 6,000 calories a day and be using that energy. So it's hard to define the kind of unit of analysis, so I'm just going to stay broad with it.

As I mentioned, this is something that is getting a lot of attention in the highest levels of government, and not just in agriculture or health discussions, but we see increasing recognition of links between food and security. Two examples of this: In March of this year, U.S. Director of National Intelligence, James Clapper, told the Senate Select Committee on Intelligence that there were direct links between food and security. His statements were elaborated on in the U.S. intelligence community's worldwide threat assessment for this year, which concluded competition and scarcity involving natural resources, food, water, minerals, and energy are growing security threats. This is the first time the national intelligence council has ever included food and environmental issues in their threat assessment. Normally they talk about things like China and terrorist groups, and so their talk about food and water and energy is a real sign of a sea change, at least putting things on the table.

We also see one of the most difficult challenges now in thinking about food security is the increasingly interactive nature of the world's food, energy, and water systems. This interactivity is something that's led the national intelligence council to identify the food-energy-water nexus as one of the key what they call megatrends that's going to shape the world between now and 2030. Gerry, for instance, in his initial presentation mentioned concern by people in California who are worried about the transition from soy grown outside the state to alfalfa grown in the state. Alfalfa in California is grown everywhere from the desert and the Imperial Valley up to the high mountains of Oregon—a lot of different environments and a lot of ecological conditions. A lot of the people who don't want to see more alfalfa production in California would rather see that water go towards extracting oil and natural gas from the Monterrey shale. So we see not just water should be used for people or golf courses, but water should in essence be traded for energy. So this nexus is one of the challenging things that often what we are really talking about which trade-off, which food or water or energy need that you are going to be buying?

We see in this recognition and interest from the security community that globalization and global environmental change have altered the way that people access food and have given rise

to a vast global grid of food systems. In the U.S. between 10 and 15% of all of our food is imported, 80% of seafood and almost 2/3 of fresh fruits and vegetables. Other countries like Britain, now 80% of its food coming from outside of the country. Gerry mentioned Hawaii. Some places are a lot more worried about this than others.

Also, not to get too philosophical, but it's also worth thinking a little bit about what do we mean as food in this food system? Often in these discussions of food people talk about and have images of food as a thing that's the immediate result of hunting, fishing, gathering, or farming. But what we eat as food—especially industrialized societies, but often in developing nations as well—requires a lot of preparation and processing. In the United States as much as 80% of the food dollar is value added after the thing originates in a crop or a fish. So when we talk about resilient food systems, thinking about things like community gardens misses the whole other aspect of the food processing and preparation chain in thinking about what's involved.

And so we see in the past few decades the emergence of this global network of food systems, which essentially means that nations and people are no longer able to provide the food they need from other people and they are dependent upon other people, other places, other land, other water for the food that they eat every day. As a historian I look into the origins of this global food system because one of the things that surprises people is that we ended up exactly where we wanted to be, which is that people are dependent upon other parts of the world. A lot of people who focus on some of the changes that have been going on in our food system—people like Michael Pollan, for instance, if you've seen the film *Food, Inc...* The first words you hear in that film are Michael Pollan saying, "The way we eat has changed more in the last 50 years than in the last 10,000." Every time you get a bunch of historians into a room and ask them where something started or stopped, you get all sorts of opinions. So I'll say my opinion is that that may be true if you look at the rate of change, but a lot of the preconditions for these changes have been going on since at least the mid 19<sup>th</sup> century. These are things like new energy sources; coal and oil gave us tremendous ability to do work, to move things. This is especially true for oil, because the oil went through a remarkable period ... if you look at the orange line, this is historical crude oil prices from 1860 to the present in 2009 dollars. There's this remarkable century from 1876 to the early 1970s where oil prices are pretty low but so too is oil price volatility. And when we're looking at conflict and violence, it's often not prices that matter, but volatility. If a price is going up steadily year after year, people can adapt to it. But if prices double or triple in the space of a couple years, it's very hard for societies to respond.

So energy, changes in transportation, things like creation of the Erie Canal and the completion on the transcontinental railroad, completely transformed in relatively short periods of time who was growing what, where, and why. New technology—Cyrus McCormick's mechanical reaper, John Deere's steel plow, but also things like self-sealing Mason jars which gave people an ability to preserve food with a reasonable chance that it was going to provide you nutrition and not botulism, which was always a kind of fun game of Russian roulette when you open something.

And the rise of large food corporations happens. The first supermarket starts in 1869, AMPT Company. As soon as the transcontinental railroad is completed they start shipping tea across the United States on trains and then they start setting up shops. So when you talk about the decline of local food shops and the rise of large brands, it's not the 1950s, it's the 1870s, 1880s that Quaker Oats has a train going around the country giving away free samples of Quaker oats. Also, companies like Heinz pioneered the idea of inviting people into your factory to see how clean, how respectful the production was, and things like the National Biscuit Company's Uneeda Biscuit, a national biscuit company, got rid of the cracker barrel and provided people boxed food.

And so what we see is a lot of these changes were going on. There wasn't a lot of intentionality to them, there wasn't a lot of policy designed to explicitly do much more than encourage American farmers to be good, to be smart, to go to college, to use technology, to do these things. After World War II, we see major shifts in food production and consumption to allow the U.S. to deploy food as an element of national power. It wasn't often talked about this way, people talked a lot about using food, and there was this assumption that agriculture would provide. And what happened is that agriculture did. The years after 1950 saw unprecedented increases in the productivity of American agriculture, driven by the earlier changes I talked about and also things like the creation of land grant institutions, extension services, but also rapid changes in machinery, in electrification, in plant and animal breeding, in the development of chemicals and medicines.

And just to give a couple of examples:

Efficiency gains in labor input. In 1900 it took you 147 hours of human labor to grow 100 bushels of corn. By 1990 that was down to 3. The same decline, 147 hours for 100 bushels of wheat, also declines down to 6. In terms of yields per acre, corn went from about 25 bushels an acre in 1900 to 120 bushels an acre by 2000. So tremendous gains in the productivity of the agricultural system. Lots of things that went along with this—shift from small farms to larger farms, from less intensive agriculture to more intensive agriculture—but again, the design of the system to be more productive it was doing exactly what it was supposed to do.

So we see though this tremendous change going on in agriculture, but not a lot of conversation about what sort of food system America ought to have. In contrast, if you look at things like security and what sort of security policy should the U.S. have, there are great debates happening in newspapers, in Congress, and in major journals like *Foreign Affairs*. We get major acts of Congress; the National Security Act in 1947 sort of starts off this process. The Goldwater-Nichols Department of Defense Reorganization Act of 1986 which reshapes the armed forces and the security community to deal with the legacy and issues that came out of Vietnam. So big conversations about security, not a lot of conversations about food. Maybe you get a little bit about food every 5 years in this thing called the Farm Bill, but that's usually about who is going to get what payout. And you get a lot of things going on at what Ulrich Beck calls the sub-political level: nutritional standards, labelling, what's organic, what's not organic, what's a natural food, what's low salt, those sorts of things. Not big conversations. We have

every 4 years a president's national security strategy. We have never had a national food strategy articulated.

So how does this come back to our topic today of resilience? And we see that moving into the 21<sup>st</sup> century, food really is seen in the mid-1990s as kind of a solved problem. If you're worried about world hunger, the set of solutions that people have in place seem to be working. The data points are going down. FAO really starts collecting data using the same methodology from about 2008 going back to the 1960s. So 1995-1997 it seems like wait a couple more decades and everybody will have enough food to eat.

Now we look back and we see that the rates of hunger in the world during the food crisis in 2008-2009, it was estimated that at least 1 in every 6 people in the world didn't have enough to eat. So no longer can we talk about food as a solved problem. Not just talking about hunger—are people getting enough calories—but there's also issues of are people getting the nutrients and the minerals they need to lead an active and healthy life. This is especially key for children in the first 1,000 days of development; it's especially key for women who are pregnant and with the maternal death rate, and things of that sort. So it's not just caloric targets, it's what people are eating. And there's also this issue where we have the highest number of people in the world in human history who are hungry, but also the highest number of people in human history who are overweight or obese.

So, difficult to look at this food system and think that it's doing its job and we can just be confident that the problems will get solved. In addition to the old challenges—who's hungry and why—we get all these new challenges, trends others have talked about so I won't get into them because of the time—world population growing, 7 billion last year up to maybe 11 billion by the turn of the century; people are getting older, wealthier; they want more processed foods, they want more dairy, they want more meat. Rising costs for inputs; we've heard a lot of conversation about food prices, but fertilizer prices have been going through the roof as well. So inputs becoming more expensive, greater competition for food, water and energy.

In addition to these challenges we can group things into two big sets: systemic problems—threats, vulnerabilities in the system based upon how it's been designed. We can think about the kind of growing litany of what's the big food safety problem right now. In the last years it's been spinach, pet food, peanut butter, half a billion shell eggs, frozen berries, if you're following the latest food recall. We also get the problem of deliberate attacks. In 1984, a local religious cult in Oregon got into a land zoning dispute with the board of supervisors and they decided to use a bio-weapons attack on salad bars in the town to make people sick on the day of the election so that they could get their candidates elected and get their zoning approval. Deliberate attacks—war, terror, crime, maybe profit. Lots of ways you can make a lot of money using bio-weapons attacks on the food system.

So we get into this idea of resilience, which is just a way of thinking about what Andrew Zollie and Ann Marie Healy talk about as an intentional stance of strategic looseness. It's kind of a hard thing to define. At times it makes sense to have a system that can couple with other

systems but can also decouple when you need to, that can be modular. It functions well with other systems, but it can break off and also function on its own. So it's very difficult to talk about at a general level, which is one of the things about looking at the context, to think about resilience which has the key challenge of allowing us to look at high-impact hard to predict events. We have a lot of ways of thinking about risk analysis, about things like car crashes. We have a huge record of data, we have some sense of a normal probability of occurrence. We can make a lot of predictions about things that make people safer in car crashes—seatbelts, air bags, structural improvements in certain places.

Resilience offers a good way to think about two real challenges: One is what happens if you have things that aren't in the historical record? Maybe it's an asteroid impact, maybe it's a big volcano eruption, something that you can't go back and look at the data set. The other challenge is that the adverse event that we may be worried about may not be *a* thing, it may be a set of events converging that have cascading effects. You have a bad winter storm, an influenza pandemic, those two things together create a crisis. So rather than having a plan to try and develop for every eventuality, resilience offers a way to think through some of the changes that have been going on and some of the intentionality we'd like to put in the food system to deal with changes in the future.

# Resilience and World Food Problems



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**Food security**

**Origins of the food system**

**Resilience**

# **FOOD SECURITY in an AGE of GLOBAL CHANGE**

# Food Security

All people have the food  
they need to lead active  
and healthy lives

# Food and Security





# Food, Water, Energy Nexus







# What is Food?







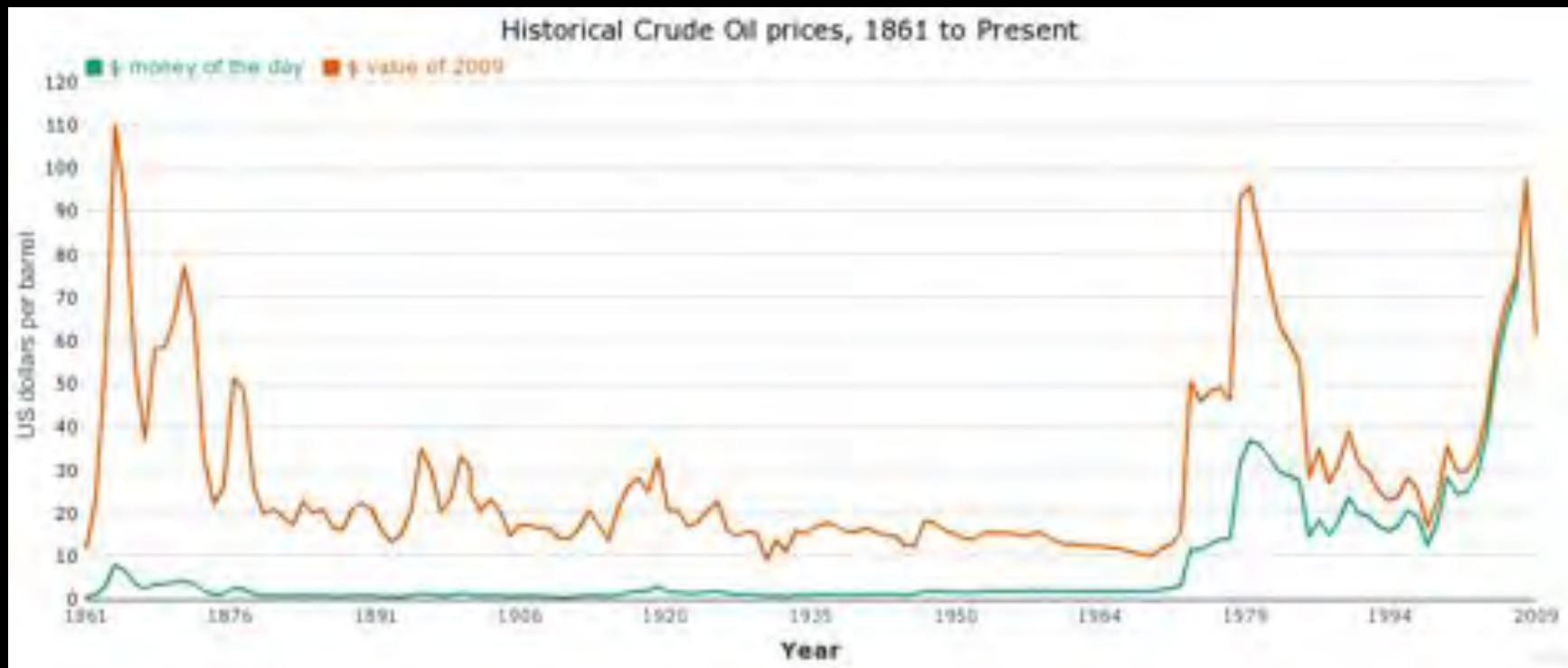
This document is a record of the food resilience sessions at the Association for Environmental Studies and Sciences Annual Conference, Pittsburgh, June 22-26, 2013.

# **ORIGINS of the GLOBAL FOOD SYSTEM**

# Origins and Changes

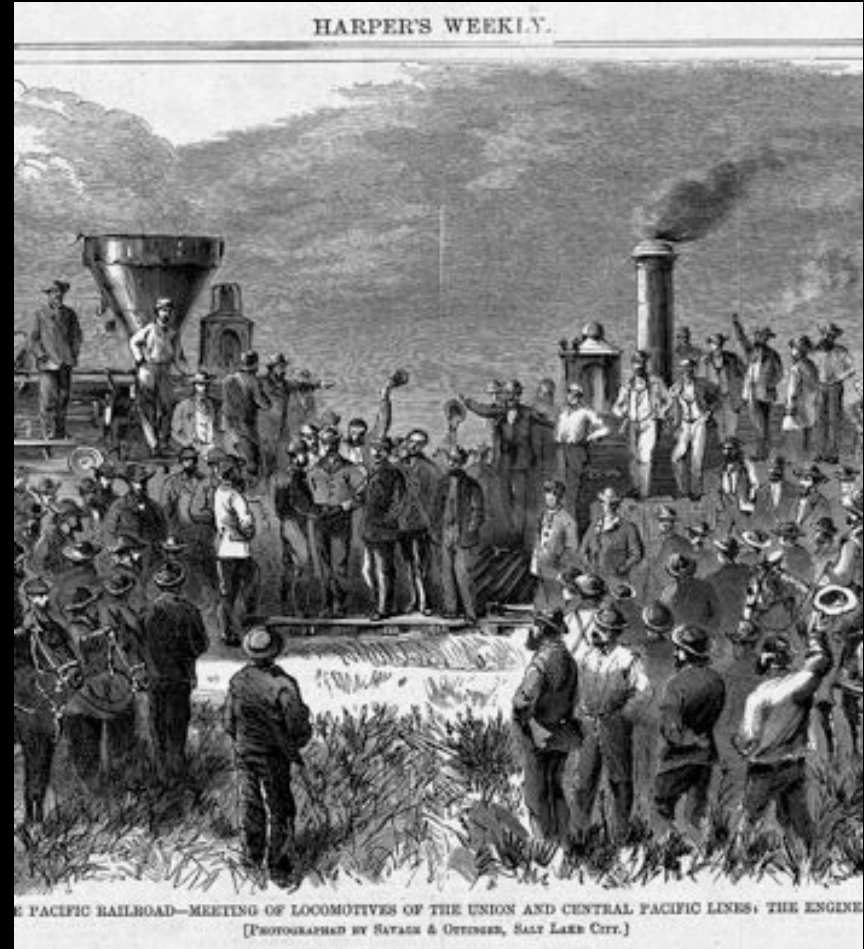
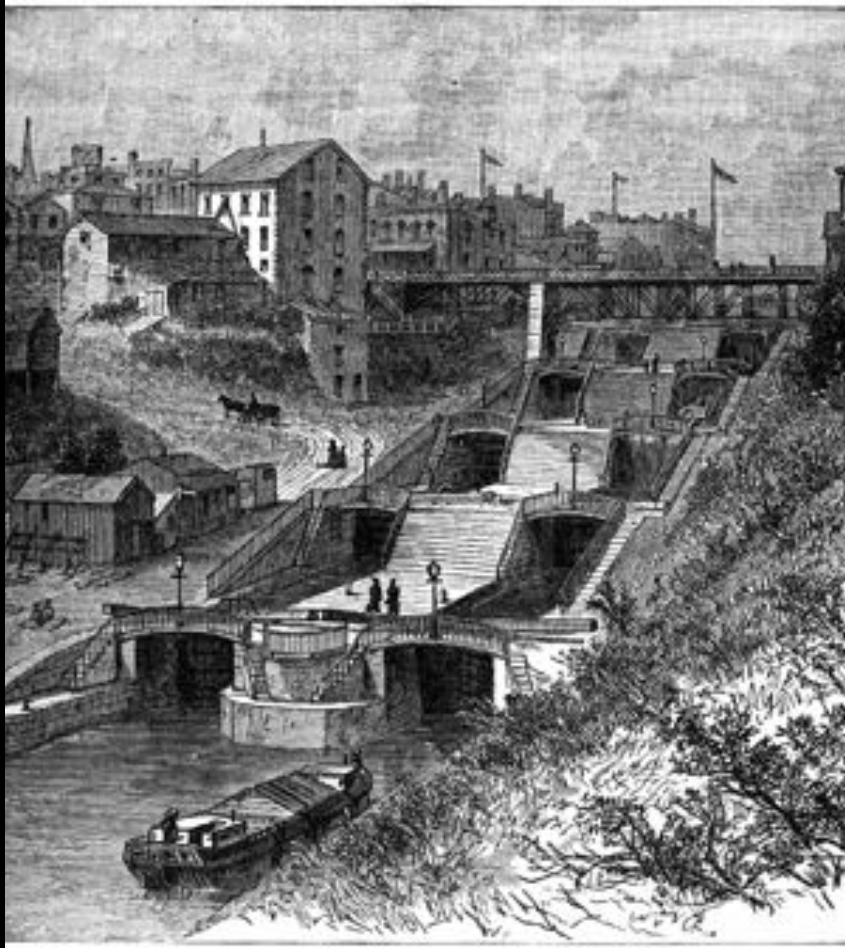


# Energy

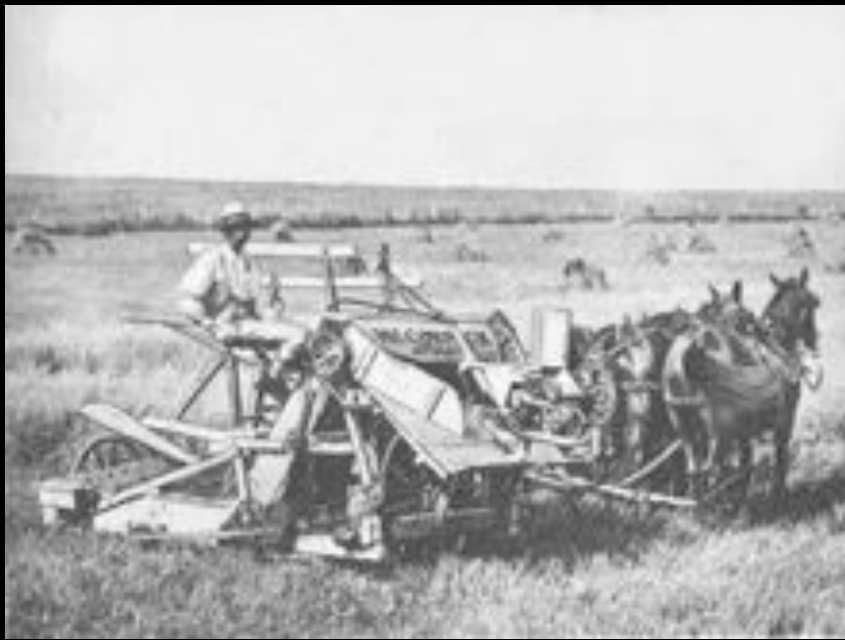




# Transportation



# Technology



**Can Your Peaches This Year in the Better, Easier Way**

**P**ARE peaches and put into jars. For each pint jar take half a cup of water and a cup of sugar. Make a syrup of the sugar and water, and fill the jars full. Fasten the covers loosely and set in a "Wear-Ever" Roaster—filling the lower half with water. Cover and let come to a boil. Steam about ten minutes.

Take out the jars one at a time and fill each to the top with the boiling syrup, and seal. You will have peaches, perfect in shape and color—and with less work and fuel, if you use the

**"Wear-Ever"**  
Aluminum Roaster

Pears, plums, pineapples — all can be "put up" in the same easy way. In this same Roaster you can steam vegetables, you can roast meat without basting, you can bake fish in the oven, you can bake apples or potatoes on top of the stove, you can use it for a bread



box. It is the pan you use every day the year around.

The enormous pressure of rolling mill and stamping machines makes the metal in "Wear-Ever" utensils dense, hard and smooth. They give enduring satisfaction—cannot chip or rust—are pure and safe.

Replace utensils that wear out  
With utensils that "Wear-Ever"

If "Wear-Ever" utensils are not available at your dealer's mail us 12 round stamps and we will send you a one-ounce "Wear-Ever" Stamping—stamps to be returned if you are not satisfied. Send today for booklet, "Canning and Preserving"—contains everything you should know about putting up fruits and vegetables.

The Aluminum Cooking Utensil Co.  
Dept. 300 New Kensington, Pa.  
or Hamilton Aluminum Co., Ltd., Toronto, Ontario  
Send one, please! a 1-oz. "Wear-Ever" Stamp, for which  
enclose 12c in stamps or its equivalent if 12c are not mailed.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Your mailing name  
(if different from above) \_\_\_\_\_



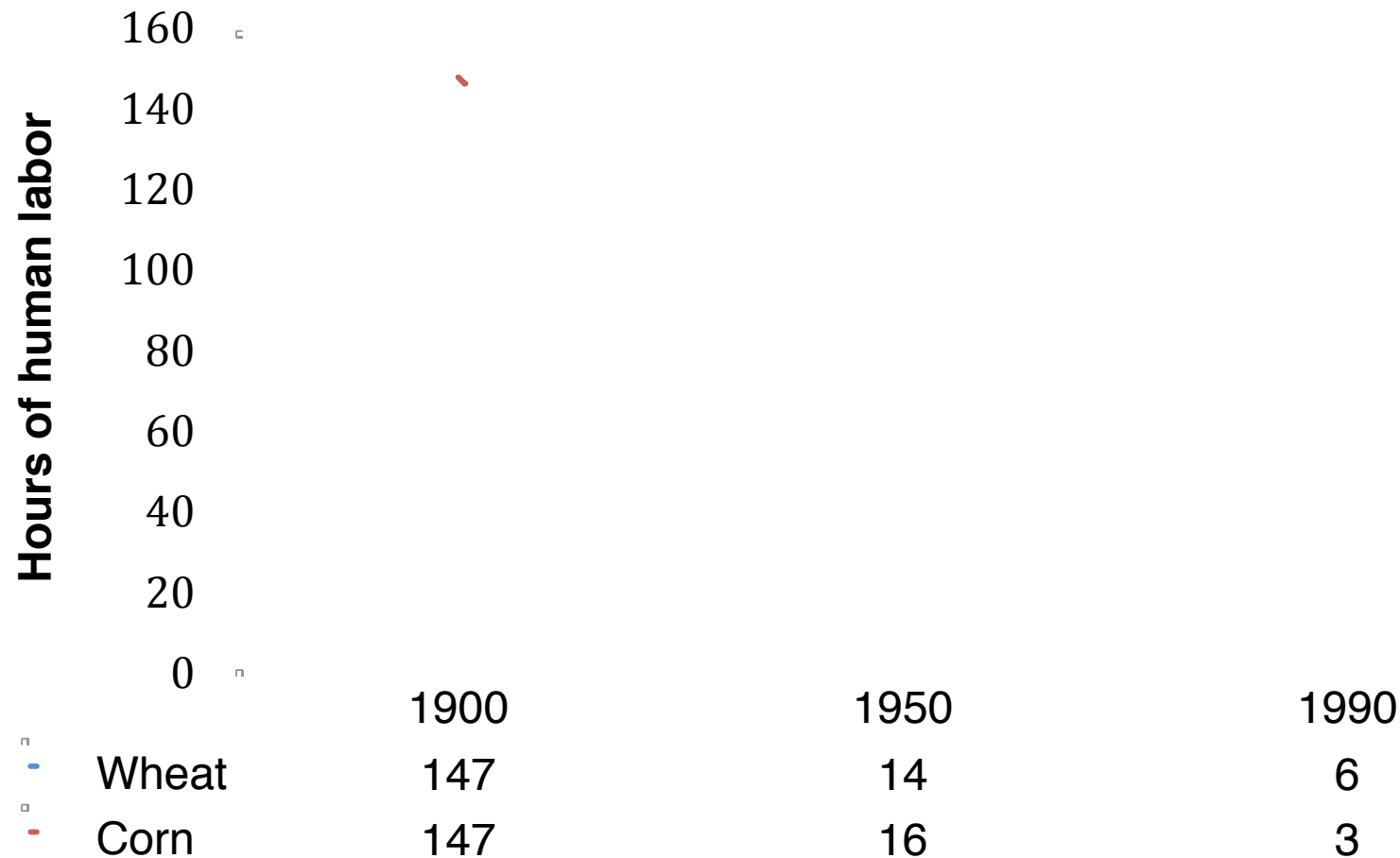




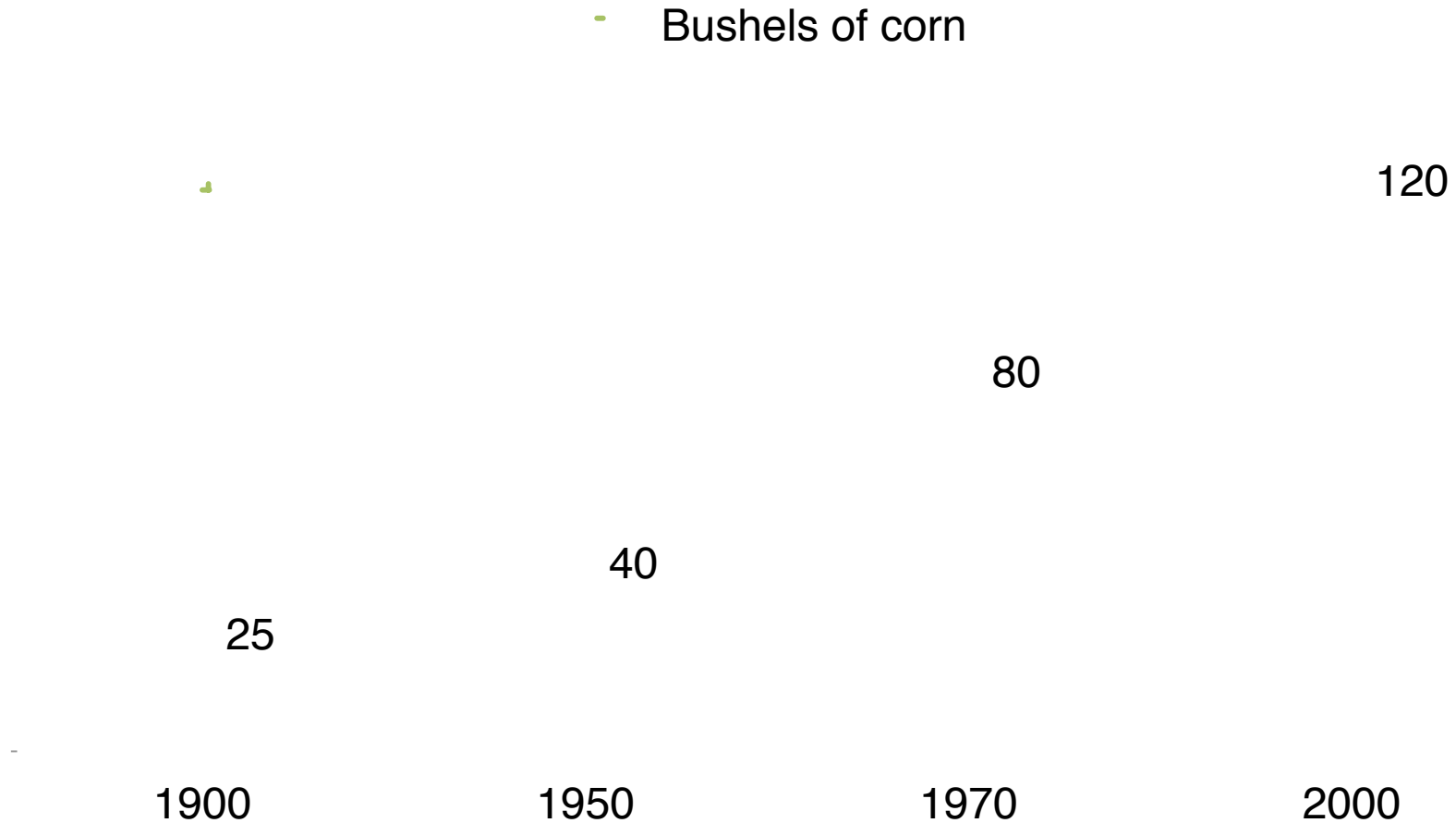




# Hours of human labor needed to grow 100 bushels of...



# Yield Per Acre



# What Food System?



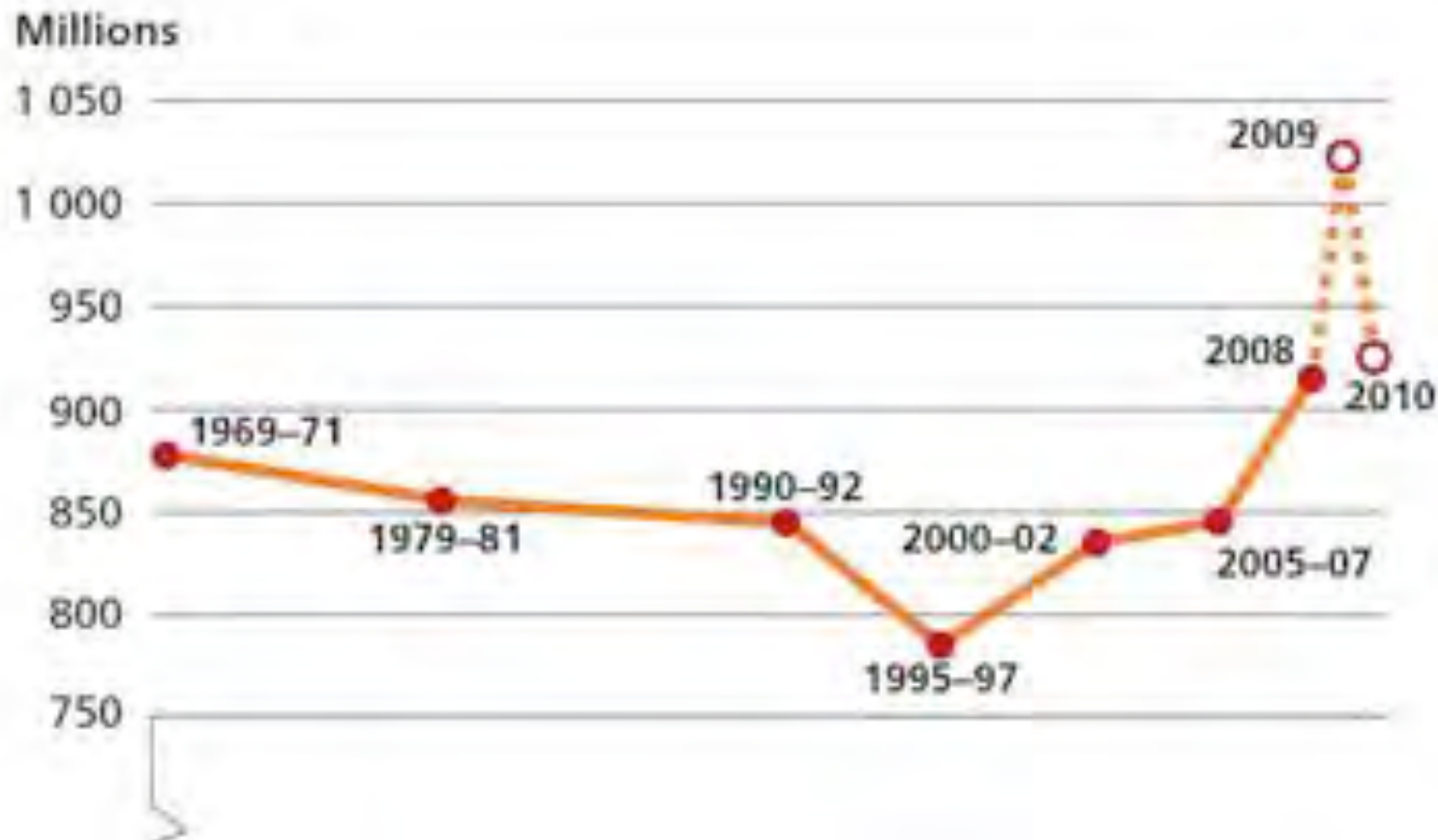
# **RESILIENCE and WORLD FOOD PROBLEMS**



Food and Agriculture  
Organization of the  
United Nations

Economic and Social Development Department

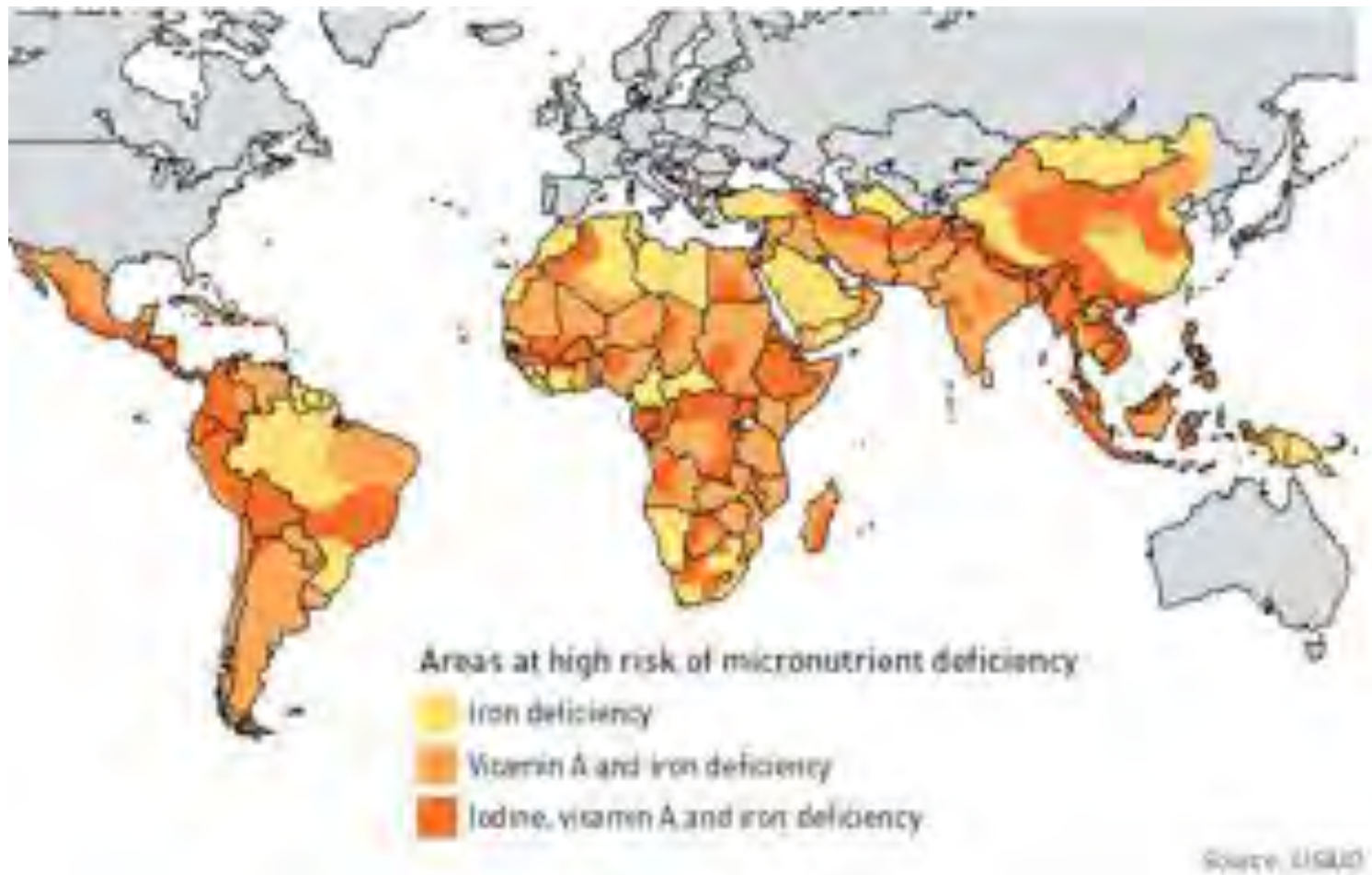
# Trends in world hunger



The State of  
Food Insecurity  
in the World



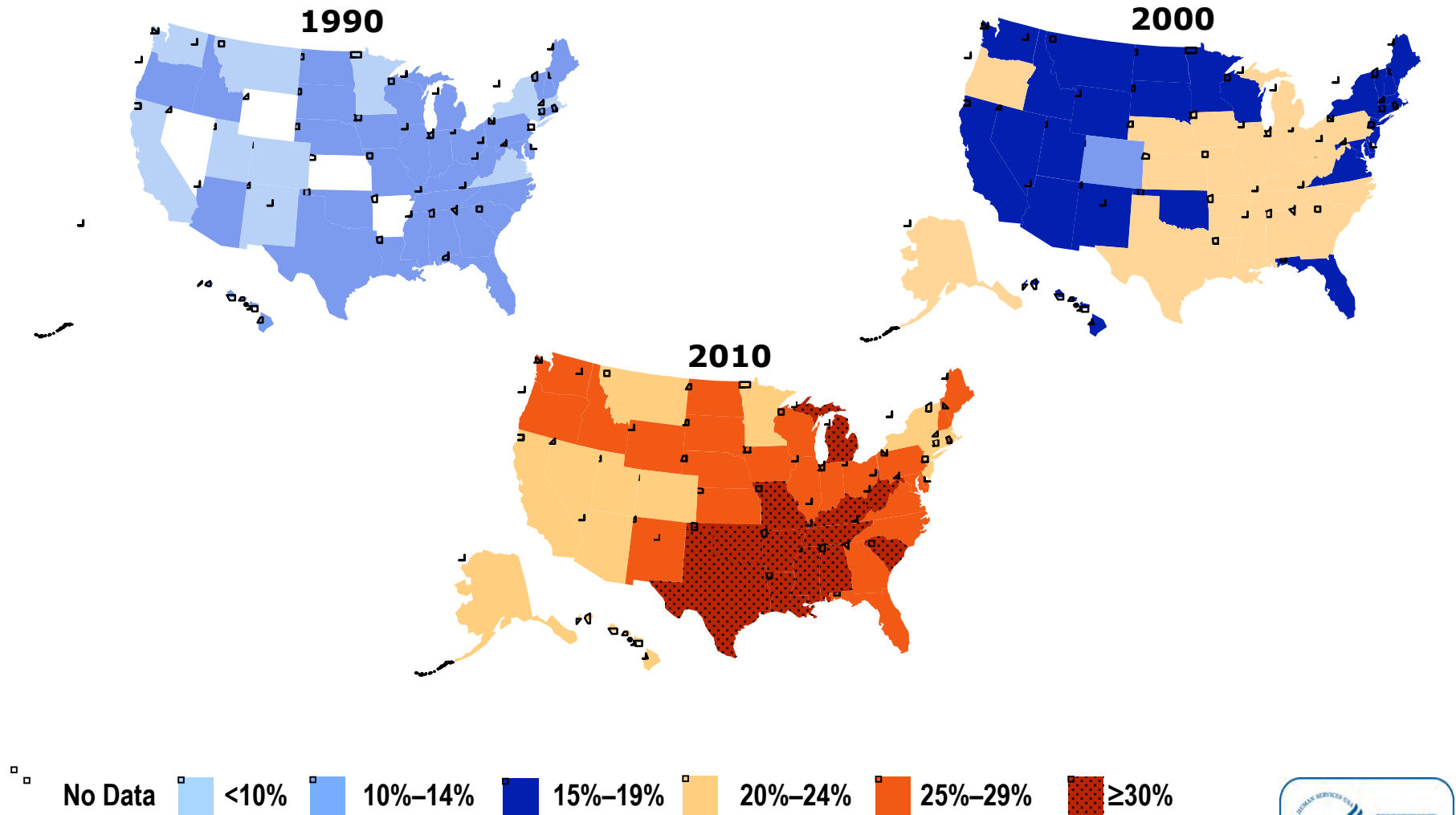
# Micronutrient Deficiency



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1990, 2000, 2010

(\*BMI  $\geq 30$ , or about 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.







# **Systemic Problems**

# **Deliberate Attacks**





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# Resilience

The ability of a system to absorb shocks, as well as its capability to recover from, or actually become stronger as a result of, adverse events





# **Shared vulnerability**

# **Risk assessment**

# Strategic Looseness









## Peter Jacques, “Global Fishery Collapse: Theory and Potential Variables”

**ABSTRACT.** Around the world fisheries are being stressed through a host of disturbances, not least of which is fishing, which substantially increased in the post-war period compared to prior human experience through history. Single-species stocks have collapsed in the past, but is it possible, even if improbable, that there could be a systematic collapse of *global* fisheries? The first part of this paper asks whether or not global fisheries could be described accurately as a panarchy of subsidiary adaptive systems in which global fisheries the highest level and scale, or if fisheries are disparate populations that cannot accurately be described as making up a coherent system through a series of tele-connections and interdependencies. If global fisheries can be described as the highest scale in fishery systems, then we should be able to analyze the potential of global collapse according to the adaptive cycle. If we cannot show the mechanisms and relationships that would indicate a global system, what would be highest level in fishery systems and what are the conditions of these varied levels? To advance thinking in these terms, the paper analyzes relevant variables, such as habitat changes in the World Ocean System, important to global fisheries to get an indication of directions, as well as historical collapses to understand and potentially build a social-ecological model of global fishery collapse. While US food security does not hinge on the health of global fisheries, fisheries are additive to the portfolio of foods that US consumers rely upon, particularly for protein and micro-nutrients.

Most Americans do not get their calories from fisheries, but we have to think about fisheries in a global sense because fisheries exist in a global economic system at this point, import and export. So my question is, can we think of the world’s fisheries—all of them—as a system, as an integrated panarchy? This is coming from the Resilience Alliance research where we start to think of nested adaptive cycles of fisheries. But can we think of world fisheries in this way? Certainly we’ve had specific fisheries that look like they go through an adaptive cycle—that is, they go through development, collapse, reorganization, conservation. In other words, we’ve had local fisheries that look like this kind of issue, but can we think of the world’s fisheries in a totally integrated ... or at least integrated enough that we would look toward the future of global fishery collapse?

So why would we want to do this? Well, because if this is the case, if it’s possible to think of the world’s fisheries as an integrated system, then it’s possible these integrated systems can be set up as a global class, not just a local one. There are specific challenges to making this case. First of all, there are so many uncertainties with just even local fish populations, it’s ridiculous. It is now a truism that counting fish is like counting trees except they move and you can’t see them. It’s tough even just getting an understanding of what one fish population looks like, let alone what they look like in terms of food webs, the water columns in which they live in, the currents that they’re following, etc. What are the connections between any one variable and any others? And what’s the sensitivity between the changes between different variables? We don’t have a lot of really good ... we don’t have a good sense of that.

Also this quote here: An important consideration is that laws and principles relevant to any given scale might not be the same at any other scales. So, even if we connect different local

scales to a global scale, we don't really know how those dynamics really work. One thing might work at a local level, but it might not translate to a global level. So there are challenges here to make this case.

In case you're not familiar, this is C.S. Holling's metaphor for the adaptive cycle, where we have different phases of r-phase "exploitation" growth. This fits so well with fisheries. For local fisheries this is almost a perfect metaphor. So you can think of the development of a fishery as the growth phase. You put the hooks in the water, and the first hooks pay off really well. And as you start to industrialize these fisheries, it starts to pay off even more. But at some point there's going to be a plateau of how well those hooks deliver fish. And if global fisheries are an adaptive cycle as a larger panarchy, as a nest of these adaptive cycles, then we would hypothesize here—so we're building a theory of, would we expect a plateau at some point where the Resilience Alliance folks call thresholds or break points, where there is rapid change and no going back.

These are the different cycles, the growth through the r, readily available resources that allow for accumulation of structure and high resilience, "conservation" the K phase where growth slows and the system is more and more interconnected, and that interconnection builds both solutions—say, on a human scale—as well as dependencies. So the connectivity becomes at some point a vulnerability. But at this point you are developing interconnections, become less flexible, and as that flexibility declines we become more vulnerable to external fluctuations and disturbances.

The "back loop" of Holling says this is the essence of sustainability. The back loop of the adaptive cycle, the "release" for the omega phase of bound-up resources occurs as a result of these disturbances and the accumulated structure, that complexity, collapses. And then, if you have enough energy and material in the system, then you can reorganize. If you've gone through a state change, though, it won't look like the original adaptive cycle, it will be something different.

My question is about fisheries, so ... This is from the last SOFIA report 2012 *State of the World* fisheries and aquaculture. So for better or for worse I'm going to take this out of the equation, so we're just going to look at the wild catch, instead of the aquaculture. So where is this curve going? In 1950 we start to take global data from world fisheries. And you see really big growth here in the beginning. You start to see a really important period for industrializing fisheries and 1980s, 1990s essentially Asia comes online with industrializing fisheries, getting loans from the Asian Development Bank for putting more fleets in the water.

My question is, where is this curve going? And I think you can think of this in three different ways: It can stay where it's at, it can keep going flat; it can go up; or it can go down. And so theoretically we want to ask what are the different indicators of where that curve will go? All of this hinges on whether or not we can call this a panarchy, a global panarchy. This would be part of the conceptualization of this, so you have global scale, maybe this is the cod population off of Newfoundland, and does that cod population fit within the larger regional system, maybe

a large marine ecosystem (LME). And now the big question is “Can that LME connect to a global situation?” Or is it limited to different oceanic basins. Maybe we can’t call it a global panarchy. Maybe we can call it the Pacific panarchy, or the Indian Ocean. So maybe there’s that level of systemic connection. I think there’s some mystery into how well we can answer that question.

Do different scales change at different time periods? So we can see really fast changes in the cod population in the 1990s over the course of maybe a year or two for Newfoundland, where it goes through a classic collapse. But changes as you go up in scale are going to take longer. I think this is pretty common at this point in our studies, at least in our field. So as you get bigger, if we have a global panarchy, we would expect these changes to be rapid at this point, but rapid in the context of a global system. So maybe instead of one year, you might see changes that would look rapid in the context of over a decade. So theoretically if I’m right in proposing this, you might see a global panarchy collapse of fisheries that would occur over a decadal scale.

If Holling is right, when a level in the panarchy enters its omega phase of creative destruction, the collapse can cascade to the next larger and lower level by triggering a crisis, so that that cod can potentially then change the way in which the food web works at the regional level. And we did see some of that change, so for example, one hypothetical reason why lobster is doing so well is because cod eats lobster larvae. Although I’m not sure how regional the lobster fishery is. But such an event is most likely if this lower level is at its K phase because at this point that next system is also more vulnerable to collapse. So the larger system, if it’s been pushed, and it’s ready to tear, then it would be hypothetically more vulnerable than if it was just kind of growing, right?

It turns out that there is reason to believe that we can think of this as a ... there is plausible reasoning to believe that we can think of the global fishery panarchy. Garcia and Charles have already done this work. And they actually detail where they think the system is. So a long-term evolution of world fisheries might be described using the cross-loop figure eight model. And specifically they describe the stages of R as being industrial fishing starting in 1900-1945, and then development through 1945-1960, and a steep expansion to 1985. And they believe that we are entering this global fisheries crisis that has been building up this entire century, indicating that world fisheries entered into the stages of the K phase.

Now, the resilience factor is dependent on how long that back loop is. So if we go back to that figure 8 ... so if we’re going here and we’re in that plateau period of the K phase, how long that is depends on the different factors that will add resilience to it or push it further. So for example, we know that diverse fish populations add strength to the system. We know that habitat is important, etc.? So those variables appear to be what we might be thinking of in terms of how or where can we start to solve if this as a potential problem. So the main line of reducing risk would be to increase that length of the K phase, maybe even back off of it if you possibly can. Whether or not that’s possible is questionable even at the theoretical level. So

we know that the length of the K phase will be determined by the potential and the connectedness in this cycle.

And one of the things that becomes a main line of weakness in this system is the complexity of the fishing industry, the fishing system itself. It's gone through multiple changes through the last 50 years and has become much more complicated. So if you land an Atlantic bluefin tuna, it's a happy day, because there's going to be someone in New York City, who's from Tokyo, who's going to drive up with an ice-filled casket to the dock and buy it for 10, 30, 40 thousand dollars in cash, drive straight back to New York City that day, fly it to Tokyo, just so it's cut. And then the little bits of that tuna, they go all over the place. Another way of thinking about that complexity is if we want to back off fishing. Well, think of the dependencies of the fishers and the payments of the boats. The flexibility to be able to change is notoriously difficult in fisheries.

Early warning signs? We have to have a sense of how the threshold points are unpredictable. We don't know how to get them, but we do have early warning sign research that actually is done in fisheries, freshwater fisheries. Carpenter et al. essentially took one experimental pond and left it alone, took another experimental pond and introduced predators. We know that predators are an important variable in the vulnerability of the system. So it looks like some of the important variables that we can think of that will indicate the length of that K phase will be the trophic chains, the predators at the top of the system which control top-down, water quality characteristics. and the nature of the fishing.

So what are the directions that we can take? If we can't precisely figure out all this stuff because of deep uncertainty, what are the directions of these things? Where are the different variables going? Stepping back and taking a look at how depleted are predators. Myers and Worm, in an important but disputed study, 90% of the predator biomass has been removed from the ocean at this point. Really good work done by John Sibert and others, John Hampton, also Tom Polacheck. This particular study used catch effort data and it is important understand that it's a flawed way of going about it. You can't really use catch data to understand the biomass and population in this way. Sibert and others argue that many top ocean predators are actually at a reasonable maximum sustained yield. Their argument is—and according also to Ray Hilborn – that we have the biomass exactly to a large extent what we would want, because it's a policy we designed. So maximum sustained yield we would expect. So for example, one study, Sibert says some of the predators in the Indian Ocean, I think, or maybe it's the Pacific, are between 36 and 75 percent of non-harvestable biomass.

But what if we don't use catch data? Jackson and Blanchard report, where we don't use catch data, we use more of a theoretical method from macroecology that indicates large fisheries has huge amounts of biomass removed from the ocean, according to that method. This jives with the more extreme case of Myers and Worm.

Resilience here would have to do with the interaction strength, so to eliminate more apex predators intensifies the trophic interactions and diversity is able to diffuse those. Water

column – it's warming. What is the direction where the variable is going.? One is that we've infused enormous amounts of heat into the ocean where marine systems are undergoing abrupt shifts of unwanted stable states, in part because most of the heat from warming has entered the ocean. That's how much energy has been put into the ocean according to Levitus. pH change. This has been the sleeper. pH change is going down faster than at any other time in 300 million years. Nitrogen creating over 400 dead zones. Fish just can't live there, especially if they're affecting nurseries.

Fishing changes itself—global catch per unit effort is 50% of what it was in 1950. What I mean by that is for every hook you put into the ocean in 1950, you come up with half of what you do now. I mean, now you come up with half of what you did in 1950. The main drivers are ... fishing is the main driver for large marine ecosystems, and we have been anthropic degradation is "profound" according to Strong and Frank. Today most fish and invertebrate stocks are severely depleted globally, and one half to two thirds of global wetlands and seagrass beds are also lost. Of 80 fish species surveyed in a particular article of '91 are depleted. 31% are rare and 7% extinct. So the signs here are that directions are going towards more and more stress.

What happens if we do start to see a transition in that K phase? It's not likely that we'll come out of that with a more rich and abundant ocean.

The global fishery can plausibly be described as panarchy, as a global panarchy. It's possible that global fisheries are in the K phase and the distance between the K and collapse are likely to turn on potential of key variables that don't look very good.

## “Global Fishery Collapse: Theory and Potential Variables”

**Conference Draft, do not cite or distribute**

Peter J. Jacques

Department of Political Science  
University of Central Florida

## Research Question



- Are the ensemble of the world's fisheries a system of nested panarchy?

## Why?

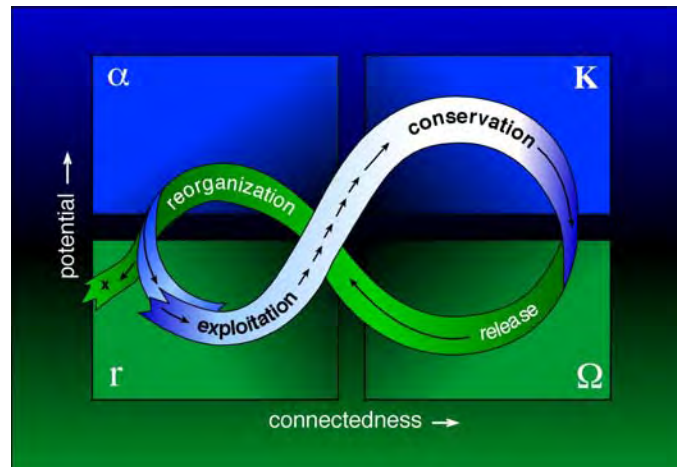


- Panarchy is a hierarchical, interconnected system of adaptive cycles, and if the world fisheries are a panarchy, then there is adequate theory for a global fishery collapse.

## challenges

- “An important consideration is that laws and principles relevant at a given scale might not be predictable solely from those observed at lower or higher scales (e.g. systems may not be fractal)” (Garcia and Charles 2007, 582)
- Tele-connections between any one variable and another have varied sensitivity
- Deep uncertainties are more dominant than what we think we know

## Adaptive Cycle



Citation: Gunderson and Hollings (2002) *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington D.C., Island Press. Used with permission.

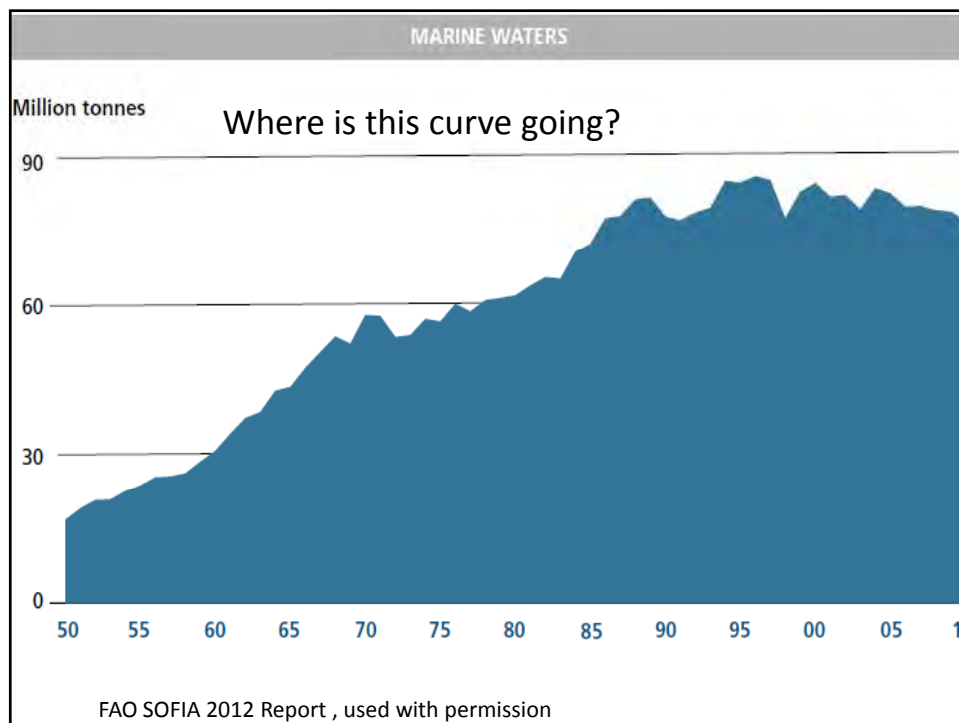
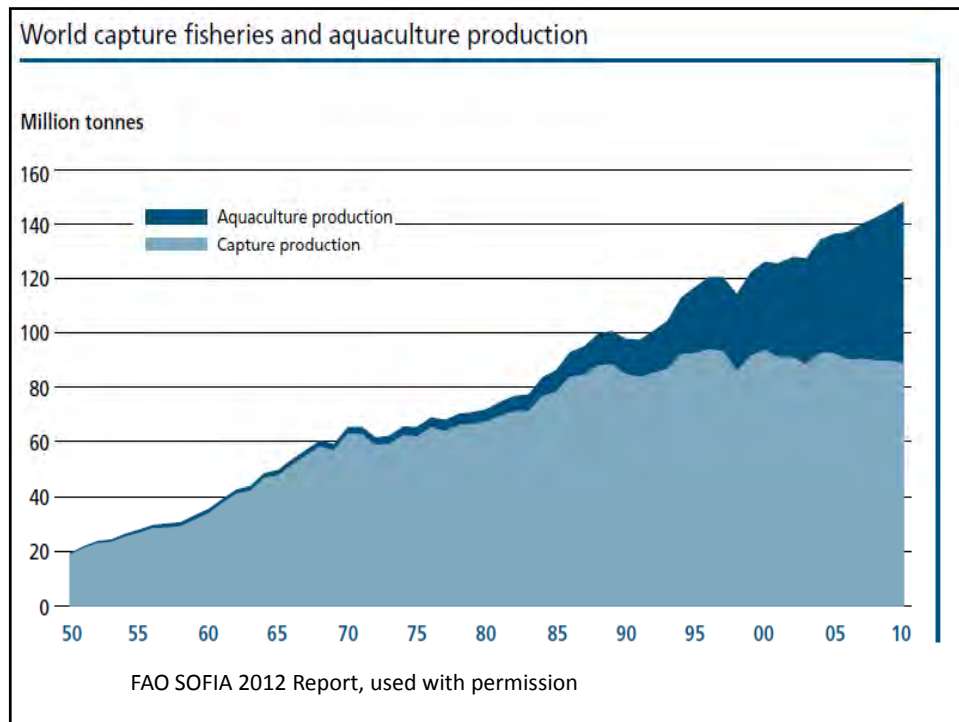
### The Fore Loop of the Adaptive Cycle:

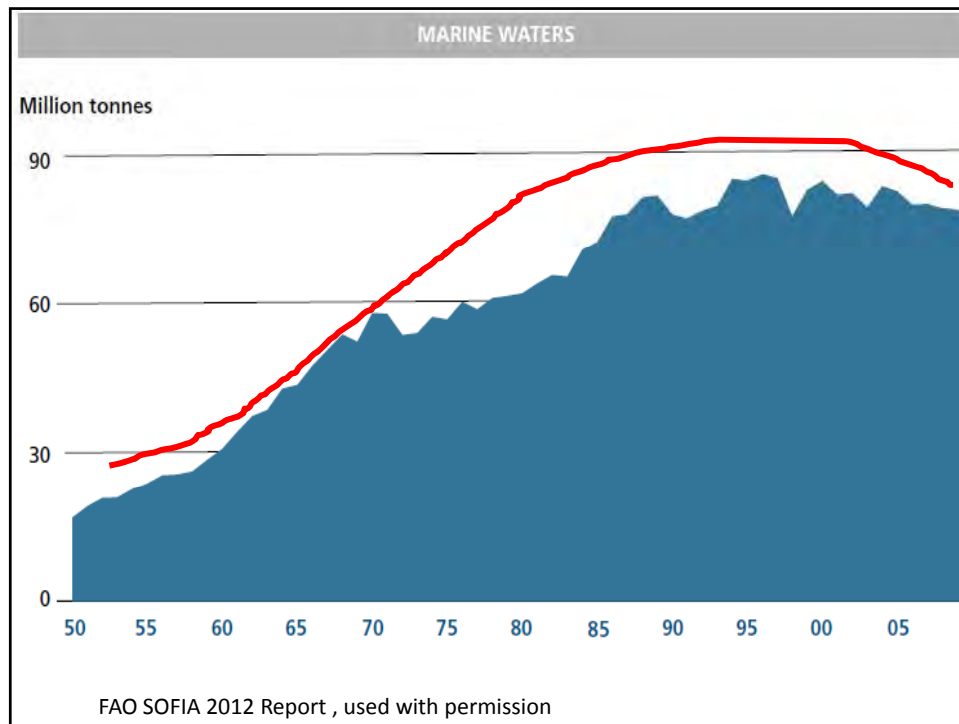
1. Growth ( $r$ ) through readily available resources that allow for the accumulation of structure and high resilience (see below).
2. Conservation ( $K$ ) where growth slows as the system is more and more interconnected and less flexible, and therefore more vulnerable to external disturbance.

### The Back Loop of the Adaptive Cycle:

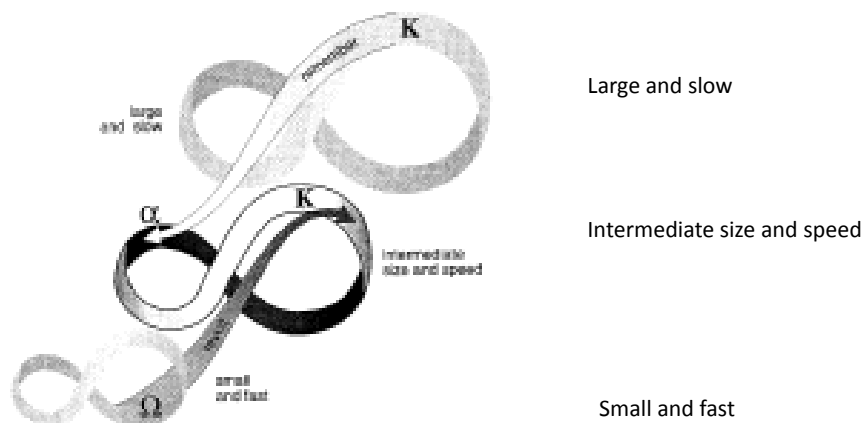
3. Release ( $\Omega$ ) of bound-up resources occurs as a result of disturbances and the accumulated structure collapses.
4. Reorganization ( $\alpha$ ) then follows collapse, assuming there is enough energy and matter to do so. After reorganization, a new growth phase is likely.







## Panarchy connections between scales



Holling 2001

- “When a level in the panarchy enters its  $\Omega$  phase of creative destruction, the collapse can cascade to the next larger and slower level by triggering a crisis. Such an event is most likely if the slower level is at its K phase, because at this point the resilience is low and the level is particularly vulnerable” (Hollings 2001, 398)

- Garcia and Charles ([2007](#)) write that, “Supplementing a detailed analysis by Garcia ([1992](#)), the long-term evolution of world fisheries might be described using the cross-loop ‘figure of eight’ model,” citing Gunderson and Holling’s ([2002](#)) edited volume, *Panarchy* (emphasis added).
- 
- Specifically, Garcia and Charles describe the stages of the (r) phase as fisheries moved from artisanal to industrial fishing (1900-1945) (WWII provided a well-known respite for Atlantic fisheries), with development growing 1945-1960, and steep expansion from 1960-1985. They indicate that the “global fisheries crisis” had been building up the entire century, indicating that world fisheries entered into the K phase.

## The Backloop

- How much “distance” exists in fisheries between the decline of growth and collapse?
- We know is that the length of the K phase will be determined by the “potential” and the “connectedness” in the cycle. For these elements, we turn to potential marine variables that may (or may not) determine this resilience.

## Early Warning signs

- Carpenter et al--

## Fisheries Variables

- Point is simplicity and power, not universality- what variables most impact fish populations?
- Trophic Chains
- Water column characteristics: climate and chemistry
- Fishing

## Directions of Variables?

While we can not precisely figure how each connection fits in the future of world fisheries, we do have a top-down picture of some important variables.

Can we surmise that if the curve is in the K phase, that the *direction* of key variables can provide reasonable indications of the larger system?

## TOPS

- Myers and Worm 90% but disputed
- Sibert et al; Polacheck TOPS in Pacific and Indian Oceans are at reasonable MSY
- NOT using catch data at all

## Jackson PNAS Ecological Extinction in the Brave New Ocean

- Jennings and Blanchard (2004)– using different methods than catch-effort data (e.g., Myers and Worm) the theoretical abundance–body mass relationship from macroecological theory “to estimate the pristine biomass of fishes in the North Sea in comparison with the size and trophic structure of heavily exploited populations in 2001 and come to findings totally consistent with the contested data”
  - Large fishes 4–16 kg declined by 97.4%,
  - species 16–66 kg declined by 99.2%.

## Resilience of food webs

- Weak interaction strength allows for resilience
  - Elimination of apex predators strengthens (intensifies) mesopredator and grazer interactions making it less stable
  - Diversity diffuses and therefore weakens intensity on any one part of the ecosystem
    - Functional diversity key

## Water Column

- Warming
  - Since the IR, ~84% of this added heat has been absorbed by the WOS
  - causing concern that “that marine systems are undergoing abrupt shifts to unwanted stable states dominated by microbes, flagellates, bacterial mats, and jellyfish. These opportunistic species are capitalizing on ecosystems stressed by overfishing, eutrophication, pollution, and climate change” ([McNeill, 2000, p. 291](#)).



## How much warming?

- Between 1955 and 2010, the water from 0-2000 meters warmed by .18°C because it absorbed  $24 \times 10^{22}$ J, or 240,000,000,000,000,000,000,000; and, “If this heat were instantly transferred to the lower 10km of the global atmosphere it would result in a...warming of this atmospheric layer by approximately 36°C (65°F)” (Levitus et al, 2012, p. L10603).

## pH is changing -.1% since

- already being observed and has already affected the development of marine life and will continue to challenge the *basic physiology* of plankton, mussels, coral and other organisms that depend on calcifying carbon (Doney et al. 2009 ).
- Acidification is occurring **faster than at any other time in the last 300 million years** and is expected to affect fish and other organisms (Bignami et al. 2013 ; Miles 2009 ).

## N

- Currently, there are over 400 temporary, seasonal, or permanent dead zones around the world, and they usually are in areas that receive industrial N runoff, as in the Gulf of Mexico which receives runoff from the mid-West agricultural system in the United States ([Diaz and Rosenberg, 2008](#), [Sonnett, 2010](#)).

## Fishing changes

- Global CPUE is 50% of 1950
- Main driver of most LMEs
- Fishing through the food web and trophic degradation

- “Today, most fish and invertebrate stocks are severely depleted globally, and one-half to two-thirds of global wetlands and seagrass beds also have been lost . Of the 80 species surveyed, 91% are depleted, 31% are rare, and 7% extinct. Nowhere are there any substantial signs of recovery, despite belated conservation efforts, except for nominal increases in some highly protected birds and mammals.”

(Jackson 2008)

## Conclusions

- Global fisheries can plausibly be described as panarchies
- It is possible global fisheries are in the K phase
- Distance between the K and collapse are likely determined by the connectivity and potential of key variables like TOPs, water column characteristics and fishing pressure.

## **Mohammed F. Rabbi, “Perspectives on Global Climate Change and Food Security”**

**ABSTRACT.** Global climate change has the potential to negatively impact the resilience of world food supplies during the next several decades. There are numerous uncertainties on the impact of climate change at local and regional levels. For example drier conditions will prevail in Southern Africa, Australia, the Mediterranean, and Western North America. Climate change will also affect glacial and snow melt in the water towers of the Himalayan region with potential effects on downstream hydrology. Dramatic changes can be expected in water supplies, agricultural productivity, and access to food in many regions. The poor and other vulnerable groups in both rural and urban areas are likely to be at high risk to food insecurity in the affected regions. While 650 million of the most vulnerable people live in the arid and semi-arid regions of Sub-Saharan Africa and South Asia, no region of the world, including North America, is free of the risk of disruption in its food supply. Lack of sustainability in food production is a key threat to food resilience. In this presentation, the linkages between potential impacts of global climate changes on food systems will be examined, and broader agricultural and adaptive strategies for food security will be addressed.

We have to know about agricultural crop resilience and the current policies of food security and food resilience. I'll talk a little bit about the future. Around the world, the food security in the coming decades will be in a critical state, but challenging. Some of the most profound and direct impacts of climate change over the next few decades will be on agriculture and on the crop systems and the food system. Of course we all know with higher temperature, global warming, climate change the agriculture will be most affected. My talk today centers mostly on the global scale.

In 2008, Lobel et al. through computer modeling of crop yields showed how agricultural production changes through 2030. And their models show that although there are variations with locations and it's very complex, declining precipitation in mostly semi-arid regions, like in sub-Saharan Africa are likely to cause a reduction in the yield of the crops like rice, corn, maize, or wheat, and including soya in the next decades. So according to their calculations, for each 1 degree Celsius temperature increase there is a 5% reduction in the potential yield. Already, some of the published papers showed that in Brazil they have already lost 50% of their yield of improvements in wheat production because of global warming. In Africa, by 2050 there will be an almost 22% decline in maize and also in other staple crops. These will create huge problem with food security.

This is a chart of estimated net impact of climate trend based on 1982 to 2008 on average crop yields for major crops like corn. For instance in China and in Brazil, there have been nearly 10% reduction of precipitation in 2008 causing agricultural yield problems. Wheat production in Russia suffered a lot during 2008. On the other hand, rice production was not impacted that much. Net impacts of temperature change and precipitation varies depending on the various types of crops. Some of them are C3 plants like rice. They survive with even the highest temperature. But not corn. Corn and soybean are crops with C4 CO<sub>2</sub> fixation pathway in photosynthesis. So agriculture is highly sensitive to climate change with longer trends in precipitation, temperature for global distribution of food crops, Inter-annual variability of rainfall, drought, floods, heat waves, and in some cases frost and extreme events. Also, mostly in the developing countries, invasive species and increase in plant diseases.

These two slides show the impact of global temperature increase that by 2030 or 2050 would be around 3.3 degrees Celsius or temperature nearly 1.8 or 1.6 degrees Celsius above current land temperature. With global temperature increase of 3.3 °C, some projections assume 15% increase in crop yields due to fertilization effects of increasing carbon dioxide. It would be due the relationship with increased rate photosynthesis with increased carbon dioxide in the atmosphere. In the southern United States and parts of South America and Africa, agricultural productivity as well as in central Asia with increasing carbon fertilization, there are going to be more plants growing over there, but still in the southern United States and most of Africa and South America, there will be reduction in agricultural productivity.... and even India they are detected.

There are two scenarios. One is with increase in global annual temperature, relative to 1980-99, you can see what happens. Now this slide shows that what happens to the crop productivity and cereal production. Decreases cereal production in low altitudes with increase in the annual temperature; while there will be some increase in the cereal production in higher latitudes. However, if the temperature goes up 5 degrees Celsius, then all the regions in the world, including the low and high latitudes, their productivity will be affected.

Now, more about this graph, this very well-known graph. In 2000 you can see the projected changes in global average temperature are pretty much correlating. And these are the three scenarios: B1, the lower emission scenario, A2, this is the high emissions scenario. This slide is an extension of this curve. If we could maintain this A1B scenario in global emissions. But most probably by the end of the century we have to settle on this A1B scenario. And if we can't control the greenhouse gas emissions, it's going up the scale (A2 scenario).

Now the thing is, as I mentioned earlier, there are important uncertainties in climate change scenarios and challenging based on the computer modeling. There are so many uncertainties that vary both at the regional and the local scales. So I will show you in the next few slides that using Components of global change modeling systems (CGM), showing the differences between the CSIRO scenario research and also NCAR/MIROC scenarios. There are so many uncertainties and variations. Based on this, the change in average annual precipitation using CSIRO scenario to 2050, you can see the green and blue shows increasing precipitation; and red and orange show the decreased precipitation scenario. The MIROC scenario shows pink and red regions of less precipitation and green and blue increased precipitation. So this shows the variations of precipitations with dryer scenarios in South America; wetter scenarios in eastern Africa and parts of India. IFPRI study shows that in South Asia, by 2050 there will be about 50% reduction of wheat production, up to 17% for rice, and about 6% for maize. And in East Asia and the Pacific region, less reduction, but still about 20% reduction of rice, 13% for soybean, 16% for wheat, and 4% for maize. In sub-Saharan Africa by 2050, scenarios for average crop yields will decrease for the reduction of rice, wheat or maize, but still less than South Asia. This is a chart that shows the reductions in southern Africa, East Asia, using different computer modeling (CSIRO and MIROC models). Climate change will also cause the price rise of crops and cereals and an increase in malnourished children by 2050. In South Asia, 59 million malnourished children and in in East Asia and pacific region, 14 million children. That is the big concern.

Now, what are the policy recommendations for adaptations about this?

1. Integrate food security and climate change.
2. Increased investment in agricultural productivity and national research; modernize extension programs.
3. Improve the global data collections and analysis.

Also there is a lot of work to be done in the models for better understanding climate change and agriculture.

1. Integrate food security and agricultural adaptation strategies as key agenda within the international climate negotiation processes.
2. To increase the resilience of food systems, crop diversity, drip irrigation. Increased resilience of food system to climate change, pest management, and the recognition that food security and climate change are closely related.
3. Facilitate the increased access of farmers to bank loans and other financial service and global food trade regime.
4. Develop lower emissions agricultural strategies.
5. Many of the prime lands have been converted into homestead. Adopt framing and grazing practices to prevent loss of soil carbon.
6. Improved water management in rice fields and support farmers to adapt to technologies with multiple benefits.

There is a silver lining in Bangladesh.

1. Improving access to land tenure and water resources.
2. Increased access to credit from the bank and financial services (NGO, Grameen bank), and is the most critical is the recognition of key role of women in household food production.

## **Perspectives on Global Climate Change and Food Security**

**Mohammed Rabbi  
Valley Forge Military College**

**Annual Conference (AESS)  
Duquesne University, Pittsburgh, PA  
June 19 – 22, 2013**

- **In 1996, the World Food Summit adopted the following definition of food security:**
- **“Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.”**

----- [http://www.fao.org/wfs/index\\_en.htm](http://www.fao.org/wfs/index_en.htm)



**Selected Poverty and Food Security Statistics  
(millions)**

<b>Number of undernourished people (2006-2008)<sup>1</sup>:</b>	<b>850.00</b>
<i>Developed regions:</i>	<b>10.60</b>
<i>Developing regions:</i>	<b>839.40</b>
<b>Share of Children under 5 years with underweight (2009)<sup>1</sup>:</b>	<b>18%</b>
<b>Number of people below the poverty line (\$1.25/day) (2008)<sup>2</sup>:</b>	<b>1,289.00</b>
<b>South Asia:</b>	<b>570.70</b>
<b>Sub-Saharan Africa</b>	<b>386.00</b>
<b>East Asia</b>	<b>284.40</b>
<b>Latin America and Carribean</b>	<b>36.90</b>

1 – FAOSTAT <http://www.fao.org/economic/ess/ess-fs/fs-data/ess-fadata/en/>

2- World Bank, Poverty and Equity Data <http://povertydata.worldbank.org/poverty/home#>

**Global Climate Change and  
Food Security**

- “Some of the most profound and direct impacts of climate change over the next few decades will be on agriculture and food systems”  
----- “Food security under Climate Change”.  
Brown and Funk. Science 319, 580 ( 2008).

- Using crop models, Lobell et al (2008) calculated changes in agricultural production to 2030.
- Their model showed that increasing temperatures and declining precipitations in semiarid regions are likely to reduce yields for corn, wheat, rice, and other primary crops in the next two decades.
- “Global impacts of climate change on yields cannot be estimated due to variation among locations and crop types. But the overall impact on grain is negative – the potential yield loss is about **5 percent for each degree Celsius** of global warming”

Source: D.B. Lobell et al. Science 319, 607 ( 2008).

### Impacts of current levels of warming on food and farms

- The disruption of traditional land use and vegetation-patterns is one of the most significant impacts of climate change.
- This has the potential to decimate crop yields, agricultural production and food supplies globally.
- The number of ‘hot days’ each year globally has increased 300% since 1900, killing crops and people. (Hansen 2012) .

(Source: *Hansesn, J et al, Perception of climate change, PNAS September 11, 2012 vol. 109 no. 37 E2415-E2423*

### Impacts of current levels of warming on food and farms

- **Almost 50% of the yield improvement of Brazil's wheat production has been lost to climate change. (Lobell 2011).**

(Source: Lobell D et al(2011). *Climate Trends and Global Crop Production Since 1980. Science* 333, 616–620. )

- **A 22% decline in maize crop in Africa by 2050 is predicted with similar dire warnings for other staple crops.**

(Source: Schlenker W., and D.B. Lobell. (2010). *Robust negative impacts of climate change on African agriculture. Environmental Research Letters* 5, 014010)

- **The price of maize, wheat and rice will all at least double by 2030.**

(Source: Carty, Tracy, *Extreme Weather, Extreme Prices: The costs of feeding a warming world (Oxfam International) Policy Paper, September 2012.* )

### Impacts of current levels of warming on food and farms

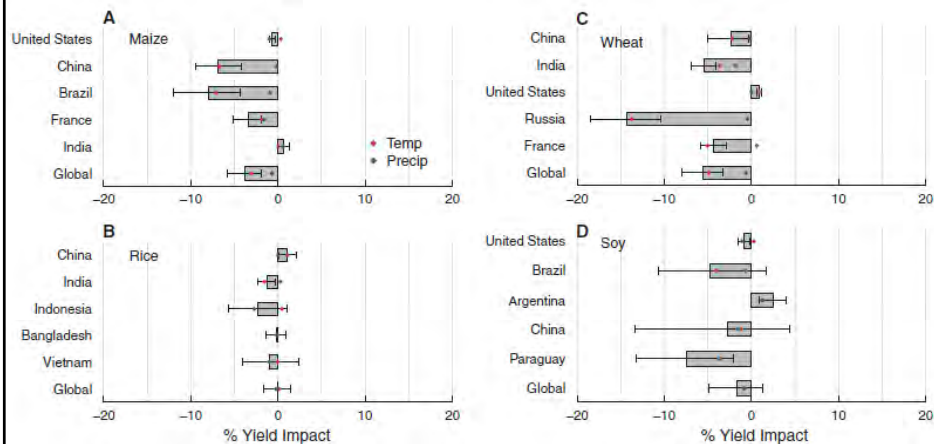
- **It is estimated that record climate-driven food price hikes in 2008, pushed more than 105 million people into poverty.**

(Source: World Bank, *Global Monitoring Report, 2012.*)

- **With 925 million people already suffering from hunger, huge spikes in food prices would be a disaster for the 2.3 billion impoverished people identified as at high risk to fluctuations in food prices.**

### Estimated net impact of climate trends for 1980–2008 on average crop yields for major producers and for global production

(Source: Lobell et al (2011). Science 333:616-20)



Grey bars show median estimate; error bars show 5% to 95% confidence. Red and blue dots show median estimate of impact for temperature trend and precipitation trend, respectively.

### Climate change impacts on agriculture

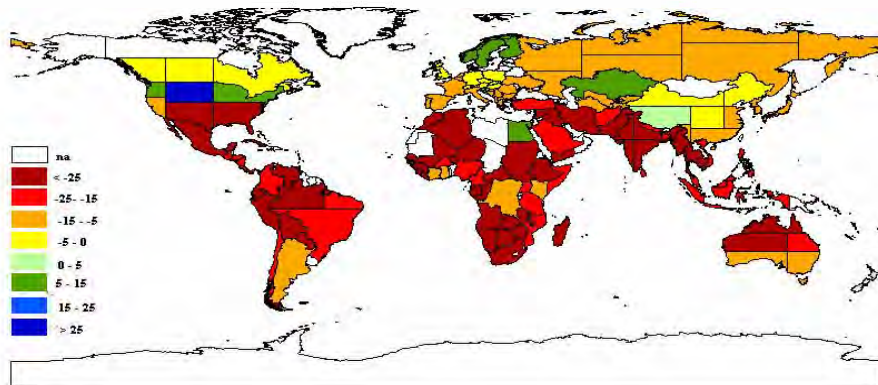
Source: Achieving food security in the face of climate change (2012). CGAIR.

- A changing climate is associated with increased threats to food safety, post-harvest losses and pressure from invasive species, pests and diseases.
- Agriculture is highly sensitive to climate:
  - longer-term trends in the rainfall, and
  - Temperature for global distribution of food crops,
  - Inter-annual variability of rainfall,
  - droughts,
  - floods,
  - heat waves,
  - frosts and other extreme events.

**Projected Climate Changes and Impacts on Agricultural Productivity in 2080s  
without Carbon Fertilization (percent)**

Source: Cline, W.R (2007) Center for Global Development

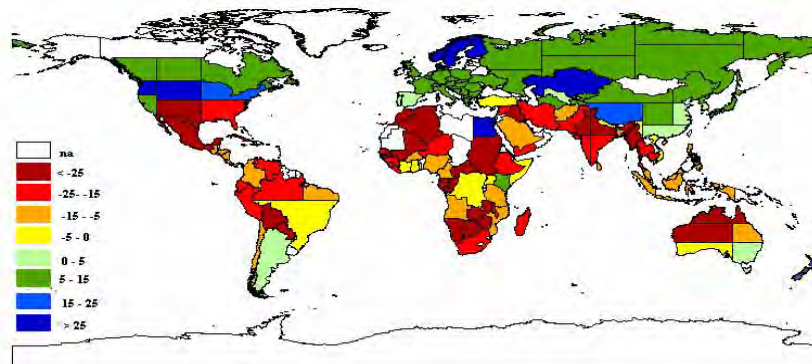
Global Temp Increase: 3.3°C



**Projected Climate Changes and Impacts on Agricultural Productivity in  
2080s with Carbon Fertilization (percent)**

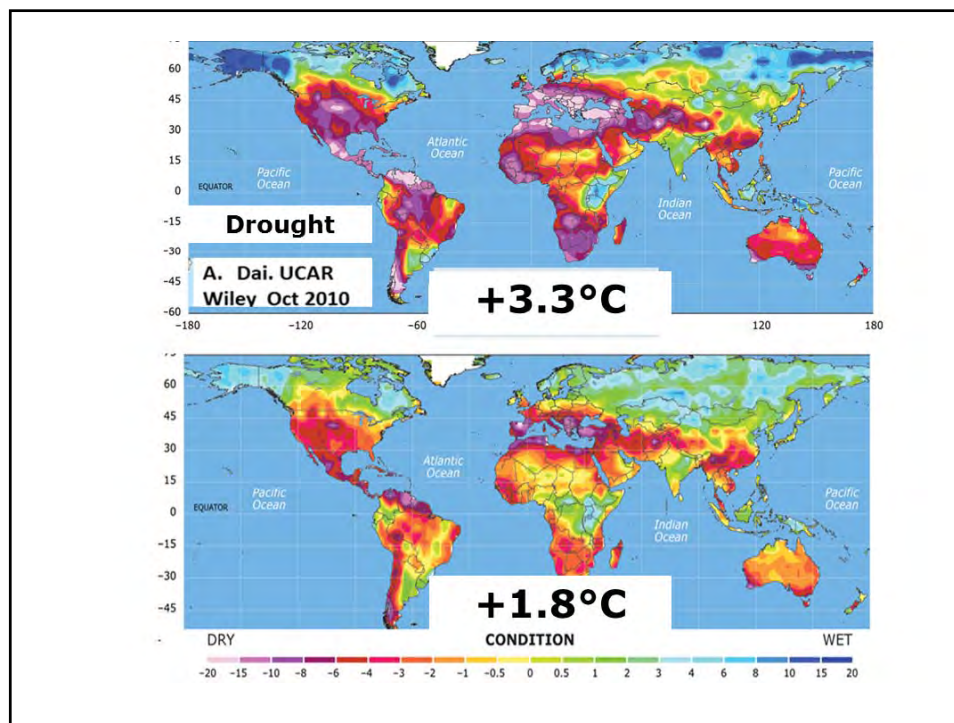
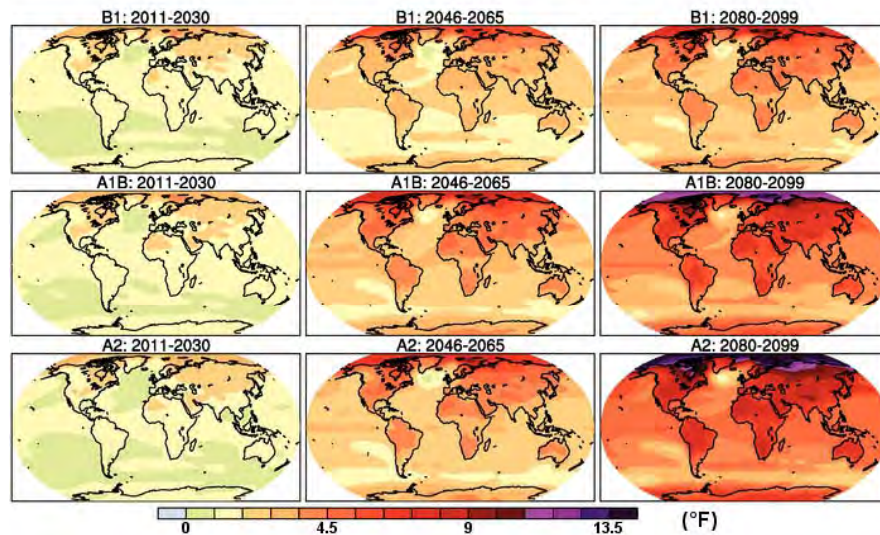
Source: Cline, W.R (2007) Center for Global Development

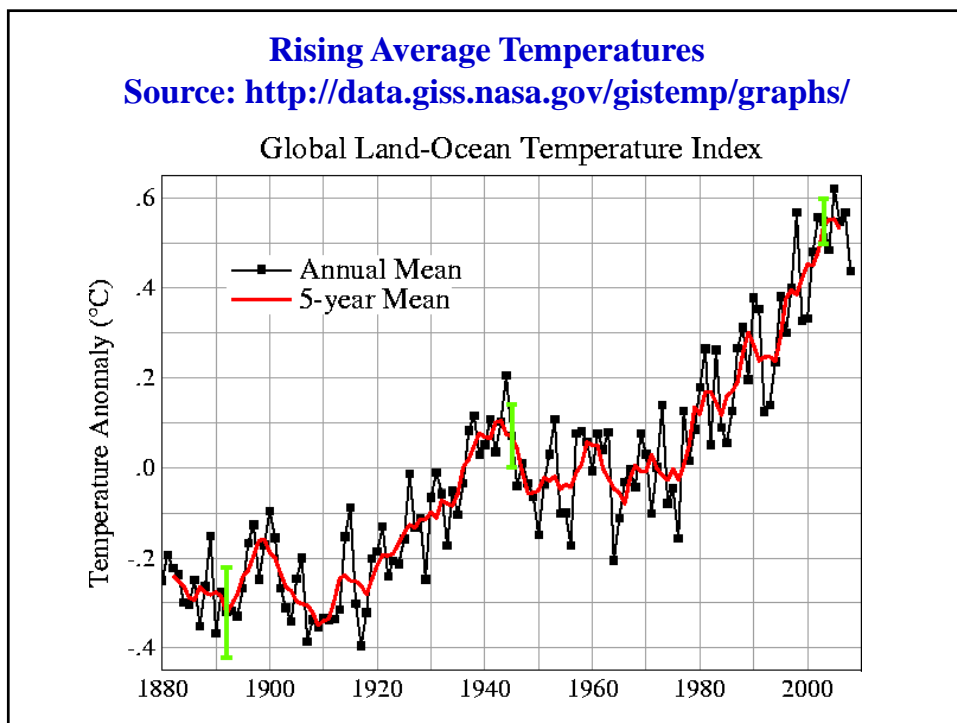
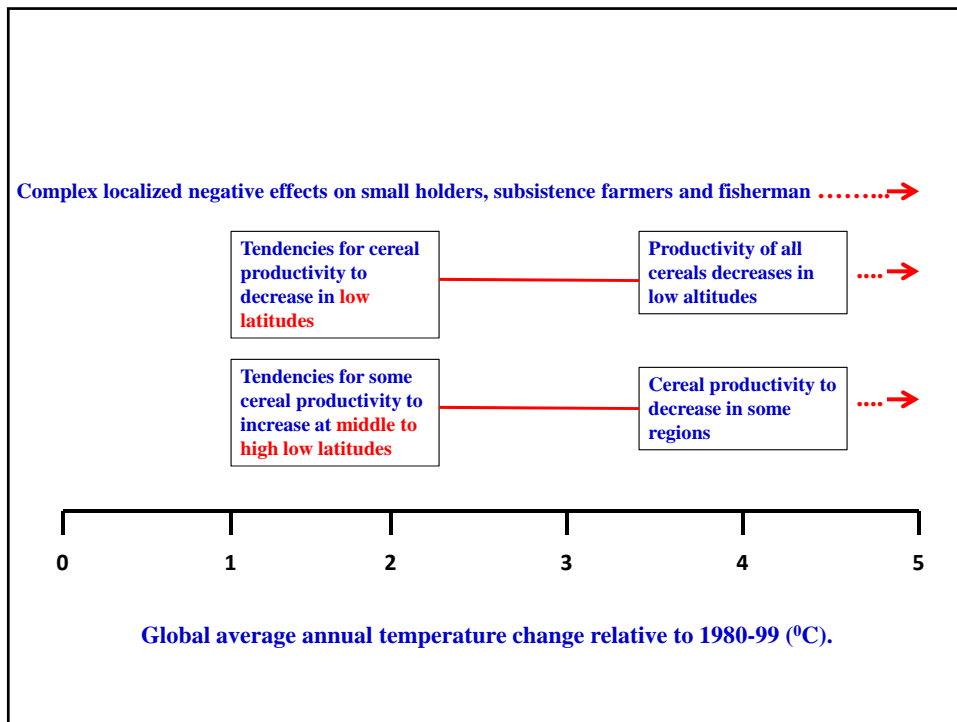
Global Temp Increase: 3.3°C



Projections assume a uniform 15% increase in yields due to the fertilization effect of rising CO<sub>2</sub> in the atmosphere on some plant species. (Note that this coarse-grain analysis does not project local-scale impacts which require geographically-specific analysis.)

Projected changes in global average temperatures under three emissions scenarios (rows) for three different time periods (columns). Changes in temperatures are relative to 1961-1990 averages. The scenarios come from the IPCC Special Report on Emissions Scenarios: B1 is a low emissions scenario, A1B is a medium-high emissions scenario, and A2 is a high emissions scenario. Source: [NRC \(2010\)](#)





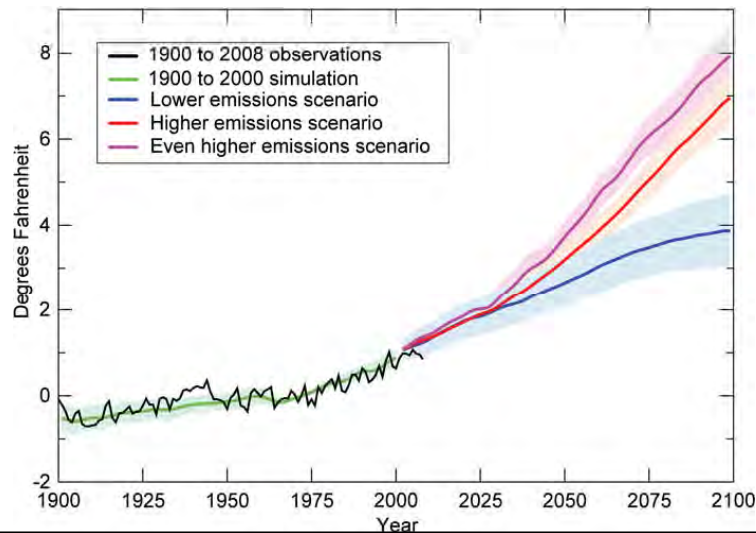


### Observed and projected changes in global average temperature under three no-policy emissions scenarios.

The shaded areas show the likely ranges while the lines show the central projections from a set of climate models. A wider range of model types shows outcomes from 2 to 11.5°F.

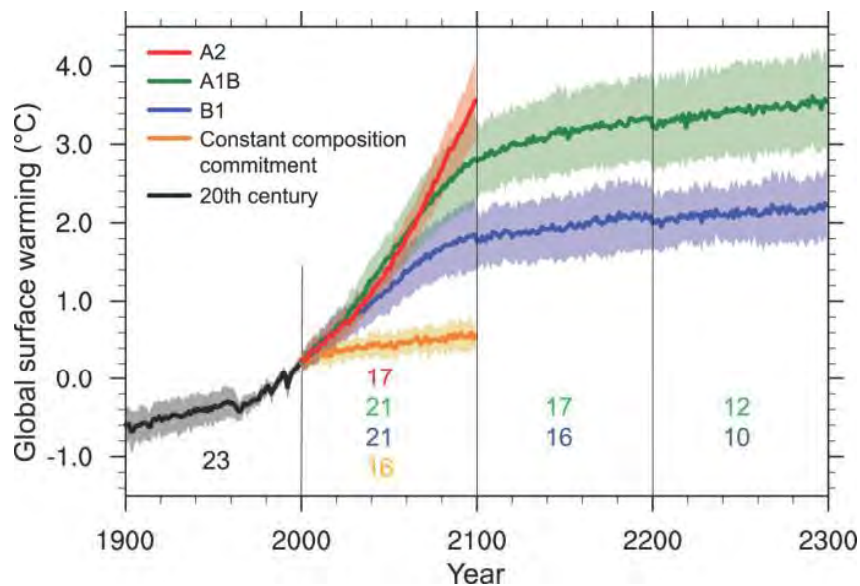
Changes are relative to the 1960-1979 average.

Source: [USGCRP \(2009\)](#)



### .... and may increase much more

Source: Meehl, et al (In *Climate change 2007: The physical science basis*)



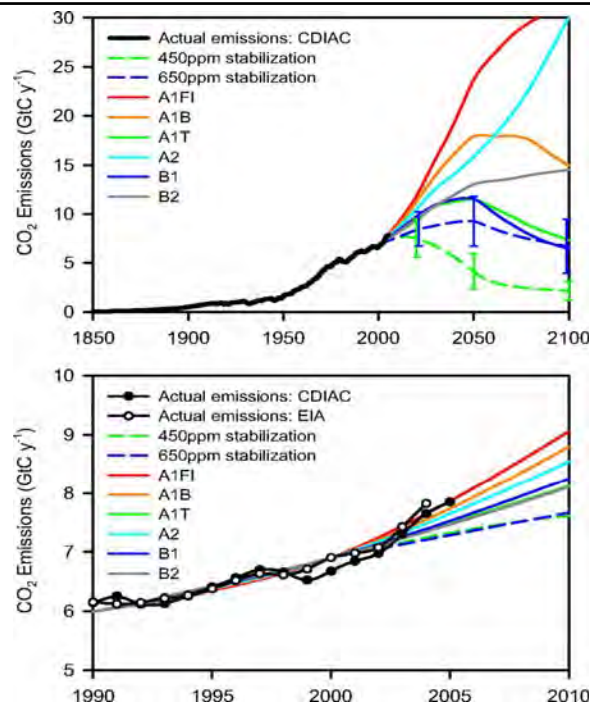
**Observed CO<sub>2</sub> emissions  
are well above A2  
simulated emissions**

--  
**Raupach M R et al.  
PNAS.104:10288-10293  
(2007)**

**SRES (2000): A2 average  
growth rate for 2000-2010:  
2.13%**

**SRES (Special Report on Emissions  
Scenarios of the Intergovernmental  
Panel on Climate Change)**

**Observed 2000-2007: 3.5%**



## CLIMATE CHANGE SCENARIOS:

- “Climate change will result in multiple stresses for plants and animals in many agricultural and aquatic systems in the coming decades. There is a great deal that is yet unknown about these stresses may combine.....”
- ----- Food security and climate change (A report by Committee on World Food Security (CFS), June 2012).
- There are important uncertainties in the way climate will change, magnified at regional and local scales.

### Components of Global Change Model (GCM)

Two GCM climate scenarios showing variability: NCAR/MIROC (wetter) and CSIRO (drier).

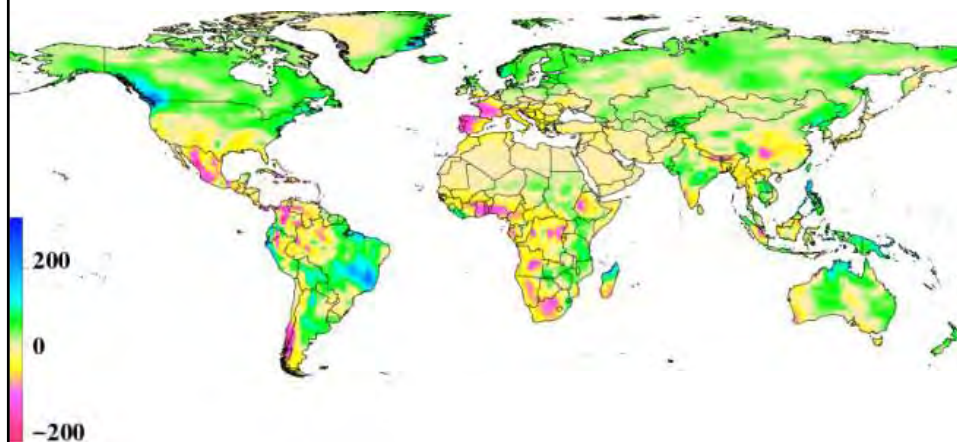
**CSIRO** (Commonwealth Scientific and Industrial Research Organization; abbreviation for the CSIRO-Mk3.0 general circulation model)  
-----drier scenario (Av. pptn. increase of about 10 percent.)

**NCAR:** The national Center for Atmospheric Research, US.  
-----wetter scenario (Av. pptn. increase of about 2 percent.)

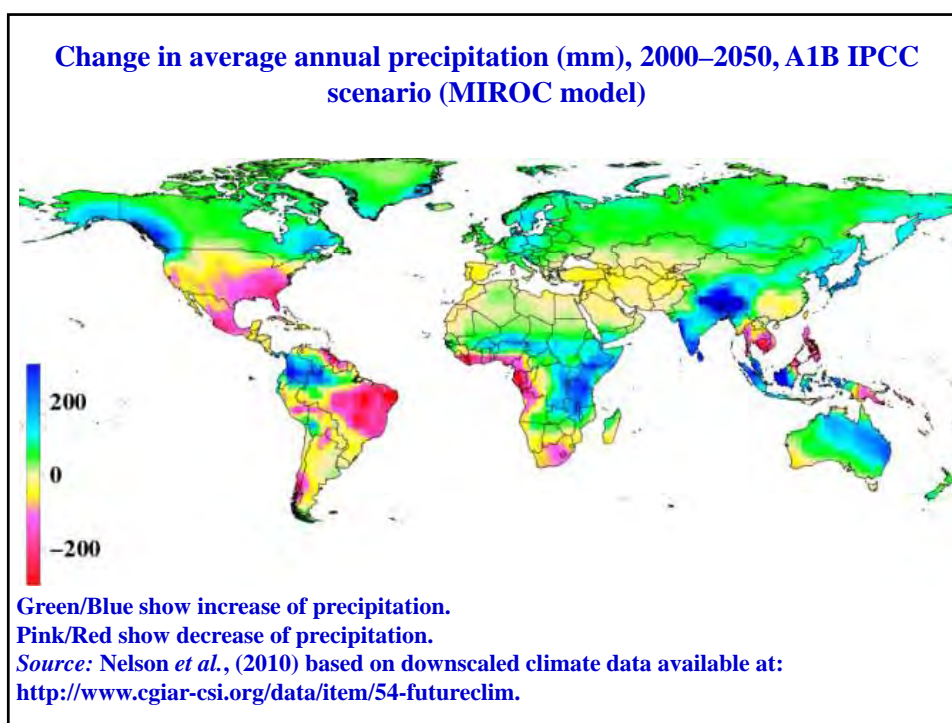
**MIROC** abbreviation for the MIROC 3.2 medium resolution general circulation model (produced by the Center for Climate System Research, University of Tokyo; the National Institute for Environmental Studies; and the Frontier Research Center for Global Change, Japan)


Source: Nelson G.C (2009).  
Climate Change and Agriculture: Impacts and costs of adaptation (IFPRI)

### Change in average annual precipitation (mm), 2000–2050, A1B IPCC scenario (CSIRO model)



- Green/Blue show increase of precipitation.
- Pink/Red show decrease of precipitation.
- Source: Nelson *et al.*, (2010) based on downscaled climate data available at:
- <http://www.cgiar-csi.org/data/item/54-futureclim>.

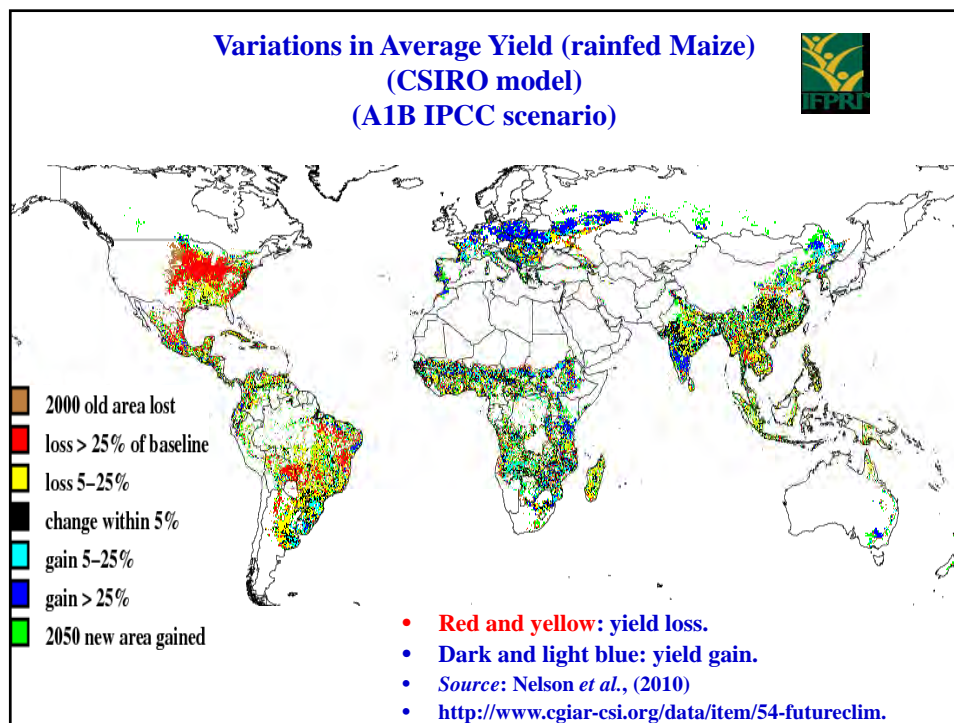


Average Yield Reductions By Climate Change (%) 			
Crop/ management system	Sub Saharan Africa	East Asia and Pacific	South Asia
<b>Irrigated rice</b>			
NCAR	-14.1	-19.8	-15.5
CSIRO	-11.4	-13.0	-17.5
<b>Rainfed maize</b>			
NCAR	-4.6	1.5	-7.8
CSIRO	-2.4	-3.9	-2.9
<b>Rainfed wheat</b>			
NCAR	-21.9	-14.8	-44.4
CSIRO	-19.3	-16.1	-43.7
Source: Nelson (2009). Climate Change and Agriculture. IFPRI.			

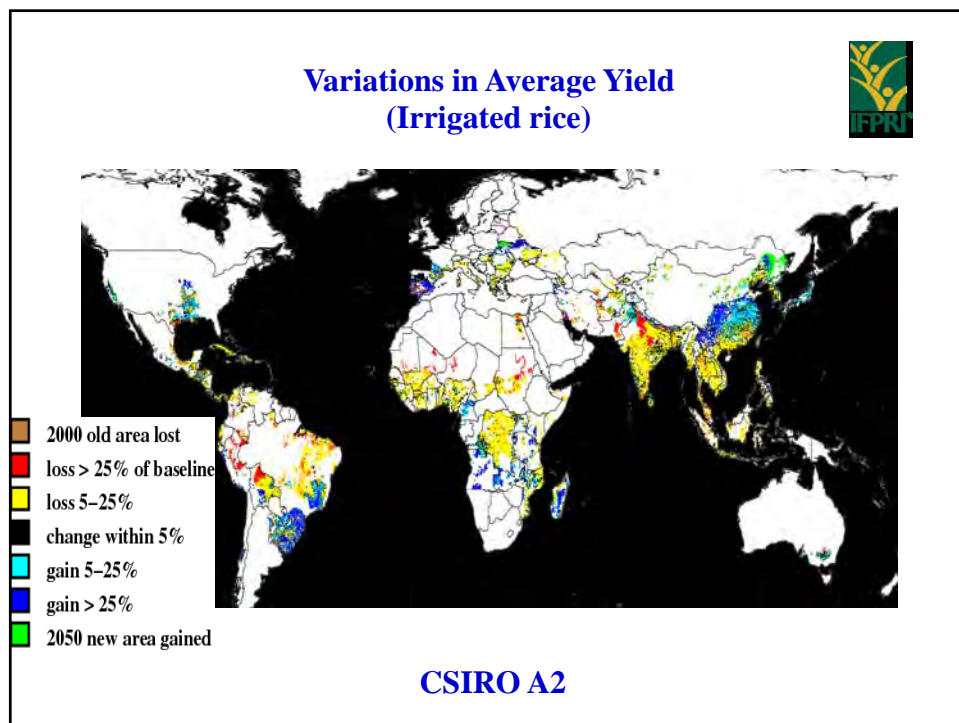
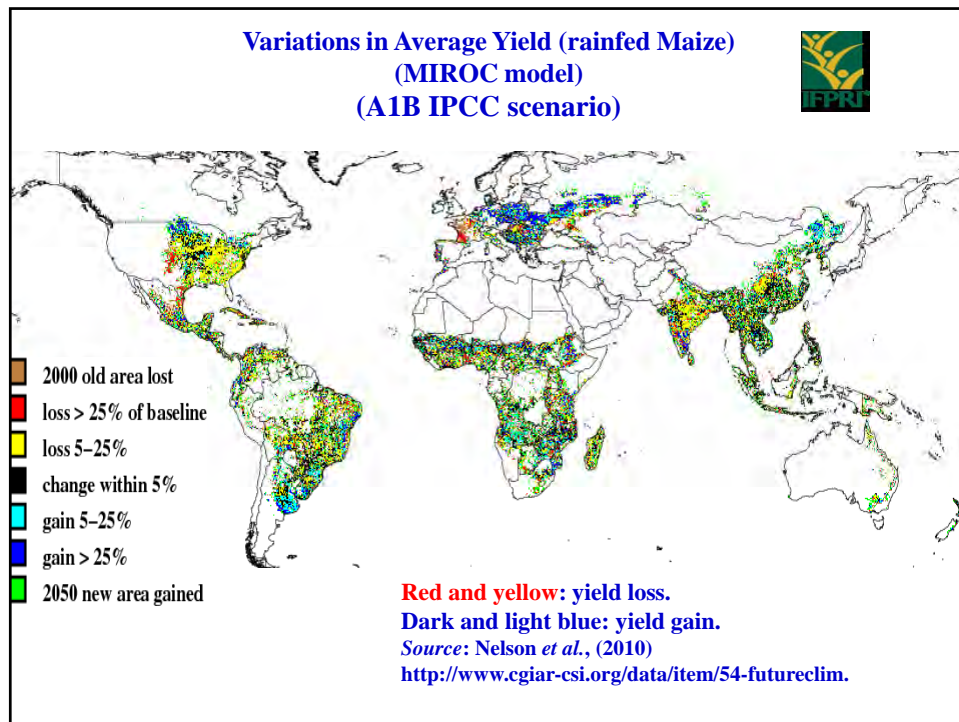
<b>Climate Change Induced Yield Effects by Crop and Management system</b> (% change from yield with 2000 climate to yield with 2050 climate) Source: Nelson et al (2009).Climate Change:Impact on Agriculture and Costs of Adaptation. IFPRI				
Region / <b>Maize</b>	CSIRO ( No CF )	NCAR ( No CF )	CSIRO ( CF )	NCAR ( CF )
<b>Irrigated-</b>				
Developing countries	-2.0	-2.8	-1.4	-2.1
Developed countries	-1.2	-8.7	-1.2	-8.6
<b>Rainfed-</b>				
Developing countries	0.2	-2.9	2.6	-0.8
Developed countries	0.6	-5.7	9.5	2.5
<b>Note:</b> For each crop and management system, this table reports the area weighted average change in yield for a crop grown with 2050 climate instead of 2000 climate. <b>CF</b> = with CO <sub>2</sub> fertilization; <b>No CF</b> = without CO <sub>2</sub> fertilization.				

<b>Climate Change Induced Yield Effects by Crop and Management system</b>				
Region / <b>Rice</b>	CSIRO ( No CF )	NCAR ( No CF )	CSIRO ( CF )	NCAR ( CF )
<b>Irrigated</b>				
Developing countries	-14.4	-18.5	2.4	-0.5
Developed countries	-3.5	-5.5	10.5	9.0
<b>Rainfed</b>				
Developing countries	-1.3	-1.4	6.5	6.4
Developed countries	17.3	10.3	23.4	17.8
<b>Note:</b> % change from yield with 2000 to yield with 2050. Source: Nelson et al (2009).Climate Change: Impact on Agriculture and Costs of Adaptation. IFPRI				

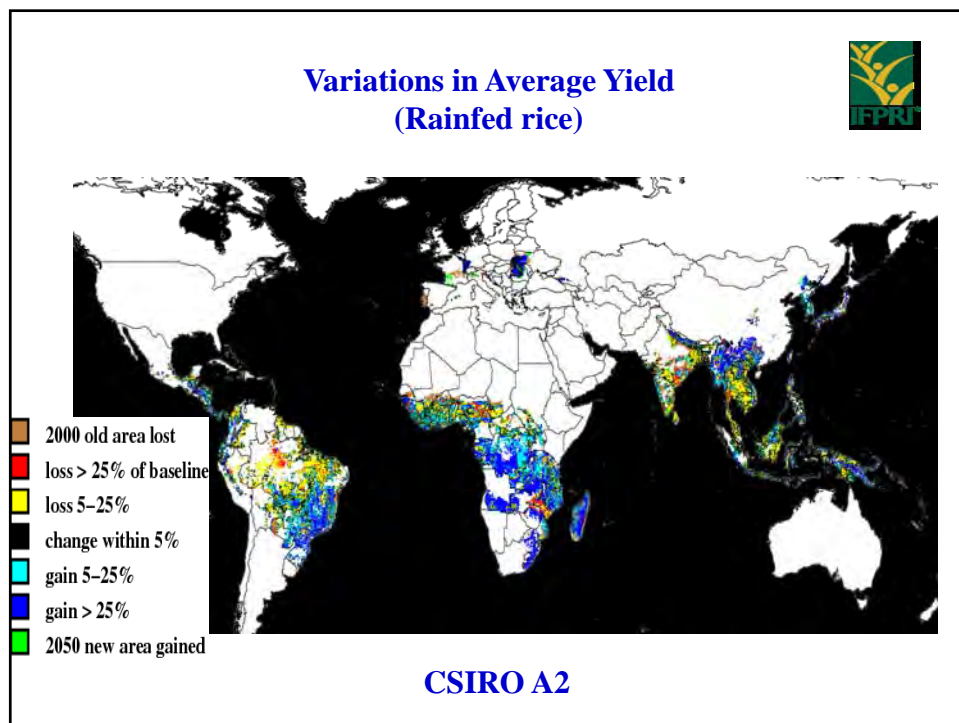
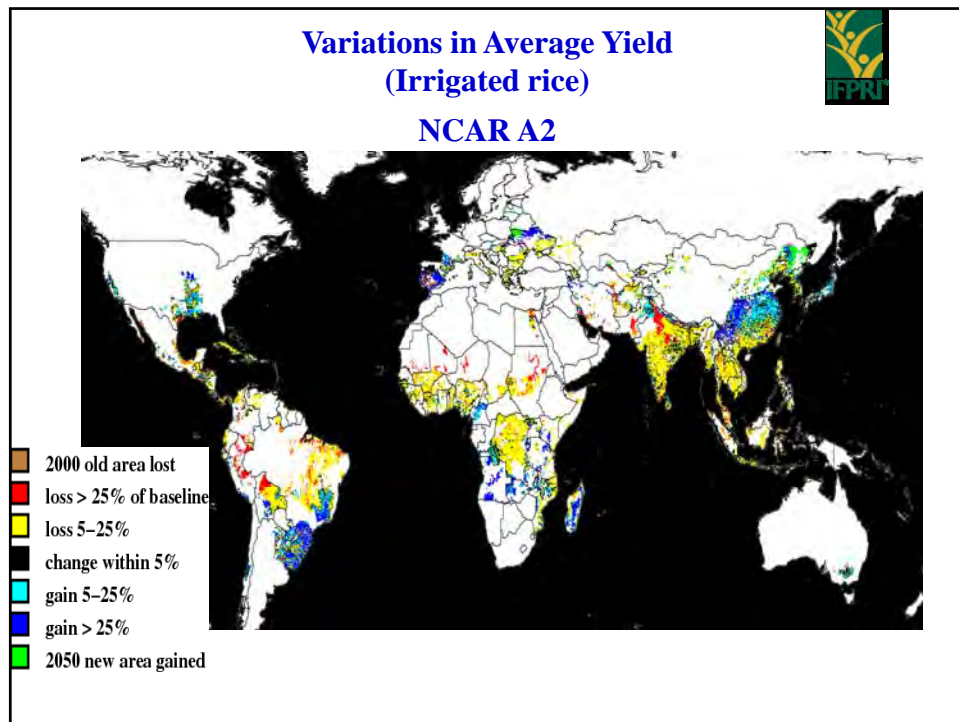
Climate Change induced yield effects by crop and management system				
Region / Wheat	CSIRO (No CF)	NCAR (No CF)	CSIRO (CF)	NCAR (CF)
<b>Irrigated</b>				
Developing countries	-28.3	-34.3	-20.8	-27.2
Developed countries	-5.7	-4.9	-1.3	-0.1
<b>Rainfed</b>				
Developing countries	-1.4	-1.1	9.3	8.5
Developed countries	3.1	2.4	9.7	9.5
<p><b>Note:</b> % change from yield with 2000 to yield with 2050.</p> <p><b>Source:</b> Nelson et al (2009). Climate Change: Impact on Agriculture and Costs of Adaptation. IFPRI</p>				

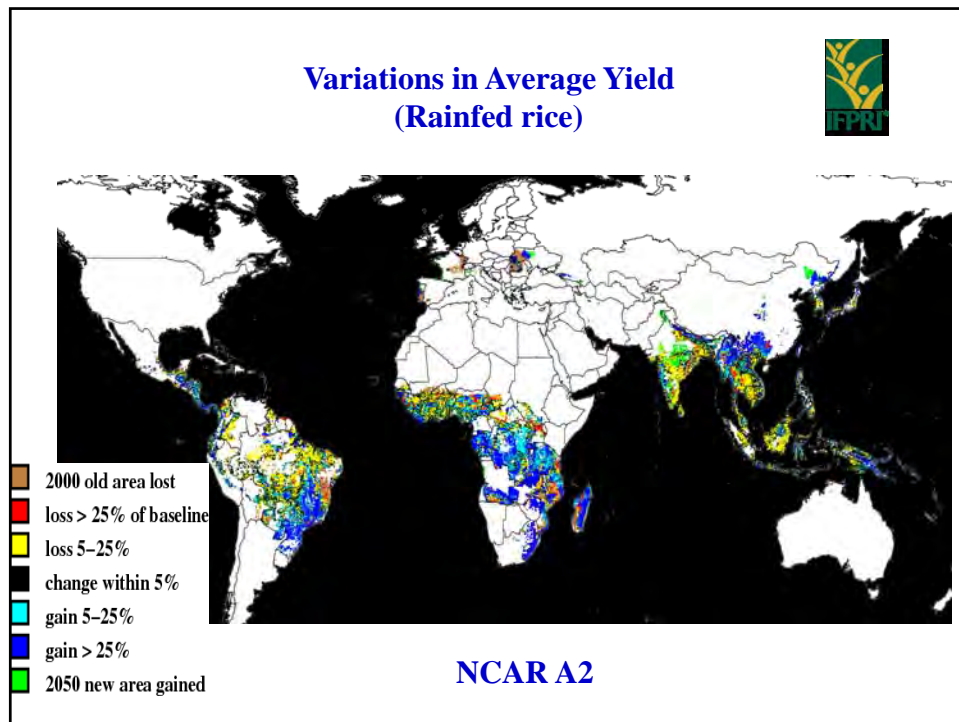












- **Climate change reduces maize production growth in developed countries (particularly in the United States with the MIROC GCM), but generates small production increases in the developing countries.**
- **Rice production growth is largest in the low-income developing countries (17–33 percent).**
- **Wheat production growth is relatively small in developed countries (11–24 percent) but much larger in the developing countries (41–94 percent).**

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

Source: International Food Policy Research Institute (IFPRI)

Crop Model Predictions of Climate Change:      Asia-Pacific region:

- The **Asia-Pacific region** will experience the worst effect on rice and wheat yields and could threaten the food security of **1.6 billion people** in South Asia.
- South Asia is particularly hard hit by climate change and is the region with the greatest yield decline.
- In **South Asia**, average yields in 2050 for crops will decline from 2000 levels by
  - about 50 percent for wheat,
  - 17 percent for rice, and
  - about 6 percent for maize.

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

Source: International Food Policy Research Institute (IFPRI)

Crop Model Predictions of Climate Change:

- In **East Asia and the Pacific**, yields in 2050 for crops will decline from 2000 levels by
  - up to 20 percent for rice,
  - 13 percent for soybean,
  - 16 percent for wheat, and
  - 4 percent for maize.
- With climate change, average calorie availability in Asia in 2050 is expected to be about **15 percent lower** and cereal consumption is projected to decline by as much as **24 percent** compared to a no climate change scenario.

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

Source: International Food Policy Research Institute (IFPRI)

Crop Model Predictions of Climate Change:

- Climate change will cause the number of **malnourished children** in 2050 to rise to **59 million in South Asia** and to **14 million in East Asia and the Pacific**, increasing the total number of malnourished children in Asia by about **11 million**.
- To counteract the effects of climate change on nutrition, South Asia requires additional annual investments of **\$1.5 billion** in rural development.
- Over half of these investments in both regions must be for irrigation expansion.

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

Source: Asian Development Bank, *Addressing Climate Change in the Asia and Pacific Region, 2009*

Additional Facts:

- The Asian countries most vulnerable to climate change are Afghanistan, Bangladesh, Cambodia, India, Lao PDR, Myanmar, and Nepal.
- Afghanistan, Bangladesh, India, and Nepal are particularly vulnerable to declining crop yields due to glacial melting, floods, droughts, and erratic rainfall, among other factors.
- Asia is the most disaster-afflicted region in the world, accounting for about 89 percent of people affected by disasters worldwide.
- More than 60 percent of the economically active population and their dependents—2.2 billion people—rely on agriculture for their livelihoods in developing parts of Asia.

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

**Sub-Saharan Africa:**

- The negative effects of climate change on crop production are especially pronounced in Sub-Saharan Africa, as the agriculture sector accounts for a large share of GDP, export earnings, and employment in most African countries.
- Furthermore, the vast majority of the poor reside in rural areas and depend on agriculture for their livelihoods.
- (Source: “Setting Priorities for Public Spending for Agricultural and Rural Development in Africa,” IFPRI, 2009)

*Climate Change: Impact on Agriculture and Costs  
of Adaptation, 2009*

Source: International Food Policy Research Institute (IFPRI)

**Crop Model Predictions of Climate Change:**

- In 2050 in Sub-Saharan Africa, average crop yields will decline by up to
  - ☐ Rice: 14 percent,
  - ☐ Wheat: 22 percent, and
  - ☐ Maize: 5 percent, respectively.
- With climate change, food availability in the region will average 500 calories less per person in 2050, a **21 percent** decline.

**Policy Recommendations of Agricultural Adaptation Strategies to  
Climate Change**

Source: CFS (Committee on World Food Security). Food Security and climate change (June 2012).

**I. Integrate food security and climate change concerns:**

- Increasing investments in agricultural productivity for food security and resilience of food systems to climate change.
- Increasing investments in national research for adaptation/mitigation and modernize extension programs.
- Improve global data collection and analysis.

**Policy Recommendations of Agricultural Adaptation Strategies to  
Climate Change**

Source: CFS (Committee on World Food Security). Food Security and climate change (June 2012).

**I. Integrate food security and climate change concerns:**

- Improve GCC models that facilitate understanding of climate change on agriculture.
- Support community-based adaptation strategies.
- Make agricultural adaptation a key agenda point within the international climate negotiation process.

**II. Increase resilience of food systems to climate change:**

- **Increasing crop diversity and broader access to genetic resources and drip irrigation.**
- **Develop integrated land-use policies for adaptation and Integrated pest management.**
- **Recognition that enhanced food security and climate--change adaptation are closely related.**

**II. Increase resilience of food systems to climate change:**

- **Facilitate access of farmers to financial services.**
- **Promote a global food trade regime that incorporates the concept of food security and resilience of foods systems.**



### **III. Develop low-emissions agricultural strategies:**

- **Reduce land use change for agriculture.**
- **Adopt farming and grazing practices to prevent loss of soil carbon.**
- **Improve livestock and manure management.**
- **Improve water management in rice fields.**
- **Assess the contributions of various types of biofuels to mitigation and food security**
- **Support farmers to adopt technologies with multiple benefits.**

### **Bangladesh is investing in smallholders and food security**

Source: Achieving food security in the face of climate change (2012).  
CCAFS (CGIAR Research Program on Climate Change,  
Agriculture and Food Security)

- **Improving access to and tenure of land and water resources;**
- **Improving access to credit and other financial resources;**
- **Enabling private sector involvement; and**
- **Recognizing the key role of women in household food production.**



## Krystyna Stave, “Thinking in Systems Terms about Food Security”

**ABSTRACT.** Food security, sustained access to sufficient and safe nutrition for all people, depends on a complex web of interconnections. What we eat is a product of the sun, water, and soil, mediated by social and economic systems and moved around by energy, via transportation infrastructure. Disturbances in any part of the system can affect all the rest. Fundamental systems concepts such as stocks, flows, and feedback help us organize what we know about the food system and identify points of vulnerability and leverage within the system. This talk presents a conceptual system dynamics model of the food system and uses it to examine risks in the face of uncertainty in different parts of the system. The model helps identify important reinforcing and balancing feedback loops that push the system toward or away from security, as well as key stocks that help the system buffer unexpected shocks. How can a systems approach help us understand the issue of food resilience? How can we understand in a complex system where the vulnerabilities are, where the risks are, and where the leverage points for making it less vulnerable and more stable, where those might be. My training is in systems dynamics thinking. So what I am presenting here is a methodological overview of how we might use a systems approach to help us think about food resilience.

I’m going to start with a brief primer or refresher of systems thinking. The term “systems thinking” means different things to different people. The way I use the term comes from the field of system dynamics. It is a problem-based approach for developing an operational understanding. What all that jargon means is that we’re trying to understand, for a given problem, how does the system work to cause that problem? So rather than trying to solve the symptoms of a problem, we want to know how can we address the root causes of that problem. How can we leverage the connections and feedbacks to lessen or fix the problem. The approach is founded on one major premise, which is that the behavior of any given system is a function of its structure. If you accept that assumption, then the way to change the behavior of the system is to change the structure of the system causing the problematic behavior. So what is the problem with the food system? Yesterday we heard a number of things that are happening with the food system; Gerry was talking about the decline in food storage over time, others about declines in fisheries. One of the ways to frame possible problems with the food system is to think of how the system might respond to some kind of shock. One way we could measure the effect is a change in the number of calories available to people relative to what they need, a gap between calories available versus calories needed.

What do we mean by system structure? System structure is the set of all the components of the system and the way they are connected. We represent those in this particular form of systems thinking with stock and flow diagrams or we can represent causal linkages and feedback loops in influence diagrams. The second important basic assumption or basic principle in this tradition of systems thinking is that we need to extract from the complexity of the real world only the structure that’s relevant to the problem that we’re looking at. So we start with a specific problem and then describe the structure that’s causing that problem. This is the process of modeling. Modeling can be a formal process, but I use it in the sense that we all are modelers. Modeling is just simply extracting from the complexity of the real world the information that’s relevant to your specific problem. If you’re trying to drive from point A to

point B and you need to get there as quickly as possible, you extract from the complexity of the real world information about where the traffic lights are, the number of lanes on the different roads you can choose between. If you're getting from point A to point B and your goal is to show some tourists around, then you don't really care about the stoplights, you're more interested in what you're going to see on the route. So you're going to extract from the complexity of the real world the information that's relevant to the specific purpose or problem that you are interested in.

When I talk about structure and behavior, what does that mean? How is this connected? Here is one example: Say we're interested in the system of chickens and eggs. Here we see a diagram describing the relationship between chickens and eggs – the more chickens you have, the more eggs they're going to lay. More eggs create more chickens. This is a classic example of a reinforcing feedback loop for population growth. If we represent the behavior of this population of chickens as a graph over time, we start off with a couple of chickens and over time we're going to end up with lots more chickens. That's a simple relationship between structure and behavior.

Now we know that even in our simple chicken and egg world, things are more complex. So the more chickens you have, the more chickens you have trying to cross the road—the more chickens you have crossing the road—the fewer chickens you have. More chickens leads to more road crossings leads to less chickens. So what we might see instead of a simple exponential growth curve is that the population of chickens increases for a while, but then they start crossing the road, which reduces the number of chickens. This reinforcing loop leads to increases in chickens; this balancing loop counteracts the increase. And you might get oscillatory behavior between the reinforcing loop and the balancing loop. This is just one example of how we represent system structure using causal loop diagrams.

The other tool in our systems toolbox is thinking in terms of stocks and flows. In the environmental world we have all kinds of interesting stocks—stocks of resources, fossil fuels, minerals, soil nitrogen, as well as, in our case, food production, arable land. These things are variable, they change, they increase, they decrease. Human-environment systems have other stocks as well. Human population, for one, but also other aspects of the social system, such as rules that govern how we interact with the environment, or money spent for environmental compliance. Intangible things can also be stocks, such as levels of happiness, or levels of confidence in our food system.

So we know the basic principles of how stocks work, right? We all know how a bathtub works—the level of water in the stock increases as a function of the relationship between the inflow and the outflow. If we want the level to increase, we have to make sure the inflow is greater than the outflow, and vice versa.

The reason I wanted to introduce these basic system dynamics concepts is to help explain how these concepts help us think about resilience and sustainability. One way to think about sustainability is in terms of that bathtub. What if we wanted to sustain the level of water in the

bathtub? It's very simple then; we all know that to sustain the level of something, the inflow has to equal the outflow. In a bathtub, we generally make those both zero if we want to keep the level the same. In other systems we might have a steady outflow of something, then to make it sustainable we want to match the outflow with the inflow. For example, if you have a certain amount of food being consumed and you want to sustain the amount of food that's available, you need to have the same amount of food that's produced.

So that's a simple way of looking at sustainability—maintaining the level of a stock by adjusting the inflows and outflows to be the same. But you can achieve that sustainable condition with various levels in the stock. We can maintain the sustainable condition—inflow equals outflow—with a high level of food available for distribution, a high level of food storage. You can also have a sustainable condition in the case where you maintain a low level in the stock. Now the difference between those two examples, which are both “sustainable” becomes important when we start talking about resilience.

We can frame a crisis that might affect the food system as another outflow from the stock. For example, we might have a crisis that removes food out of storage. Let's say we had a failure in the electricity grid that affected food storage cooling systems in a way that some portion of food in storage that's perishable is spoiled. This could be a sudden, one-time shock to the system which removes a portion of the stock. If we started with a large amount of food in storage, we might reduce the amount to something that's non-zero that would still leave food available to be consumed, which may reduce food per capita, but still keep food available. But if we were maintaining the system with a very low level of stored food a shock might decrease this to zero, which then might increase the number of deaths in the population, potentially decreasing the labor force and ultimately decreasing the amount of food we could continue to produce.

So the different conditions for sustainability have different implications for the resilience of the system to withstand a shock to the system. Of course that's a very simplified representation, but it's an example of how you might think about it using stocks and flows.

So how can we apply these ideas to food resilience? Well the questions we would ask are, for example, what Gerry raised yesterday—what effects would climate change have on the ability to produce? What effects would it have on the distribution systems, things like that? Natural disasters, pandemics that might affect labor, both for transporting food as well as producing the food? What are the mechanisms within that system that would generate the response, and where might the leverage points be to generate a different response?

If we were to represent the problem in terms of some kind of a variable that might change, here are some of the variables we might consider:

- Average calories received or consumed per capita
- Percent of the population that has less than the minimum of calories needed
- Number of deaths by starvation, etc.

There are many ways to represent potential problems with the food system. Last spring, I had the opportunity to work with a group of 10 graduate students who were studying system dynamics. I needed to come up with a lab exercise for them, so I decided to have them take a look at this problem. I posed the question: how would we think about food security and food resilience in the U.S.? How would we represent the problem? I had them follow an approach called group model building, where we facilitate the discussion about a particular problem using the system dynamics process. We started by asking how they would represent the problem, what they thought were the indicators of the problem? We spent about an hour brainstorming, and all kinds of questions came up in this process, because there isn't one way to represent the problem of the food system. In this collaborative discussion process, you start getting the different perspectives on the problem. Some people think the length of the food chain is the problem; we should source more of our food locally rather than globally. Other people say well no ... the person from Ecuador says OK, but if you eat local then our people who produce bananas are going to have a problem economically. He asked: Do we care about the global connections and economic consequences? Others raised different points.

The next step in this process is to say, let's see if there's one, or a small set of key things that summarize the main points. They decided the key thing that encapsulated all of the problem indicators they identified was total calories available per person. We created a baseline graphed showing that over time, total calories per person has been increasing, at least in the U.S., on average. The potential problem is a crisis that would decrease the amount of calories available. Our hope is that the system would be resilient enough to recover from that crisis, and the total calories per person would increase again. Our fear is that we would not recover and ... (this line represents the minimum calories required per person) ... the fear is that the system would not recover and that the new normal would end up below the minimum needed.

That represents the problem as a trend over time. The next step in this process is to put the problem variable in the middle of a diagram and step backwards and ask, what causes that to change? Let's build out the causal relations that affect or influence the total calories per person. The total population, for example, is part of demand, so are calories available, calories required per capita, and so on. So the next part of the process was building the diagram out. The class broke into small groups and in these collaborative groups they were able to make their models more explicit, building it out in a causal diagram. This is what they ended up with after about an hour to do the causal loop diagramming.

On the one hand you could say, how is that helping us reduce the complexity of the world? Causal diagrams help you trace through connections and feedback. What we usually do in those collaborative sessions is have each group describe their map of how things are connected. In this way they're describing their collective mental model to the rest of the group. In the process people said they agreed, or offered suggestions for how it might be different. This diagram they produced would say that spoilage of food is a function of whether you can transport it from one place to another. That affects the availability. We talked through each of these loops and said well alright, is that the way that you think this works? If we are building

this model for policy analysis, other stakeholders would be involved, including experts in the various sectors.

Going back to a term I introduced earlier, the goal of this process is to develop an *operational understanding* of the system. We ultimately want to create a simulation model that represents how this works. We can translate the causal diagram into a stock and flow model. Again, this looks very complex, but really you can break it down. As with the causal diagram, we had each of the groups talk through their model with the other groups. Here we have the population, the food available to consumers, that depends on food available in retail facilities, distribution facilities, processing, raw foods produced, which is a function of land available, soil quality, food production, and so on. Again, this is a very preliminary stock and flow model. The next step would be to represent all of these connections with mathematical equations, ultimately to simulate the model and use it for what-if analyses.

How do we represent crises and shocks to the system? That's what these red arrows would be. We can think of a crisis as some kind of pulse that would affect health. For instance, a flu pandemic might decrease transportation labor. What came up in this discussion was that we're not looking at just one type of shock to the system, but there could be very different kinds of shocks to the system. One could be a single shock of short duration but great magnitude, or perhaps multiple shocks to the system at the same time, of different duration. Is the crisis short-term or long-term? Does it affect a small or large area? The types of shocks would affect the ability of the system to recover.

So how can systems thinking help us examine food resilience? It helps both specify the problem and describe the system that generates it. It helps us extract from real-world complexity those pieces that are relevant to changing the things that we care about. It is useful for individual analysis, but also provides a framework for collaboration. Finally, although the diagrams are valuable in themselves for communication, the ultimate end point is to develop a simulation model that can then be used individually or by groups to analyze what-if scenarios. What if we have this kind of shock, what could we do? What if we built up our food storage capacity, what effect would that have, how would the system respond differently? It can help identify the most effective leverage points for improving system resilience.



## Systems Thinking about Food Resilience

How can systems thinking help us understand the vulnerabilities, risks, and leverage points in the U.S. food system?

Krystyna Stave, UNLV

AESS  
June 2013



## Systems Thinking Primer I

- ST in the system dynamics tradition is a *problem-based* approach for building *operational understanding*
  - How does the system work to cause the problem?
  - How can we fix it?



## Systems Thinking Primer II

- **System behavior is a function of structure**
  - To change behavior, examine structure

*Behavior ... what's happening?*

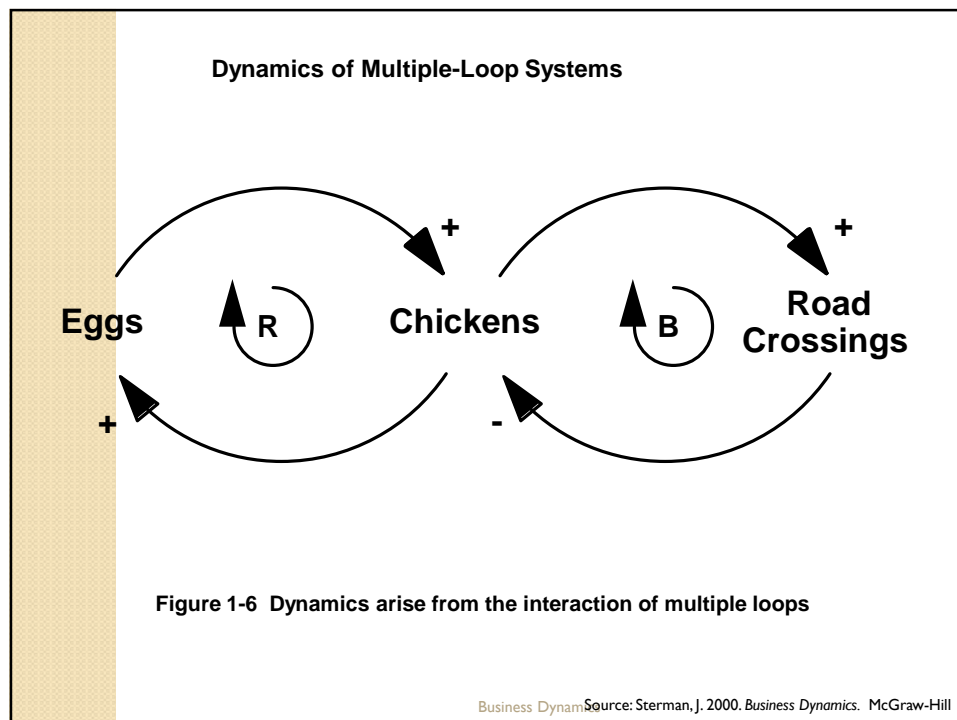
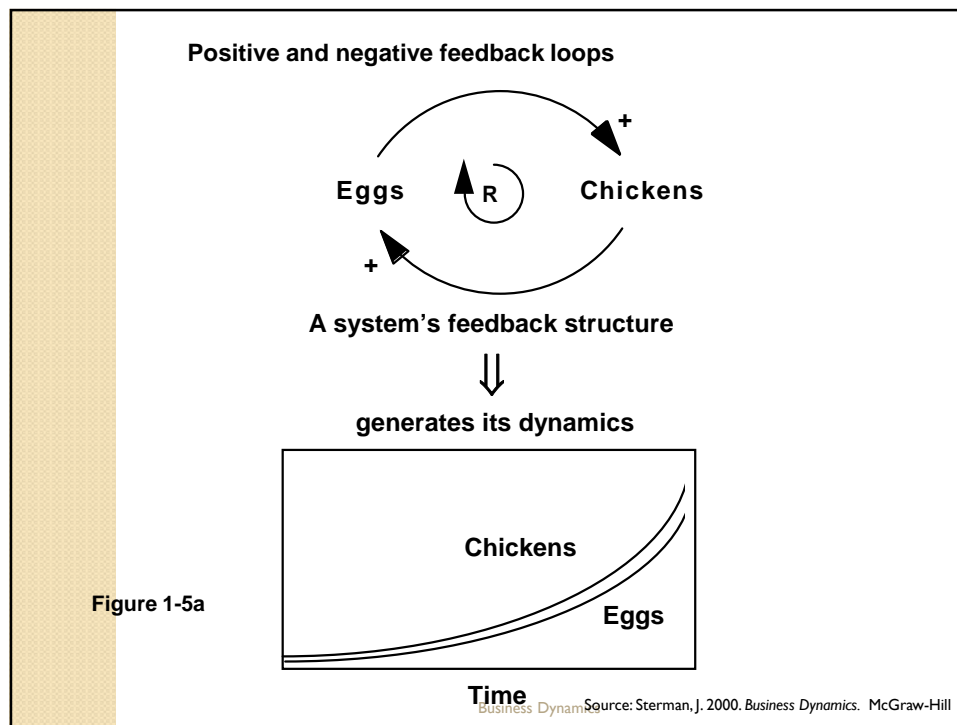
e.g. decline in fisheries  
decline in food storage  
calories available/calories needed

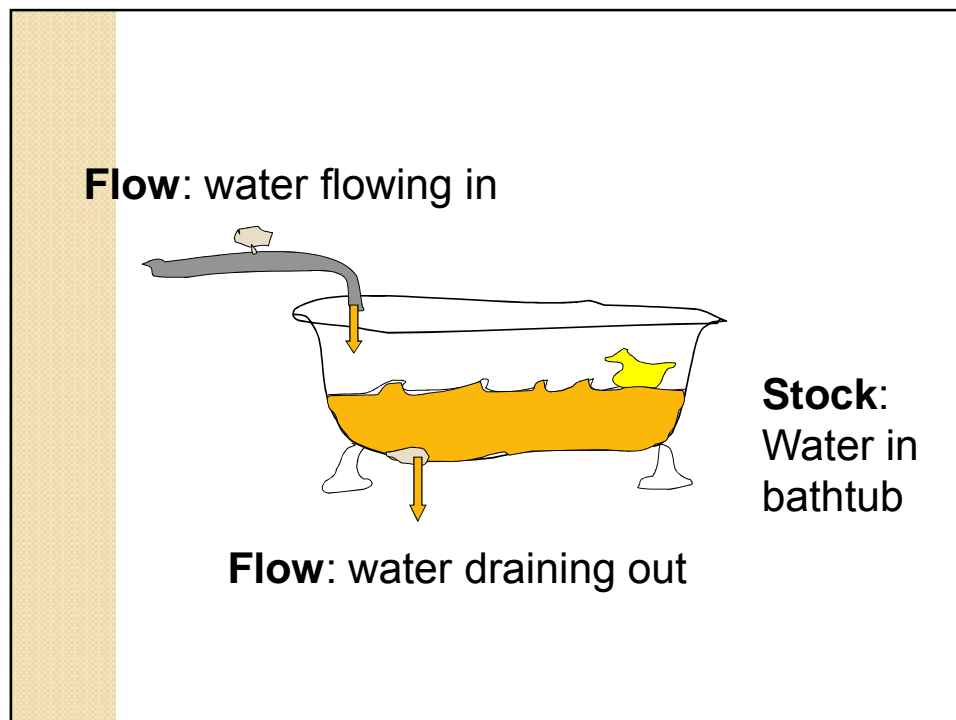
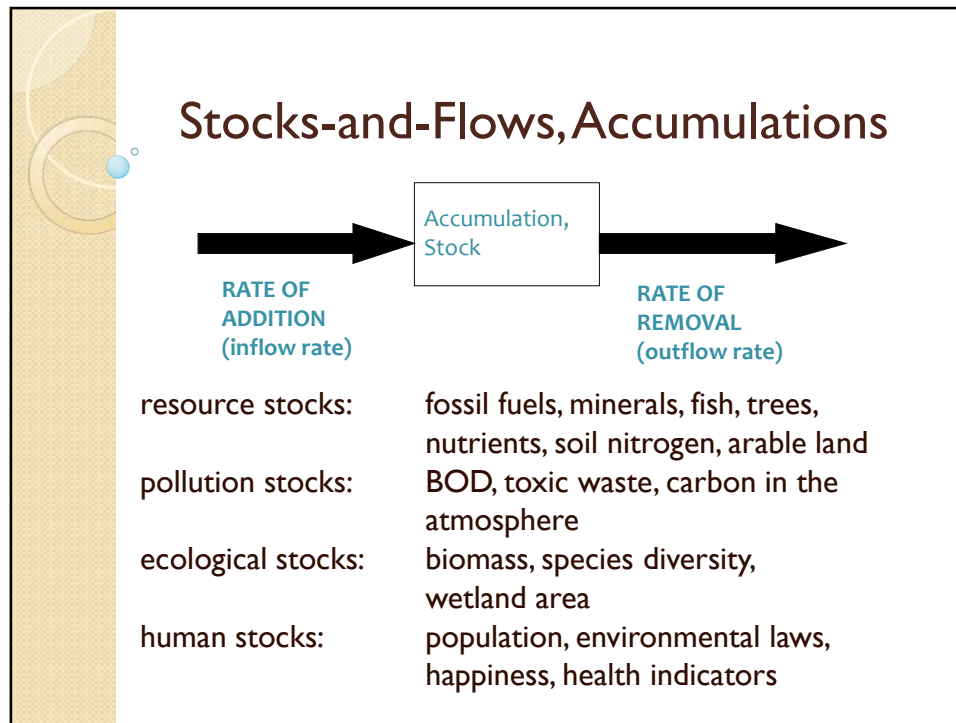
*Structure ... components + connections*

Stocks and flows  
Causal links  
Feedback loops

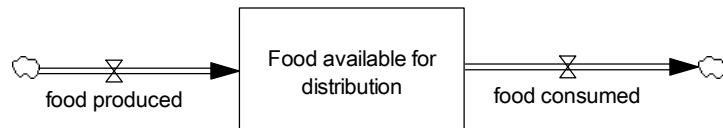
## Systems Thinking Primer III

- **Relevant structure =  $f(\text{specific problem})$**
- *Modeling ... abstracting relevant info from the complexity of the real world for a specific problem*





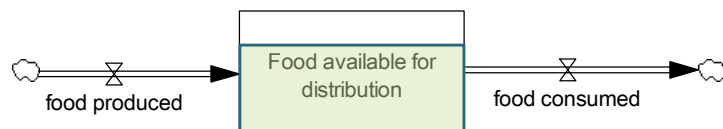
## Sustainability and resilience



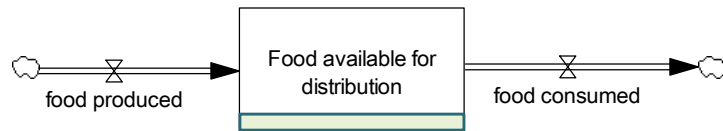
Food available is sustainable when inflow = outflow

Food produced = food consumed

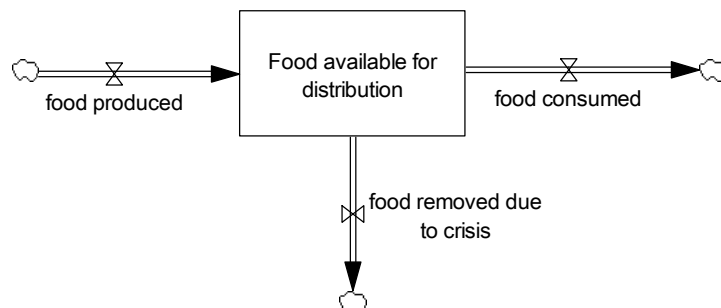
## Sustainability and resilience



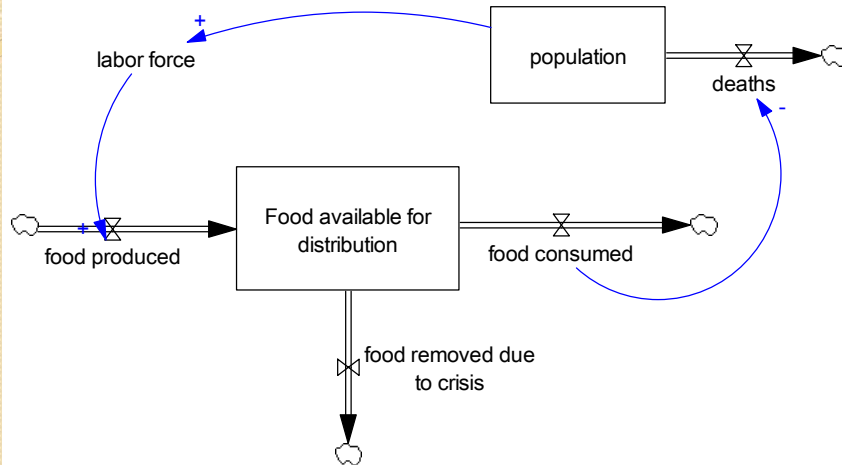
## Sustainability and resilience



## Sustainability and resilience



## Sustainability and resilience



## Systems Thinking about Food Resilience

- How would the U.S. food system respond to disturbance?
  - climate change, natural disaster, pandemic, fuel shortage ...
- What are the mechanisms within the system that would generate that response?
- What leverage points provide opportunities to change system response?

## Food system fears

What would happen to any of these variables in a crisis?

- Average calories received per capita
- % of population < min calorie level
- Rate of deaths by starvation
- Level of calorie starvation
- Level of malnutrition
- ...

## SD-based ST provides ...

- Process for eliciting and describing the relevant structure
- Tools for articulating mental models
- Tool to simulate “what if” scenarios
- Explicit, shared representation of system, boundary object, for collaborative problem-solving

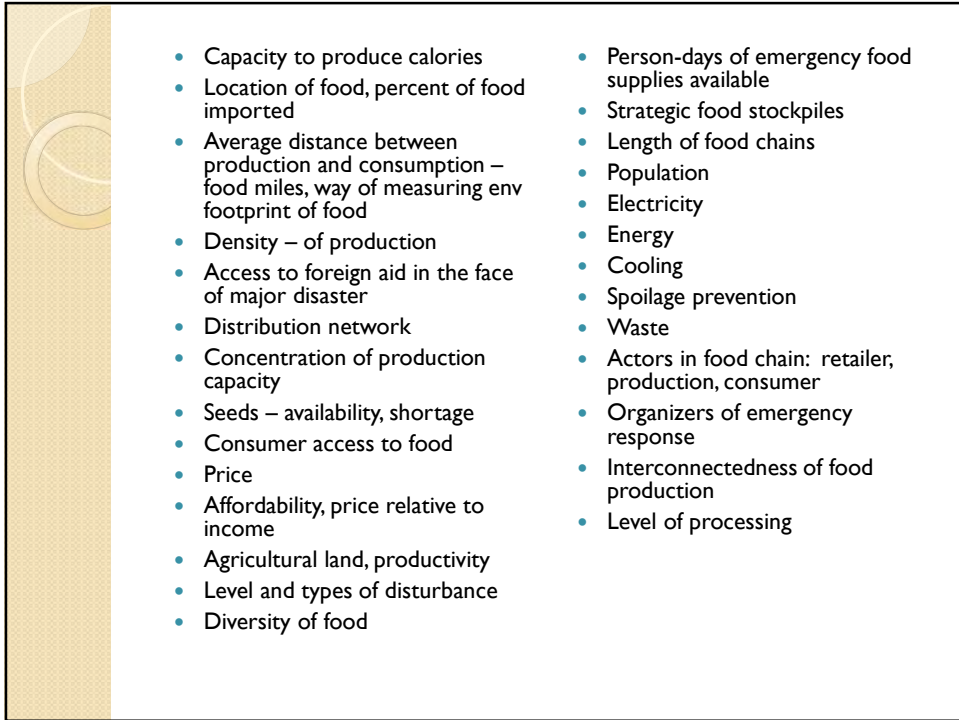


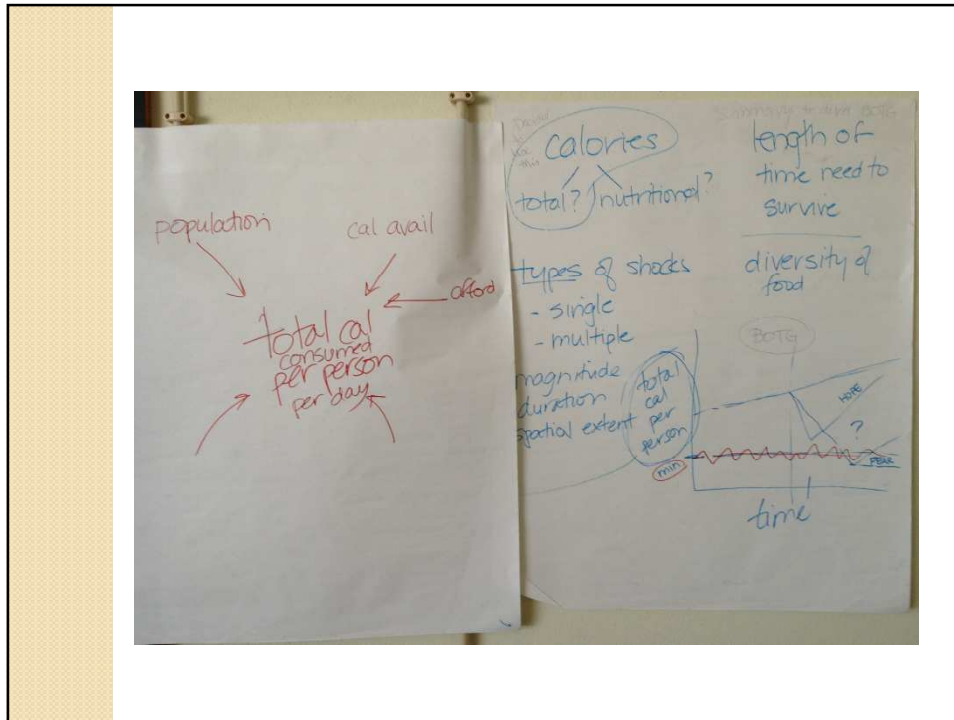
## Steps

- Identify the observed or anticipated problem
- Work backwards to describe causal structure and stock-and-flow structure
- Operationalize the model
- Use the model to identify and test leverage points

## Example of SD-style Systems Thinking Group Exercise

- 10 international grad students: Colombia, Mexico, Netherlands, Portugal, Germany, Ukraine, Russia
- Food security in the U.S.
- How do we represent the problem?





# Initial Causal Loop Diagram

The diagram is a complex causal loop diagram (CLD) illustrating the relationships between various factors in a food system. The central node is **total calories consumed per person**, highlighted in red. It is surrounded by numerous other nodes connected by blue arrows, representing causal links. Key nodes include:

- Production and Labor:** labor available for production, labor force, labor available for transportation, labor productivity, health of population, population, ratio of calories consumed to basic needs, basic calorie needs, demand for food, gap between demand and supply, excess demand, income, affordability, price, pressure to change access to food, food imports, production, technology, water, seeds, land available for production, yield, soil quality, fertilizer use, natural disturbance, ability of environment to absorb natural disturbance, effect of natural disturbance.
- Transportation and Storage:** distance to availability, length of food chains, transportation time, energy for transportation, distance to storage, energy for cooling, emergency survival time, amount of storage needed, storage, spoilage, transportation effectiveness or functionality.
- Calories and Needs:** total calories consumed, access to food, availability, labor force, labor available for transportation, labor available for production, labor productivity, health of population, population, ratio of calories consumed to basic needs, basic calorie needs, demand for food, gap between demand and supply, excess demand, income, affordability, price, pressure to change access to food, food imports, production, technology, water, seeds, land available for production, yield, soil quality, fertilizer use, natural disturbance, ability of environment to absorb natural disturbance, effect of natural disturbance.

The diagram shows a dense network of causal links, with some loops highlighted in red, indicating reinforcing or balancing feedback loops. The central node, **total calories consumed per person**, is the primary focus of the analysis.

# Initial Stock-and-Flow Diagram

## Types of shocks

- Single disturbance: natural disaster, economic crisis, fuel shortage ...
- Multiple: drought, fuel, flu pandemic, ...
- Duration: acute or chronic?
- Magnitude
- Spatial extent of area affected
- Length of time you need to survive

## Systems Thinking about Food Resilience

- Process for mapping the system
- Framework for collaboration
- Tools for “What if” analysis

## Brian Thomas, “The Social Distribution of Risk in Conventional and Alternative Food Systems”

**ABSTRACT.** Over two decades ago, Ulrich Beck suggested that modern society is defined by the distribution and allocation of risk. In this presentation I will discuss the differential distribution of risk in conventional and alternative food systems in the United States. In particular, I will highlight how conventional food systems often concentrate risk in small number of places and often place disproportionate amounts of risk upon disadvantaged populations.

This is evident in the allocation of control in production, such as the case with chicken production in the United States, where chicken farmers must take on the risk of environmental problems and disease. This is also the case with consumption where risks associated with both acute and chronic disease are often disproportionately impacting low-income and minority populations. Alternative food systems, such as Community Supported Agriculture and Fair Trade, while relatively small in terms of impact on the food system, offer an alternative way of distributing risk. In the case of Community Supported Agriculture, in particular, we see a system that shifts the distribution of risk from crop failure from individual farmers to larger communities.

The implications of risk distribution are significant for food system resilience since it highlights the differential vulnerabilities within the food system. Put simply, food systems disturbances, whether acute or chronic, are likely to have very differential and unequal impacts on different populations.

This started out that I was going to do a comparison between risk distribution in community-supported agriculture and conventional retailers. And then we had interesting discussions about that at dinner, and I kept thinking about what this framework was. And then it increasingly crept along as I thought about it and became increasingly theoretical. And I hope what it does is it sort of adds maybe some dimensions. You did a great job of simplifying certain questions. I think this is important because I think it is an important issue that's impacting people right now.

So here are my two takeaways. I'll tell you in the beginning lest you lose track. First, I think it's important to keep in mind that people are impacted differentially. I'm a sociologist, so I'm interested in stratification. So when there is a shock—however it is that we define a shock—not everybody is going to be impacted the same, right? There are always going to be people who are going to hop on their planes and fly to somewhere nicer. So that's the first thing. And the second thing is, what we decide is a shock and what we decide isn't a shock, or what we decide is a disruption or not a disruption, is going to frame to what extent are there problems now, to what extent are we sitting around waiting for problems? And who is going to be included in if it's a problem or not a problem? I think that really matters. I just made up a third one ... the third one is our perception of risk is what drives decisions. Our perception of risk may or may not reflect reality. I'm still a very strong supporter of empirical research. But our perception is what drives the decision, be it public policy or otherwise.

I'm telling you that to introduce the Zombie Apocalypse. (Some of you laughed.) Because I think that we have this growing perception that there is this coming apocalypse. OK, maybe I have one friend who is in fact preparing for the coming apocalypse. If I was really paying



attention I would have put a third one up, which would have been the U.S. Homeland Security, ready.gov, I think it is. CDC. I mean, don't you guys have this feeling that you are supposed to prepare for something? It's like the Boy Scouts ...

I think it's important to keep in mind this idea of risk perception and how society is going to organize to deal with these risks. Because we're already doing it, right? So even when we were out to dinner last night and there were some comments about don't eat meat that is undercooked, or something like that? Why do they do that? They do that because there is a cultural value that's embedded in the statement that says individuals are supposed to be responsible for what you eat. You as an individual ... it's not the restaurant's job to make sure that food is safe, at least in terms of cooking the meat thoroughly. It's your job to make sure that you don't order meat that is undercooked. It is about allocation of risk and not about the probability with which you are actually going to get *E. coli* or whatever it is from consuming that meat.

And then there's power in this, right? That's the important part, to talk about power distribution.

OK, so that's the sort of general introduction. The three things I really want to talk about is Ulrich Beck's theory of world risk, what the implications are for food resilience, and then compare risk in conventional and alternative food systems.

This is where I'm taking it from: I'm taking it from Ulrich Beck. He's a famous sociologist who wrote in the '80s, originally in German. Not that I can read German, but translations. A few things that he highlights: within contemporary society risk is manufactured and not natural. So even when things like Hurricane Katrina take place, it is perceived as being a manufactured risk. It's a result at least in part of the manufacture of climate change, right? Anthropomorphic causes. This is in contrast to previous generations where it was allocated to perhaps a divine entity, or it was just written off as a natural disaster. It's not something that just happens; it's now the product of some human action that we could then theoretically mitigate.

Perception matters in many cases more than actual probabilities. So, the NSA spending all its money to keep an eye on us but we're going to cut funding for food stamps, right? A lot more people are going to be impacted, I promise you, right, empirically in terms of people getting sick and dying, and things like that. People are going to be impacted more by the lack of access to Medicare, the lack of access to health care, the lack of access to food, than they are by terrorist attack, right? But how many of you flew in ... how many of you took your shoes off or did something ridiculous like that because of the perception of risk.

Based upon this Beck is suggesting that power distribution in society is going to be based upon how we allocate, how we define that risk. Who has the ability to define perceptions of risk. And this is why I think this stuff is extraordinarily important because what we're doing, at least in my perception, is relatively new, and how we define that risk then has implications for how power is going to be distributed in society. That's a big deal; we should all take that seriously.



So I don't think we should have this discussion of how we are going to define this stuff in a casual manner, because I think it has—at least Ulrich Beck would suggest that it has—some implications on how this is going to play out in the future.

And also—I think this is kind of important—he suggests not necessarily that this is a good thing, he's just trying to describe his perception of reality. What we have found security in the past—the government or science or the economy—we're losing faith in. People are less likely to participate in political activity, that's empirically true. Actually faith in science I think is now questionable. This doesn't say science is a bad thing; it's just, again, describing perceptions, right? And at the very least I think there's some recognition since 2009 that our security in the economy is tenuous.

So what are the implications of this for food resilience? I like the systems framework. I think it's a great way of inserting ... trying to pull all of this stuff together. I think that it's important, though, that we not simply think about the shock, but that we think about the causes of the shock. The causes of the manufactured risks. So if we're going to add another layer of understanding to this, we need to also address, or at least be giving some thought to, what's manufacturing risks. And again, we need to make sure that we're careful about what we define as risk. I'm going to touch on this in my CSA example, because we have a food system now and there are existing shocks, and there are people paying the price for those shocks. And I think it's important though that we then begin to frame is this what we're talking about? Or is this not what we're talking about?

Don't forget: don't order raw meat. I don't know, am I being too grandiose? It's a question: do we want to make these individual responsibilities? If there is some sort of shock and people are starving, they should have stockpiled rice in their closet. Do we want to organize society in that fashion? That is one way of answering the question. Do you want the government? Your neighbors? I don't know.

OK, so, can we apply this? Can we take that theory of risk and do anything at least vaguely empirical about it? I actually think we can do stuff that's more empirical. I'm not at that stage, but ...

I want to do a little bit of comparison of community-support agriculture versus conventional food systems. Do you guys know what community-supported agriculture is? Subscription agriculture.

What I think is notable and I think is interesting about CSAs is that they are resistant ... this is again dependent on definitions ... they are resistant to some forms of shocks, right? This is part of the plug that people make often in terms of why community-supported agriculture is a good idea. In fact, it's part of the reason it started in Japan. People prepay, so if moles come in and eat all of your carrots, then the community that's going to pay the price. But if you are doing nothing but growing carrots, and you suddenly have a mole infestation and they eat all of your

carrots, and all you do is grow carrots, and you've invested all this time and money at the outset preparing your fields and planting your carrots, and then your carrot crop fails, then you're out everything. It's a single individual that is suffering the consequences, taking on all of the risk.

But in the CSA format, now you've got, theoretically, because people have stepped in and they've paid their money at the onset ... and usually these CSAs, and I think probably every CSA I've heard of, has a diverse crop mixture. If there is a failure, not only is there only at least more likely to be limited in terms of the crops, but also it's spread throughout the community, right? Because everybody already paid upfront. So now that you've paid, you're out of your carrots, but it's distributed.

We are also seeing a number of CSAs fail, and in fact this is part of why the USDA struggles with trying to keep track of the number of CSAs in the United States. Because they come and go so quickly. In fact, most CSAs ... there are a few exceptions out there ... most CSAs are certainly far too small to absorb the shocks of the economic system. There's a CSA that is Michigan, they couldn't absorb the shock of losing ... actually, it's more of a community garden that suffered this ... they couldn't absorb the shock of loss of land ownership. These are shocks to the system, right? In the political process somebody gave them the land, somebody took the land away. They couldn't absorb the shock. The CSA went under.

So it really matters how we're going to define this stuff. It's a real struggle to provide every week a variety of products that people are going to want. I'm from Michigan and we can't grow stuff all year long.

CSAs are only a small part of the food system. Even people who are part of CSAs get relatively little of their food from the CSA, in terms of calories or whatever it is. Most of us get our food from grocery stores. These are complicated system, it's not direct.

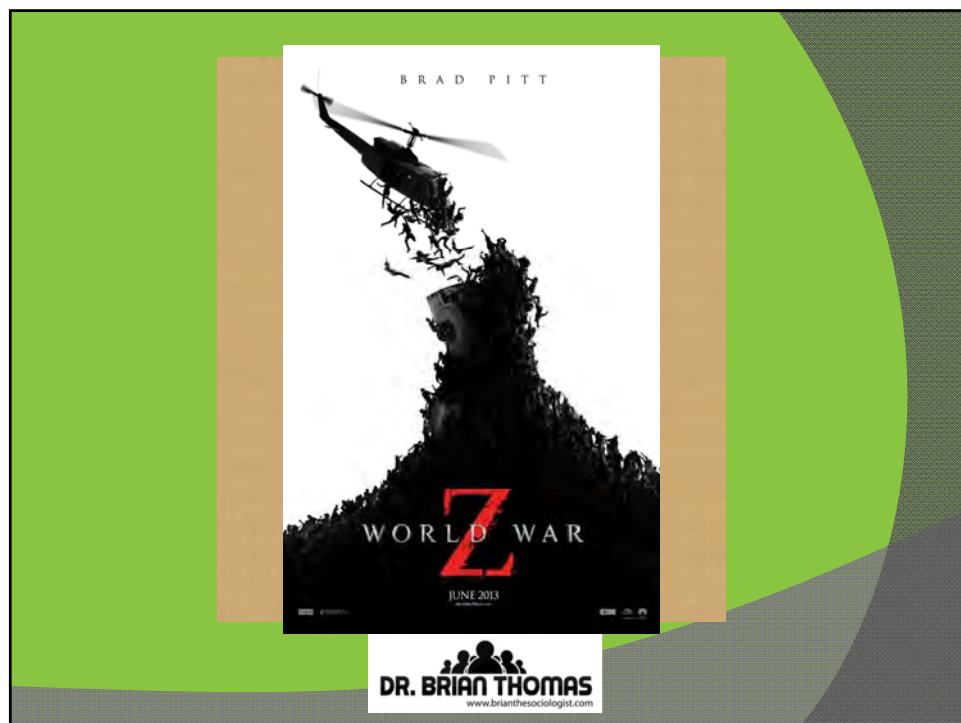
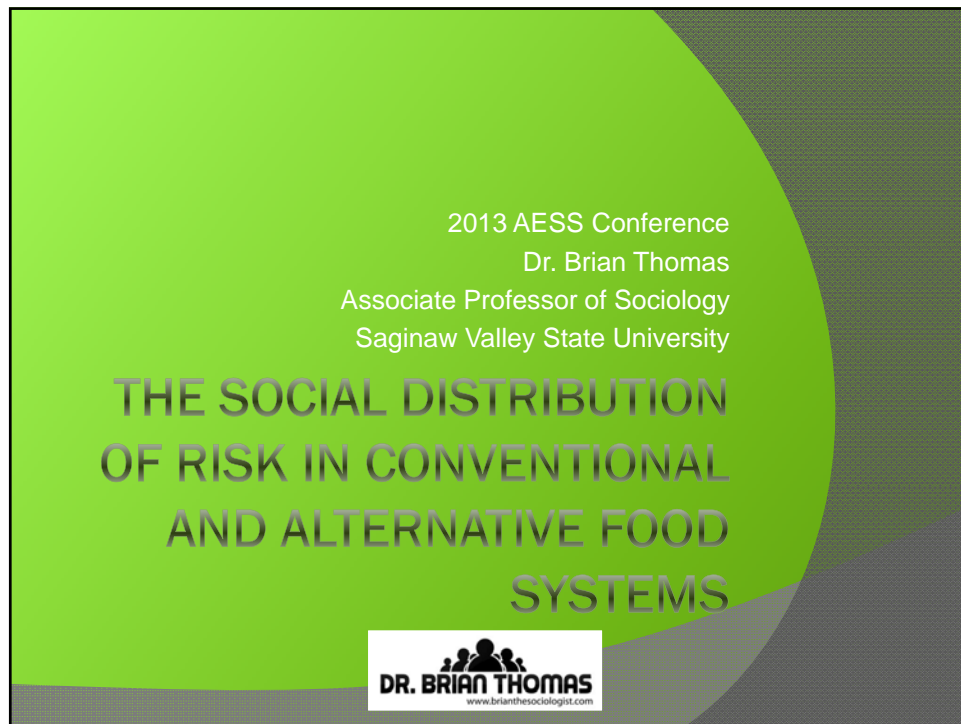
On average Wal-Marts are 187,000 square feet and have 142,000 different items ... who wouldn't want to go to Walmart, with 142,000 different items?

Large food retailers are resilient to some things. Who cares if they just had this major spinach recall? We still have plenty of food, right? They can recall beef, they can recall lots of things. We're hardly starving as a result of it. We'll just switch to a similar product. But I would say it's not necessarily resilient to other things, if we are to frame food resilience in the correct fashion. An example of the lack of resilience of the conventional food system, depending on how it's framed, right? And I use food deserts as an example of this, right? I'm from Saginaw, Michigan, somewhere around 40,000 people. It's kind of the same story in Michigan—manufacturing decline, inner city decline, lack of food retailers in the center, a lot of racial stratification, a lot of poor people. And what you see in the dots is based on the size of the grocery store. What you see is, around the outer rim you see much larger big box retailers, and in the inner city you see food, but you don't see necessarily quality food. What you see is fast food chain restaurants and you see a lot of alcohol for sale. Party stores, convenience stores. Particularly

now, most definitions of food deserts use a 1 mile radius definition. In the city of Saginaw, nearly 15% of the households in the city do not have an automobile. So who really cares if it's 5 or 10 miles away, if you've got a car. If you don't have a car, then it matters a little bit more, right?

The risk society theory suggests that increasingly we are pushing risks off onto individuals. So the threat of food resilience should be handled by people as individuals; we should not organize society in order to absorb these risks.

So I think that framework provides at least some way, some dimensions, that we need to look at in terms of this. Because I think depending on how you frame risk, depending on how you frame resilience, and depending on how you frame shocks, that's going to have an impact on the kinds of problems that we're shedding light on and the kind of solutions that we're pursuing. And I also think it's important—and this is maybe part of Beck's larger argument in terms of where society in general is going—I think it's important that we have that discussion. Because if we don't have that discussion there's sort of an *a priori* set of theories that's going to be implied, then if you at least agree with individual risk allocation, then individuals should deal with it. And I think that, again, if you agree with that, that's going to be how food resilience should be dealt with. And if we don't agree with that, if we think that there should be other strategies, or at least additional strategies that should be applied towards dealing with food resilience, then I think we need to start having that conversation right now to make sure different definitions are part of the broader conversation.



## A quick question

- Why does fresh meat have a warning that it needs to be cooked thoroughly?
- A short answer: Because food producers have successfully defined food safety in meat as the responsibility of individual consumers.
- The point? There is power in how risk is allocated.



## Today's topics

- Beck's Critical Theory of World Risk
- The implications for food system resilience
- Unequal resilience: a comparison of community supported agriculture and the conventional food system.



## 4 points from Beck that matter to food resilience

1. Risk is manufactured (e.g. Katrina was a product of human induced climate change.)
2. Perception of risk matters more than probability of risk (e.g. the NSA watches us while we cut funding to SNAP.)
3. Power in a risk society depends on the “relations of definitions” and the staging of risk (e.g. decision-makers and holders of risk may not be the same).
4. Beck states “the three pillars of security are crumbling – the state, science and the economy are failing to provide security – and are naming the ‘self-conscious citizen’ as their legal heir (2007: 45-46).



## Food resilience in the World Risk Society

- In addition to examining the ability of food systems to recover from disturbance, we must address the causes of disturbances.
- We must consider the implications of how and why we define resilience as well as how and why others define resilience.
- We need to consider the relationship between individual and social obligations.





Does Beck's theory have implications for real food systems?

## Community supported agriculture versus conventional food retailers



## What is a CSA?

- ◉ Community Supported Agriculture—create linkages between producers and consumers
- ◉ Brought to the U.S. from Japan in the early 1980s
- ◉ Shareholders purchase shares of produce before the growing season
- ◉ Share price ranges from \$200 to \$900
- ◉ One share usually feeds approximately 4 people
- ◉ Farms service from 5 to 300 shares





## CSA's are resilient to some acute disturbances.

- Prepayment means economic impact of crop failures is spread throughout the community.
- Diverse production means single crop failure is less problematic.
- Social ties between producer and consumer facilitate long-term investment.



## CSA's are not resilient to other disturbances (e.g. long-term economic)

- In most cases, CSAs are too small to provide full income for farmers.
- Resource limited consumers cannot participate.
- Most CSAs do not provide sufficient variety of products for consumers.



## Beck and CSAs

- The resilience of a CSA may depend on how you define disturbance.
- In contemporary society, short-term economic resilience matters more than environmental resilience for producers.
- CSAs may provide some relief to consumers, but are generally only utilized by relatively affluent consumers.



In contrast:



## Conventional retailers

- Most people purchase their food from large “big box” retailers.
- Food generally moves from producer to processor to distributor to retailer.
- Scale is large and relationships between links are largely economic.
- Walmart supercenters average 187,000 square feet, employ 350 or more associates on average and offer 142,000 different items.



<http://news.walmart.com/news-archive/2005/01/07/our-retail-divisions>

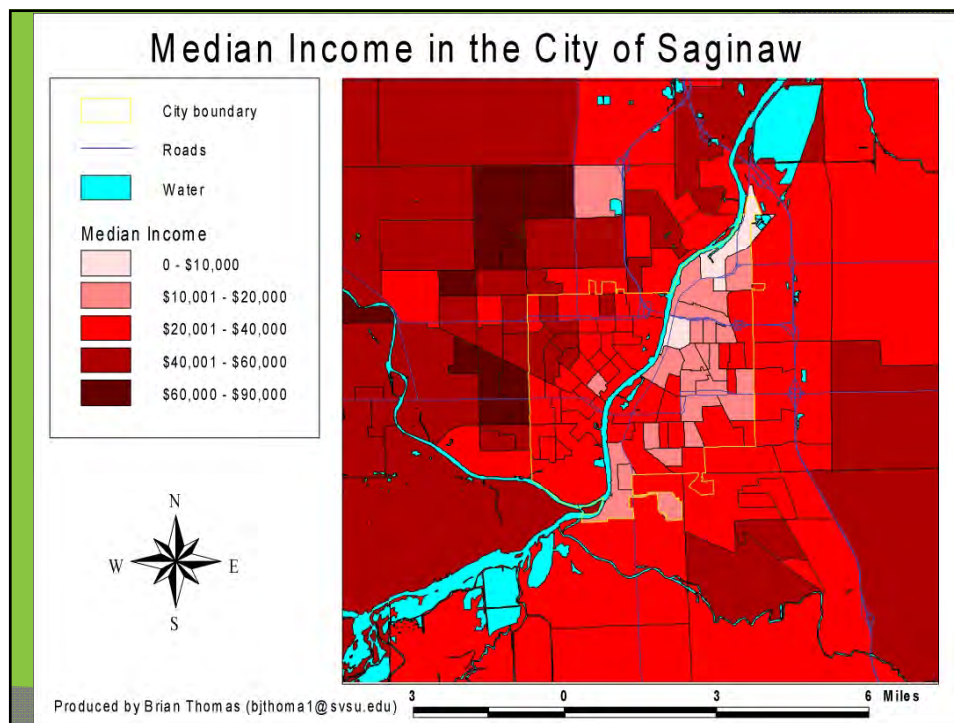
## Conventional retailers are resilient to some disturbances.

- In Feb. 2013, spinach was recalled (again) across 39 states in the US, but this hardly impacted food supplies.
- Rising commodity prices have a relatively low impact on many products.
- The conventional food system is not resilient to other disruptions (e.g. rising social inequality) however, this is NOT typically seen as a risk.

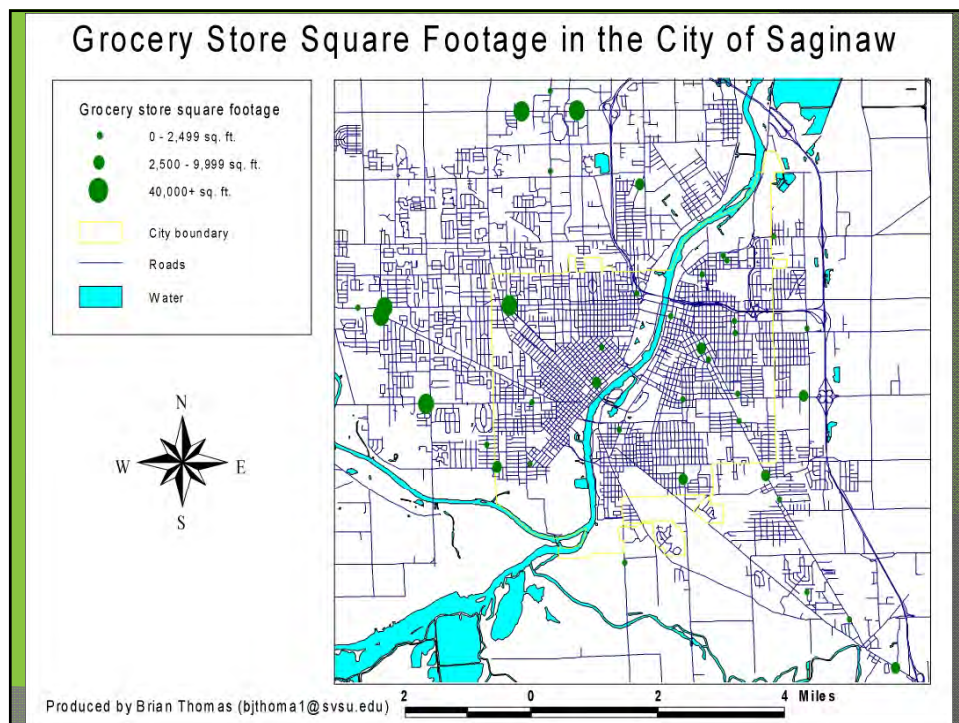
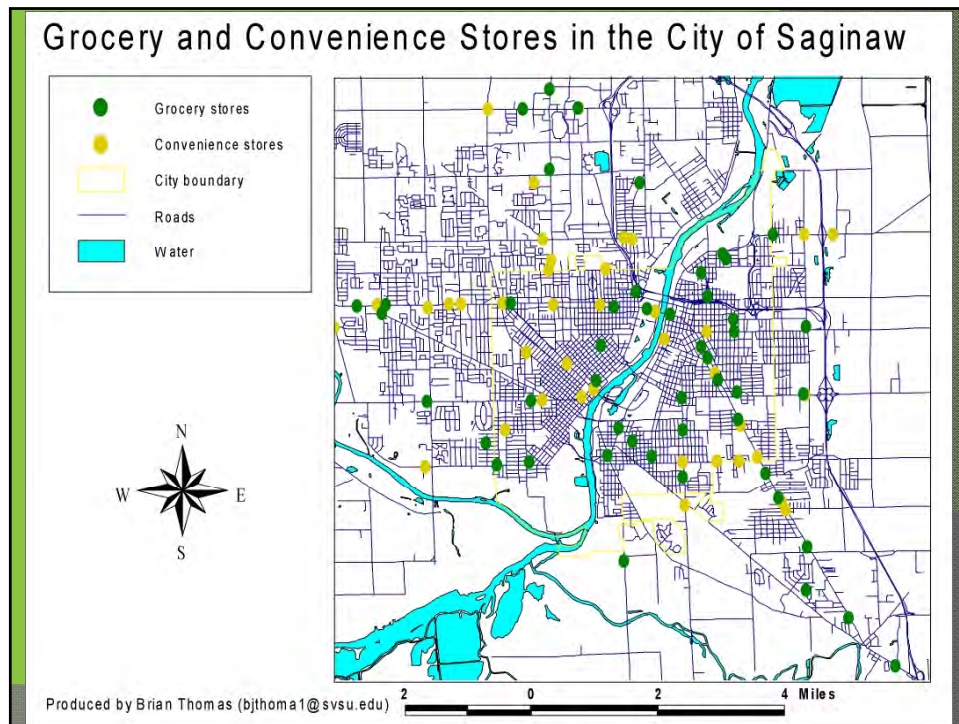


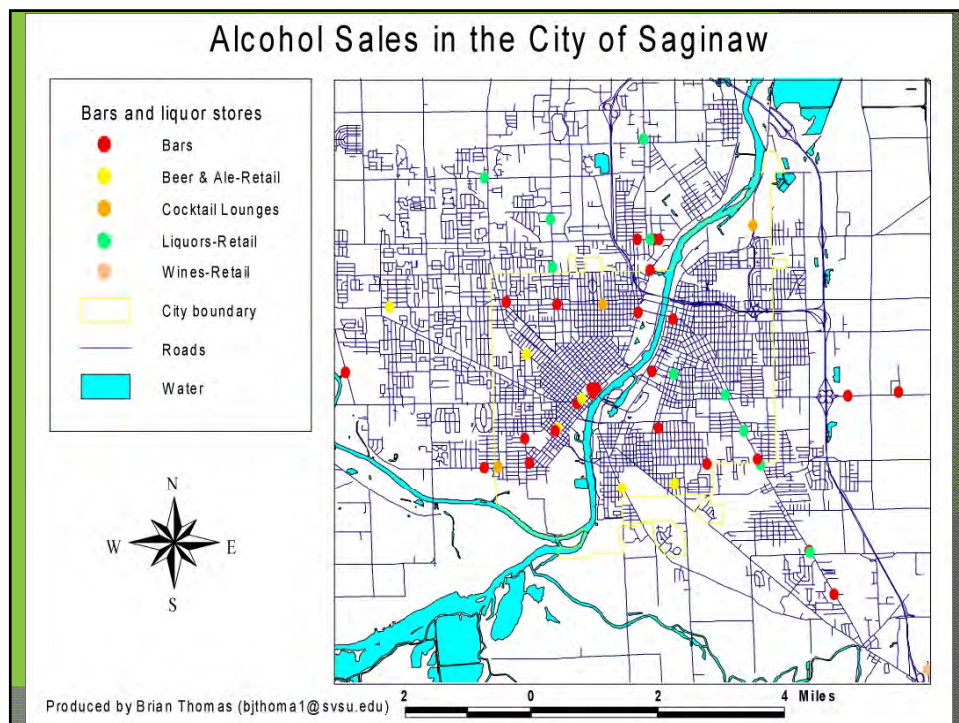
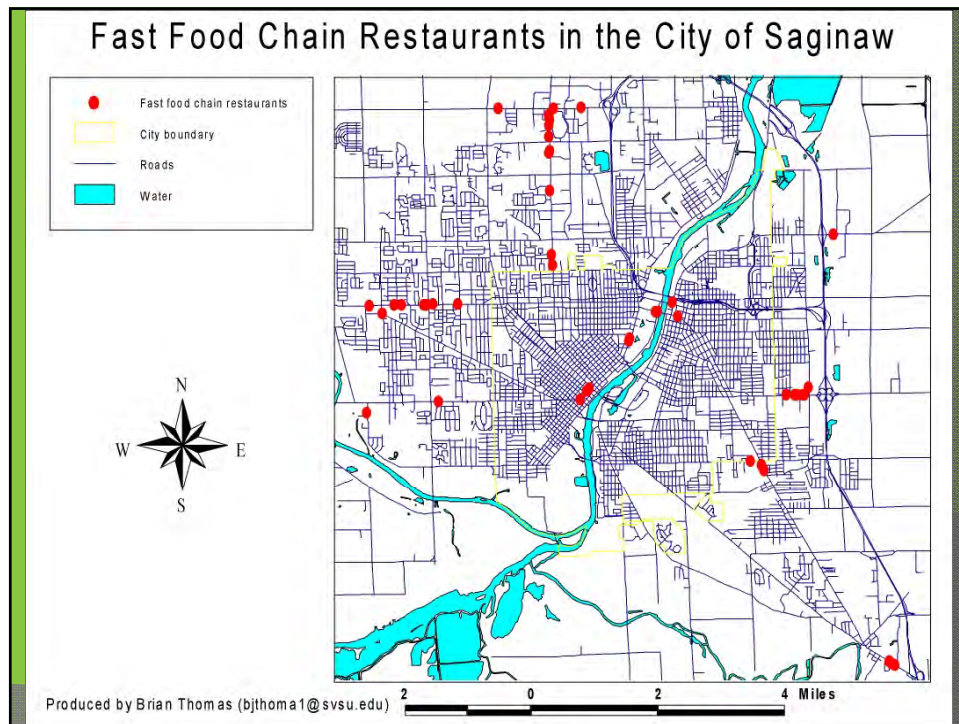
## So who frames the definitions?

- According to Beck, it is experts and counter experts.
- In the conventional food system, retailers have a primary role.
- Consider the debates about climate change and biotechnology.
- My concern is that current framing may exclude existing disturbances within the conventional food system.









## A bit more on food deserts...

- ◉ Distance influences
  1. How much we pay for food
  2. The type of food we buy
- ◉ In the city of Saginaw
  - 14.7 % of households do not have a car
  - 24.7% of families live in poverty
  - 25.6% of people 21 to 64 reported a disability



## Food deserts are not a disturbance in the Risk Society because:

- ◉ Individual problems (e.g. poverty) need to be resolved through the “self-conscious citizen.”
- ◉ Until relatively recently the food system was not problematized because there is “enough” food in the US.





## Conclusions

- ◎ I think that Beck's theories offer some meaningful contributions to a discussion of food resilience:
  1. In addition to assessing food resilience, we need to examine how and why current actors are defining resilience and risk in particular ways.
  2. We also need to consider how these definitions impact both the distribution of food and the distribution of risk.



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## Questions?



## Kip Curtis, “Food System Counter-Interventions: Addressing the Impacts of Poverty in Inner City St. Petersburg”

**ABSTRACT.** The Edible Peace Patch Project (EPPP) seeks to address the impacts of racism and poverty in the south side community by undertaking food system interventions in south St. Petersburg, Florida. The USDA has diagnosed several food deserts in some of the south side neighborhoods, and the neighborhoods that have grocery stores do not get the quality produce and healthy food offerings that more affluent neighborhoods receive. There are high levels of obesity and diabetes in this area. Good food is not available and the people who live in these areas suffer from it. In the midst of a national conversation about these food crises, it was just announced that Sweetbay, the only full service grocery store to serve the south side has announced that it is closing. The south side of St. Petersburg, the black part of town during segregation during Jim Crow segregation, suffers from the segregation of race and poverty. The schools in this part of Pinellas County reflect the condition of their community; the childhood poverty and the dropout rates are the most visible symptoms. Race continues to play a role in shaping oppression in St. Petersburg, Florida, shifting from the overt segregation of the Jim Crow era, to the spatial segregation of poverty and structural racism. Teen pregnancy is up, student test scores are down, and school dropout rates reflect a public system that is not succeeding at retaining its most at-risk youth. This is unsustainable by any measure. The Edible Peace Patch Project builds edible educational schoolyard gardens in Title I schools in this neighborhood to address some of the impacts of these conditions.

SLIDE 1 Photo of St. Petersburg	This is a story about doing something. In 2006, I came to beautiful St. Petersburg, Florida to be a college professor. To teach environmental studies. I was interested in sustainability. In a sustainability that balanced social and environmental issues.
SLIDE 2 Map of ten lowest performing districts	I quickly learned that St. Petersburg showed up as a data point on a national map. My new home had a nationally significant LOW graduation rate. Scoring alongside Detroit, Baltimore, and New York City. At the bottom.
SLIDE 3 Map with supermarket circles	St. Petersburg appears on another national map. This one produced by the USDA. It has large Food Deserts across the community. Food deserts – a problematic but helpful designation – where no supermarket exists within one square mile (10 square miles in rural food deserts). St. Petersburg more recently has a growing Food Desert geography as Sweetbay supermarket recently closed its two full service supermarkets. In the same area of my community where dropout rates are so high. Both of these circumstances in St. Petersburg.

SLIDE 4 Chart with childhood poverty rate.	Both the dropout rates and the food deserts are functions of poverty and racism. They are impacts of poverty and racism. We talk about a coming disaster – Transition Groups and Environmental prognosticators. But this disaster exists today, has existed for decades. Poverty and racism has lead to poor diets and limited job opportunities.
SLIDE 5 Ghandi with quote.	When I came to St. Petersburg in 2006 interested in sustainability I didn't come with a plan. I knew wanted to balance social and environmental issues. And dropout rates were a social issue. And food security was an environmental issue. And I was going to do something.
SLIDE 6 Three pictures of Lakewood.	Then, in 2008, a new wave of gardening ambition arrived as fresh ambitious young students wanting to grow food. When some of them learned I was raised on a sustainable farm by back-to-landers and knew how to farm, they begged me to teach them to grow organic food. I was then a parent with kids enrolled in an at-risk elementary school, So, after some coercion, we convinced the principal to let us build a garden there. And we used the garden to mentor elementary students. And we grew food. We had a naming contest in March and chose our favorite entry, submitted by Ms. Ash's 4 <sup>th</sup> grade class: The Edible Peace Patch Garden.
SLIDE 7 Harvest Festival pictures	When we held a harvest festival in May 2009. At a school where we were lucky if one parent showed up for the PTA meetings. More than 200 people attended. The elementary school children brought their parents, to show off <b>their</b> garden. And my college students served home-cooked dishes made from the homegrown food.
SLIDE 8 Image from Google Earth	Since the spring of 2009. We have been visible on Google Earth, symbolizing our permanence. We have developed a 12-week standards-based educational program for the school. Connecting academic mentoring to the cultivation and harvest of

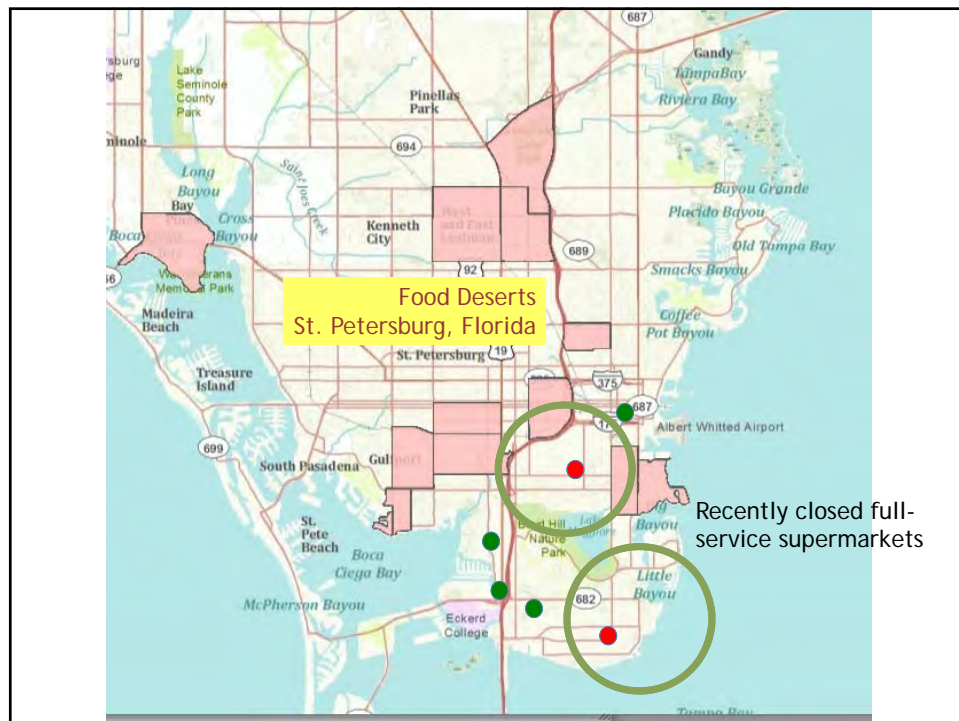
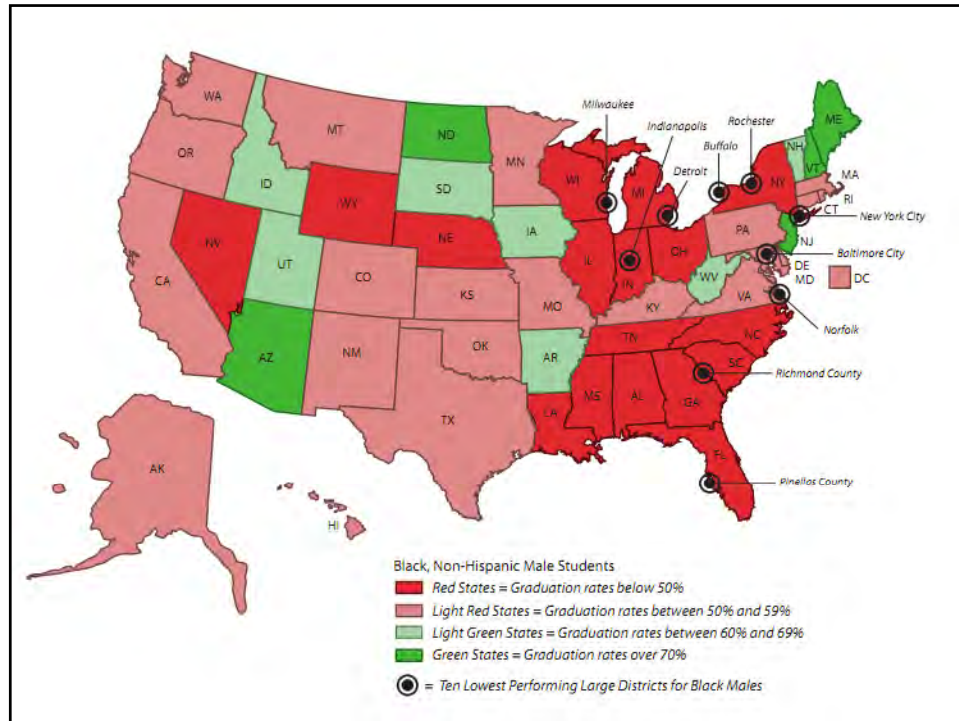
	<p>fresh food.</p> <p>We already see higher science and math scores.</p> <p>We already see kids staying in school.</p>
<p>SLIDE 9</p> <p>Slide EPPP Logo</p>	<p>In 2011, just over two years ago.</p> <p>We organized a 501(c)(3) named after the beautiful name Ms. Ash's 4<sup>th</sup> grade had provided the Edible Peace Patch Project.</p> <p>Because we believed that if it worked at one school, it could work at many.</p> <p>I knew as a parent of elementary school kids that learning well and eating well went hand in hand.</p> <p>And I believed that no child should be without that combination.</p>
<p>SLIDE 10</p> <p>Slide of Sanderlin installation.</p>	<p>We starting raising money and by January 2012.</p> <p>We had enough to add a second Peace Patch garden that we built in the schoolyard of the Sanderlin Elementary School.</p> <p>140 people turned out to volunteer for the installation.</p> <p>The Harvest Festival at Sanderlin drew 300 people that May.</p>
<p>SLIDE 11</p> <p>Slide of Campbell Park</p>	<p>And success begat success.</p> <p>In 2012 we were awarded a Rays Baseball Community Grant.</p> <p>And this past January with two Rays players, fifteen Rays employees, and more than 50 volunteers.</p> <p>installed the third Edible Peace Patch Garden at Campbell Park Elementary school.</p>
<p>SLIDE 12</p> <p>Slide of Maximo</p>	<p>And we didn't stop there.</p> <p>The Tampa Jaycees provided us a third garden grant in 2012.</p> <p>And they, along with other service-oriented non profits and several dozen additional community volunteers.</p> <p>Helped us to install a fourth Edible Peace Patch Garden at Maximo Elementary school.</p>
<p>SLIDE 13</p> <p>Drawing of Modified Hugelkultur Technique</p>	<p>So, what exactly are we "installing" here?</p> <p>We have developed and adapted a technique that contends with the absence of soils in Pinellas County (most of Florida south of Gainesville in fact).</p> <p>And that take advantage of climate patterns and an overproduction of organic waste in St. Petersburg.</p> <p>Crops grow in Fall and Spring in St. Petersburg (it's too hot in the summer time).</p> <p>But 90% of the seasonal rainfall drops on the ground during the summer.</p> <p>So these beds are designed to capture and hold that summer water into the right season. (Impermeable layer creates a basin.)</p> <p>The city pays upwards of \$800,000 a year to haul away organic mulch, ground up remnants of homeowners' yards.</p> <p>And dozens of fish packers businesses throw away tons of shells</p>

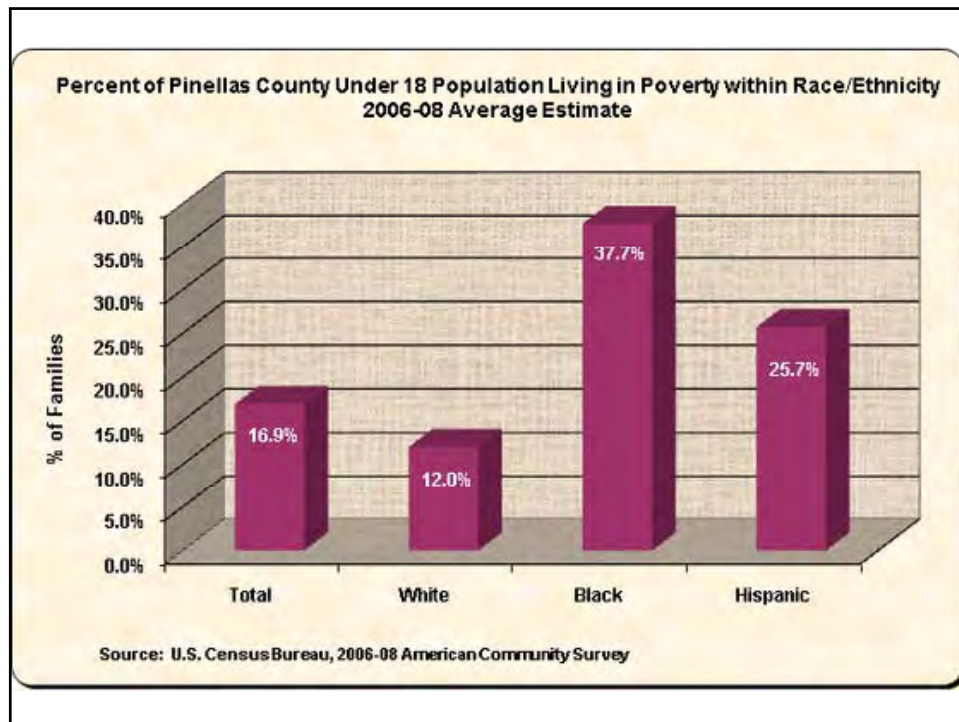
	and parts and bones, wonderfully rich organic material. Mulch, fish bones, and organic compost build and amend our beds.
SLIDE 14 Picture of all four gardens.	Since January 2009, we have installed four schoolyard gardens in south St. Petersburg. In a harsh climate, we build sustainable garden beds that grow 35 different fruits, vegetables, and herbs. And in them we provide educational mentoring and health and wellness activities.
SLIDE	All of them are now visible on Google Earth. Baseball (kids there too). Water molecule.
SLIDE 15 South side with all schools.	We are raising money to build four more schoolyard gardens in south St. Petersburg. Offering educational mentoring and wellness activities to all of the Title 1 schools south of Central Avenue. Launching the first part of a local food system project.
SLIDE 16 Slide with three parts	Over the next five years, the Edible Peace Patch Project intends to build a farm to plate food system in south St. Petersburg. Connecting food literacy to higher educational achievement. Connecting a sustainable local urban food system to community development.
SLIDE 17 Schoolyard Garden Program slide	In the gardens, community volunteers will continue to mentor at-risk students. Together they grow and sample a crop of vegetables. Together they cultivate food literacy and community investment in education.
SLIDE 18 Urban Farm Program	Schools with food literate children can then justify purchasing locally grown healthy food. Which we intend to grow on an urban educational farm on fifteen-acres of open space on the south side. A farm that will also serves the educational and skill building needs of a community suffering economic <i>underinvestment</i> . We will work with several hundred youth and young adults incarcerated for petty crimes and released back into the community without social support, or hope. We will offer educational opportunities in urban agriculture, food system education, and food literacy for college students around the country.
SLIDE 19 Food and Wellness Center	Re-investment also includes a food and wellness center to develop and produce value-added food items for cafeteria and commercial sale connecting our local produce and healthy meals. Teaching health and nutritional literacy, and providing food.

	<p>Providing the skills base for all participants to take conscious and careful control of their own food choices.</p> <p>And cultivating new forms of entrepreneurial experimentation for the emergent green economy.</p>
<p>SLIDE 20</p> <p>Final slide</p>	<p>Food system development as experiential education and community development.</p> <p>Cultivating social capital and foster community development (from the inside out).</p> <p>The Edible Peace Patch Project aims to put St. Petersburg on a new national map.</p> <p>A national map of improved education.</p> <p>A national map of innovative problem solving.</p> <p>A national map of sustainable communities.</p> <p>Thank you.</p>



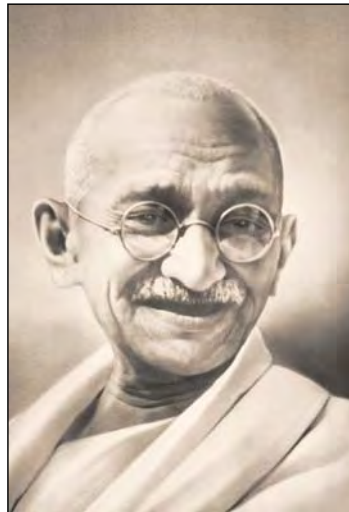






“You may never know  
what results come of  
your actions, but if  
you do nothing no  
results will come.”

*Mahatma Gandhi*





Lakewood Elementary  
Edible Peace Patch Garden

Installed January 2009



Lakewood Harvest Festival  
April 2009







Lakewood Garden

GoogleEarth

Spring 2009



Founded 2011



Sanderlin IB World School  
Edible Peace Patch Garden

Installed January 2012

Campbell Park Elementary  
Edible Peace Patch Garden

Installed January 2013



#### Neighborhood news

### Pitching in for a school's new garden

Volunteers with the Tampa Bay Rays organization recently joined students and other volunteers to build the fifth of a series of community gardens as a part of the Edible Peace Patch Project. This garden is at Campbell Park Elementary School. Others are at Lakewood and Manatee elementary schools and Sanderlin IB World School. Kip Curtis is the executive director and founder of the Edible Peace Patch Project. One of his goals is to have a garden at every elementary school in southern St. Petersburg. "The underlying premise is the experience will get kids to stay in school and stay healthy," Curtis said.



Rays pitchers Brandon Gomes, left, and Alex Cobb put their muscles to work on the new community garden at Campbell Park Elementary School on Jan. 10.



Bob Likens, from left, Noah Esteves-Curtis, 9, John Likens, 9, Austin Benschel, 10, and Cory Drescher put mulch in a wheelbarrow for the community garden at Campbell Park Elementary School, which has a marine science focus. The school is at 1051 Seventh Ave. S.

10 | Sunday, January 27, 2013 | Tampa Bay Times | B6P



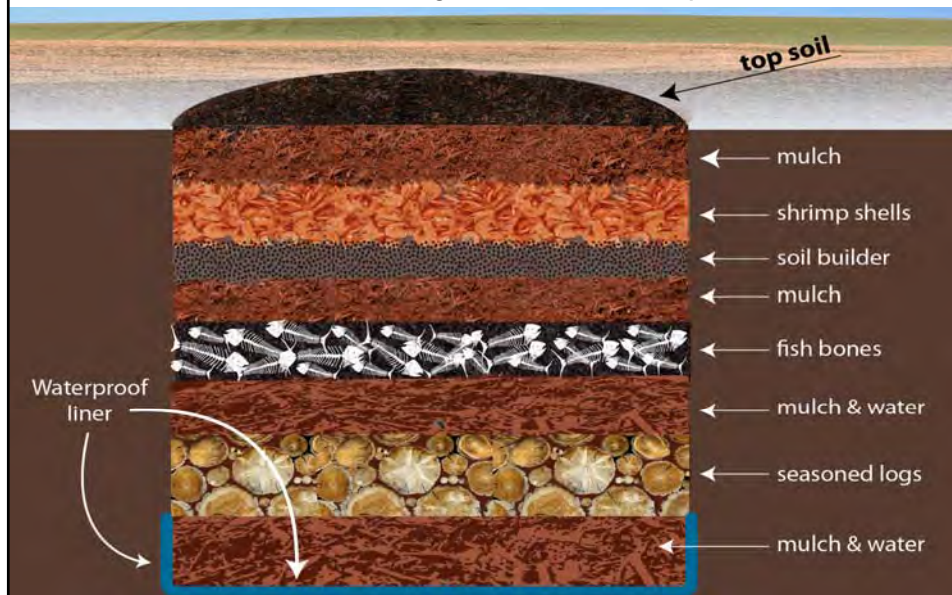
Maximo Elementary  
Edible Peace Patch Garden



Installed January 2013



Modified "Hugelkultur" technique



Cross-section of bed, approximately 3.5 feet deep.



Lakewood Elementary



Maximo Elementary



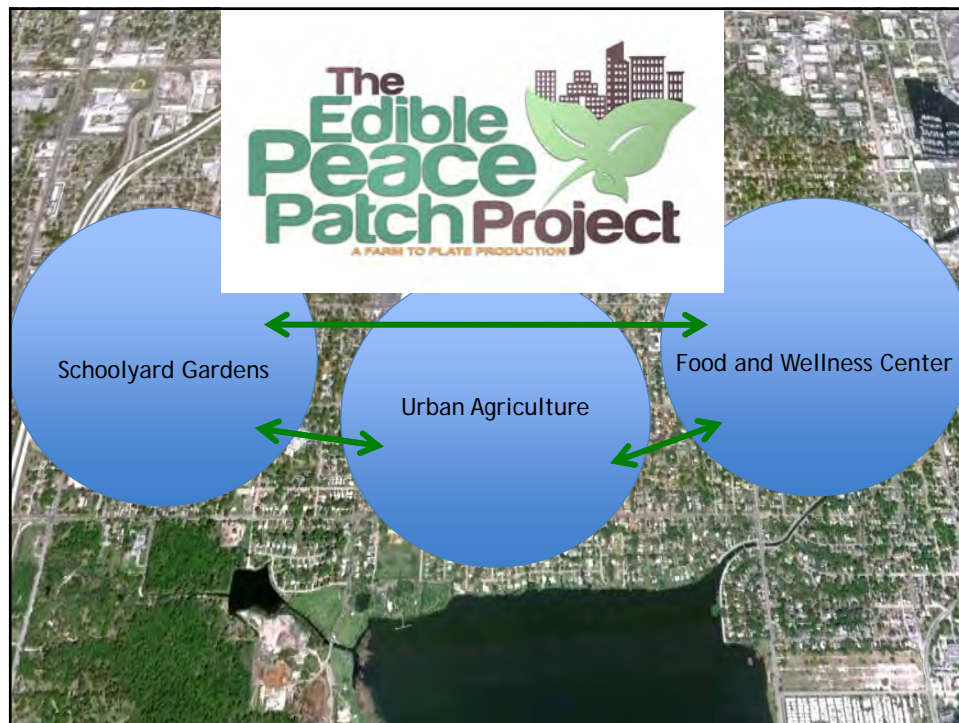
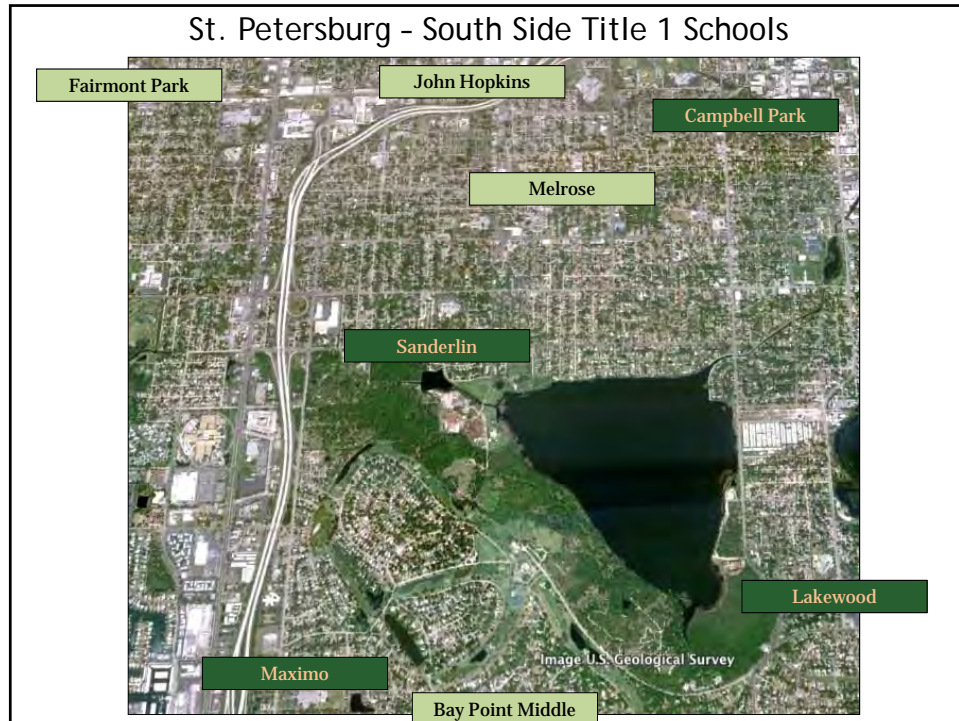
Sanderlin IB World School



Campbell Park Elementary










### Schoolyard Gardens

- Standards-based Educational Mentoring
- Standards-based Health and Nutrition Lessons
- Wellness Kitchen
- Community Building





### Urban Agriculture

- CSA Shares - Community Shares
- Youth Education and Leadership Development
- Professional Development Workshops
- Semester-long college courses on urban food systems
- Green Economy Entrepreneurship



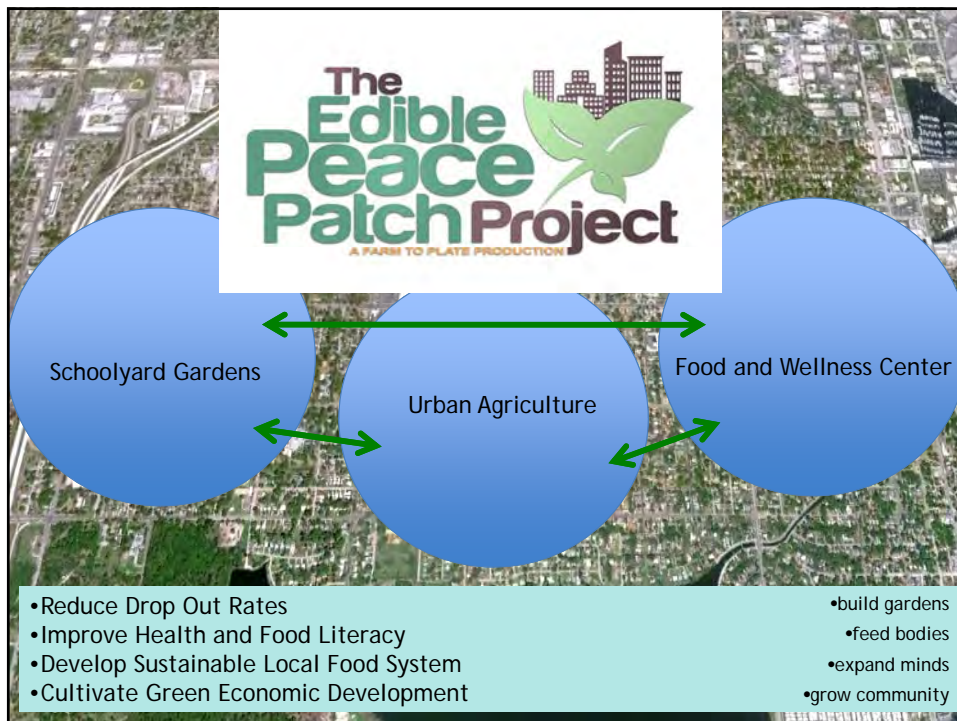
15 Acres of Open Space @ 31<sup>st</sup> Avenue South & Lake Maggiore





### Food and Wellness Center

- Youth Skills Development
- Local Food Farm to Plate Experience
- Fresh School and Institutional Cafeteria Meals
- Professional Development Workshops



**Todd LeVasseur, “Hubs of Resilience? Cultivating Food Sheds via Food Hubs: A Case Study of GrowFood Carolina”**

ABSTRACT. This presentation investigates GrowFood Carolina, a food distribution hub that opened two years ago in Charleston, SC. GrowFood states that they are, “revitalizing the local food system by providing essential aggregation, marketing, distribution, and logistical support to local growers. This support connects growers to local grocers, restaurants, community organizations and institutions, to make local and healthy food more accessible to the entire community.” I examine and analyze these claims, while relating them to the larger theme of food resiliency, given the brittleness of our industrial and global food system. My research includes participant observation at GrowFood events, as well as interviews with those who began and currently run GrowFood, and with local farmers and businesses that network with GrowFood. GrowFood provides an emerging example of the leading edge of changing our food systems, as their goal is to revitalize and sustain a 150-mile radius foodshed that links the rural with urban. Understanding their mission, values, goals, strategies, and the business and environmental practices utilized by GrowFood and their partners, can help us better understand and theorize about food hubs and their ability to help generate food system resiliency. I’ll be speaking today about food hubs. My background is ... after I graduated from college I worked on some organic farms around the country, got my master’s in Scotland and worked on a farm there. I teach in religious studies and environmental studies. So I do basically environmental humanities stuff, and my focus is agriculture and especially the values behind and that shape food choices and agricultural choices, and specifically religion.

So I heard about GrowFood—that’s the food hub about which I will be speaking that really piqued my interest—which to me is sort of a new approach in possibly dealing with food resilience.

What is agriculture? As we all know, it is the deliberate cultivation of domesticated plants. Wendell Berry rightly points out that “There is no such thing as a post-agrarian economy,” he says. So economy—how are we managing our household, how are we managing our interaction with the totality of earth’s systems. So how do we manage sunlight energy so that we all get enough calories? This is the basis of everything; despite our delusions otherwise it all comes back to managing sunlight energy.

Wes Jackson—I just had the pleasure of hanging out with him in Charleston at a conference and he says our farming has never been sustainable. Really key insights. And here specifically he’s talking about domesticated annual grains. So when we think about food resiliency and food security and agriculture broadly, managing our sunlight economy, it’s never been sustainable. It’s a really challenging insight.

So the questions that I’m thinking about as we work through this stuff together, about food resiliency, as you can see here ... how do we localize sunlight? How do we create a resilient food-based economy that runs on contemporary sunlight? As we all know, the industrial food economy runs on ancient sunlight, which is rapidly running out. That’s not at all resilient, and is very brittle. So for me, when I think about food resiliency and food security, but definitely

resiliency, this to me is a key question. We're nowhere near resiliency, let alone security, and I don't even think we're asking these sorts of questions outside of obviously people in this room.

How do we share the real-time sunlight in order to secure adequate food supply that can prove robust in the face of X-events? Have you ever heard this phrase, X-events? It's kind of a new book by systems thinker and statistician John Casti, it's an interesting book. So one of the X-events he looked at is food, actually. For Casti an X-event is an outlying occurrence beyond the statistical average and the historical record. So these are events that are so freakish in nature that we don't even think about them, yet they can possibly happen. And they would be very catastrophic. They can be quick, unfolding time as from beginning to end it could be rapid, or they could be long. I would say climate change would be long-term, even though it is rapid in geological time but longer for our lifespan, so there are longer-term X-events.

Impact time is another element, where the cost/benefit of an event is felt by some individual, in terms of food resilience X-events would be immediate impacts really quickly would be felt as a group. And the last one is the total impact, measuring the overall magnitude of the event, usually in dollars or lives lost. Historically mostly X-events are negative, they would have negative connotations and precipitate catastrophic events so that food related X-events will severely compromise our ability to generate food resiliency.

Casti points out that an event occurring very quickly, with short unfolding time that generates a big impact having lasting effects, or a long impact time, is difficult to prepare for and will be nasty. Thus, food related X-events will generate severe food shortages. Also, because of their short unfolding time and large impact, at least at the level of nations and societies, they are almost always necessarily destructive. And these are of course exacerbated by being scaffolded onto existing wicked problems, which goes back to what you were saying earlier. So X-events are scaffolded onto already brutal ... problems and this goes back to risk, who carries risk.

It also points out that for managing for X-events you have to deal with managing systems, you need to follow or understand the law of requisite complexity. He says in order to fully regulate or control a system, the complexity of the controller has to be at least as great as the complexity of the system that is being controlled, so only complexity can destroy complexity.

So to deal with resilience, or anything about which we're speaking, we need to somehow regulate a very complex system that is more complex than the system going through a crisis. This is just a graphic of seed varieties that shows over the last 100 hundred years seed companies have systematically engineered less complexity in our food system.

The challenge is, of course, and it comes back to this: there is nothing more complex than this system (i.e. sunlight bombarding earth). It's impossible for humans to control this, right? There is always going to be suffering and catastrophe within this. So nonetheless how do we plan for maximizing that resilience in a context where how we've been getting food for the last 10,000 years hasn't been sustainable. So we can never fully capture and manage the complexity of this larger system of sunlight and photosynthesis.

Nonetheless, we can do what we can locally ... and Kip, that's what you were just saying ... In terms of less complexity and consolidation of power, so this is the organic industry over the last 10 years ... increased consolidation, less complexity as well,.

Distribution and production of food and their influence on resiliency ... what do we know about 2030? Global demand for water is going to rise by 30%, and demand for energy and food will be about 50%. These are huge numbers. I don't think we are taking seriously what this means. The world price of food has risen nearly 40% since early 2010. Of course that's part of the reason for the Arab Spring.

This picture shows soil loss since 1925 and then in 1955, and I think this picture was taken in 1975. The breadbasket is experiencing dust bowl conditions again right now, so that we will most likely see more of this again very soon ...

So given this reality, what are we doing to generate resiliency? In the big picture, especially with policy and changing our agriculture, not... very much. [pictures of backyard farming] These are great things—local farming, growing food not lawns—I think these are admirable individual actions without a doubt. I don't think it nearly captures the level of complexity, though, of the scale on which we need to operate. So how do we cultivate or build resilience to counteract the myriad sorts of food related accidents? Coming back to what we were saying, we need key leverage points at appropriate scales, so this is a much bigger thing than just a backyard. Which I think comes back to what I was saying about individual responsibility, that's sort of the backyard model. Then again, if scaled out. Maybe we all need to become Mormons (said with some seriousness, so no offense to Mormons)? They all in theory are supposed to have a one-year food supply. Maybe that's a really good model, who knows, right? It's definitely more resilient than the average pantry, especially in a big city.

So we need to make something that's not too complex that it can't be managed. So how do we manage regional complexity to feed our regional populations? I think another thing we need to take seriously is carrying capacity, which needs to be taken seriously when we talk about food resiliency. For example, is Las Vegas capable of being resilient? I think this is something that all communities everywhere are going to have to grapple with, and that's obviously a huge taboo subject: reducing human population at some point.

So now we are to my specific case study—GrowFood Carolina, located in Charleston, South Carolina. I just flew in. This is my hometown. I teach at the college in Charleston, gorgeous surf at the beach, hangouts, healthy streets, great environment to build local food resiliency. In Charleston, also known as The Lowcountry, you have a maritime economy and you have a lot of good agricultural land in surrounding areas that has not yet been turned into huge mansion trophy homes.

Unfortunately Charleston definitely has vulnerabilities. Natural disasters are a big one. We have flooding. I was just walking through water this deep two days ago from the huge, basically

monsoon rain that just shut down downtown. Since it's at sea level there's nowhere for the water to go. I was thinking about in preparing for this, what happens if this rain kept up for a few days? Our food supply would definitely suffer. This rain also wasn't helped by high tides. We also have hurricanes. The last big one was Hugo, which really set Charleston back, and we are due for another category 4 or 5 sometime soon.

Longer term, the models predict we are going to have more droughts and heat waves. In the short term will be more rain, in the longer term definitely will be more drought and heat waves.

Social, societal vulnerabilities—definitely ... Kip, coming back to what you were saying ... race relations, gentrification are huge issues, economic disparities. 365,000 people live there. I'm guessing ... I didn't find a number for this, but more than 98% of what we are eating is imported, and even 90% of our shrimp, which is a local industry. So we're importing most all of our calories. All of our sunlight is currently being imported for the most part. We are 60 miles from the closest major corridor, which is I-95. We are however the 3<sup>rd</sup> largest port on the East Coast. So there is a lot of shipping traffic coming through, including of food, but most of this is shipped out as soon as it arrives.

The other thing I would say is our total almost loss and vulnerability of any sort of farming knowledge. It's been systematically removed over the years, with a lot of farm land being "developed" and farmers struggling to make ends meet. This is part of the larger American process outlined by Wendell Berry in his "Unsettling of America," and the process holds true for the Lowcountry.

One exciting development in Charleston is GrowFood Carolina, a working model of an organization that can help remediate some of the above brittleness in Charleston's food supply. GrowFood is a food hub. I wasn't familiar with the concept of a food hub until I started digging into this project. The official USDA definition is that "A regional food hub is a business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand."

. It is very much a business model, and this is the model for GrowFood, and we'll see some of the quotes from Sarah, the general manager. It's very much to make farming an economically viable living. Without that, we don't have farming.

Food hubs also may offer operational services ... you can find this all online ... producer services, community \_and environmental services. GrowFood definitely works on all three of these. GrowFood here's their logo—very cool, it's only been out 2 ½ years now. This is straight from their website too, their mission and value statement, which is that "GrowFood Carolina promotes local foods, local farms, and rural sustainability." It's a big part of their mission, and it ties in with Coastal Carolina Conservation League, which is \_the parent organization that helped GrowFood get started. I'll talk about that some too. They want to save or grow habitats on farmlands, and they want to promote good farming, not monocrop farming for export, but



diversified farming. And the only way to really save rural farmlands in this region is to make farming viable, so this is a big part of GrowFood's and also CCCL's mission.

GrowFood's mission is to help the local food market reach its full potential by providing meaningful opportunities to our farmers that will strengthen and secure the future of a regional food supply and ensure that local rural lands remain in agriculture. As their mission statement continues, it reads:

"The current model of food distribution relies on a few large-scale producers, processors and distributors to provide the majority of the food that we consume which is highly processed and damaging our health, environment and rural economies. This model has failed to deliver prosperity to South Carolina's rural communities and provides limited choices for consumers despite our rich agricultural history, abundance of fertile soil, available water, and a long growing season. Food hubs have the potential to increase agricultural opportunities and revive our rural communities that are the cultural and economic fabric of our state."

So when we're looking at ways possibly to frame food resilience issues, there are compelling economic arguments, and this is an important way to frame this, especially for generating rural jobs. If anybody's ever researched ag-school land grants, this is a really good way to frame these issues as a potential to increase agricultural opportunities and to cultivate resiliency in rural communities which form a large part of the cultural and economic fabric of many states.

So here's this sort of model ... I took this off the website ... Growers, it starts here, within 120 miles of Charleston. So they're working in a 120-mile radius \_\_but don't include the ocean so they don't look at seafood, so it's all here, and this goes down into Georgia, a bit out of state, and around. That's who they're working with, at this scale and this scale only. No bigger, no smaller. And they visit every farm that starts to work with them. Our local fruits and vegetables come to them, to the warehouse, and local funds go up this way, and the warehouse which stores, sells, and sends the produce out. They distribute it from there to retailers, communities, and restaurants. Either they have a truck, or chefs and other people come there to buy it. So it's a distribution and packaging center, it's a hub, working with farmers in a 120-mile radius with the goal of healthy farms, healthy food, healthy people, healthy communities.

So here are some pictures:

- That's the mural on the warehouse, and that's the warehouse. And here's their truck. That's the distribution center. They are working with 43 farms and 300 businesses. That's the warehouse. I interviewed the general manager. She said we are non-profit all-local wholesale distributors. She visits all the farms for transparency and tries to convince the farmers to plant a variety of crops so there is diversified local foods able to cater to a variety of markets. 52 week calendar—strategize and market to manage supply and demand
- Main goal: "to build a consistent and diverse supply of local food to this market."

- “Cash flow is the most important thing for a grower.” And she says “All we’re doing is building efficiencies for the market.”

There’s no silver bullets. We need to at the end of the day basically create and grow food. They do have a 10-year model. Food security she thought is being able to have access to food. Food resilience, she didn’t really have a definition that we’re working with for food resilience. The goal there is to build consistent, diverse supply, and it will take a while. Her definition of generating local food success: “If the president doesn’t take food seriously, why would the mayor of a smaller town?” So for her resiliency will most likely not come from politicians. We talked about CSA. People don’t know the value of food, what goes into producing it, and how food relates to health, insurance bills, farmers, and larger societal systems. Food should be cheap and plentiful. “There’s just too many problems. Take small bites. Now my bite is ensuring small farmers can continue to farm.”

Coastal Conservation League: This is the group that helped start GrowFood. I talked to their director of sustainable agriculture initiatives asked her about food resiliency and so she’s very much on board with how we’re framing it and understanding it. We also talked about food security. She says there’s decades to go ... can’t change the current food consumption patterns of Charleston ... localizing the food system ... capture the growing potential of local policy at state level. It’s a 25-year vision in process. As well as education. Farming is globalized and subsidized at all levels. She shared that in order to start a food hub. It is very helpful to have already existing local food interest and healthy farmers market and CSAs. And so there’s already a sort of a cultural tipping point present in Charleston to support this. So it is a growing food culture, and this is really helpful to them. They said it would have been a lot harder to make GrowFood viable without this leg work already done by the community.

Lastly, for her, in order to generate resiliency, we need to develop a land-based culture, we need to get off fossil fuels, and we need to take the precautionary principle seriously.

In terms of food resiliency and what maybe we can do as scholar-activists is to look at structural barriers, looking at scale, education policy, cheap energy, publishing research. Rework campus contracts with food providers—I know at College of Charleston we are dealing with Aramark right now, trying to redo our contract so we can buy more local food, even food from GrowFood, and it has been a challenge, because contractually we’re not allowed to work outside of the existing contract. Bringing agriculture into our curriculum. Looking at disinvesting from people like Monsanto. Disinvesting from fossil fuels similar thing, possibly, with farming and agribusiness stuff.

How we frame this, talking about X-events and national security. I think this is a really good way to frame food resiliency by talking about it in the context of national and regional security issues because for all the people on campus that cuts across all the disciplines and

administration. And lastly, make it fun. Let kids do it. As I think we discussed, how do we manage sunlight, how do we make this fun? And I think our students really have insight into how to make this fun.

That was my really quick case study. Larger picture, food resiliency, even where there's concerted effort to make this stuff, it's a multi-year process. Charleston does not have resiliency for food at all. And I think ... and they both recognize this is a long-term process.

## “Hubs of Resilience? Cultivating Foodsheds via Food Hubs: A Case Study of GrowFood Carolina”

Dr. Todd LeVasseur  
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Department of Religion  
Environmental Studies Program  
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### Agriculture—the deliberate cultivation of domesticated plants

- Wendell Berry: “There is no post-agrarian economy.”



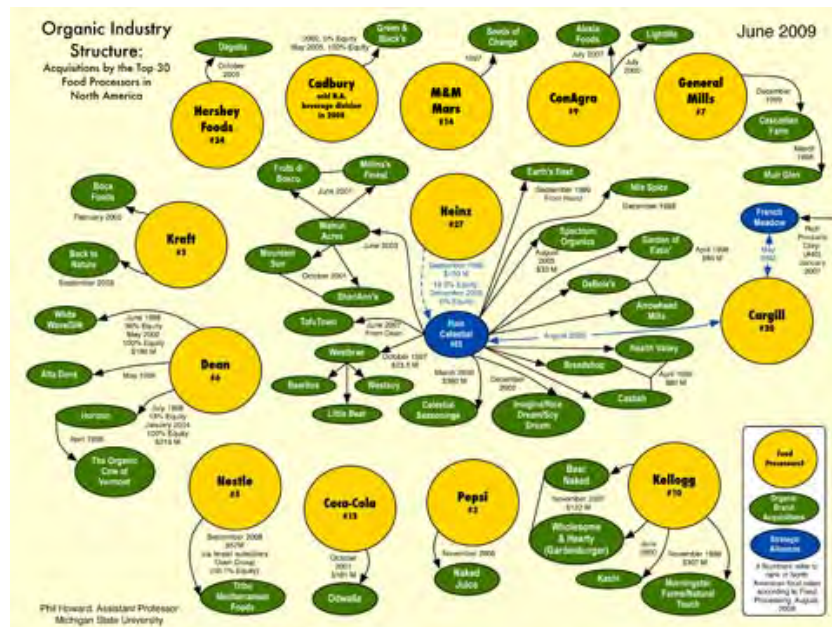
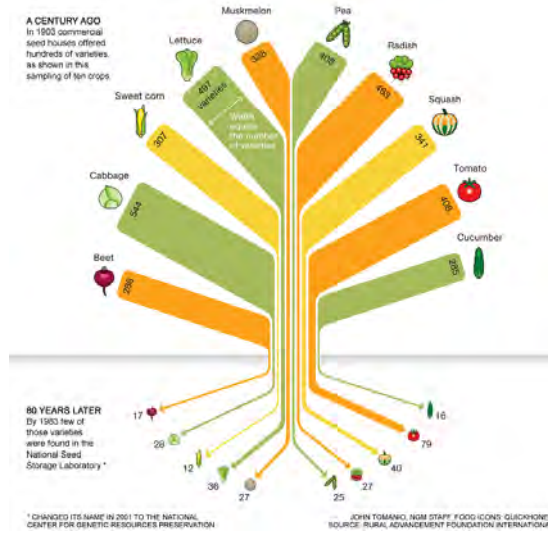
- Wes Jackson: “Our farming has never been sustainable.”

- How do we localize sunlight (generate an economy that runs on contemporary sunlight)?
- How do we share localized sunlight in order to secure an adequate food supply that can prove robust in the face of “X-events” (John Casti)?
  - X-event: outlier occurrence beyond statistical avg. of historical record
    - Exceedingly rare event that has huge impact
      1. Unfolding time—from beginning to end
      2. Impact time—during which cost/benefit of event is felt by some individual or group
      3. Total impact—measuring overall magnitude of the event, usually in dollars or lives lost

- “An event occurring quickly (short unfolding time) that generates a big impact having lasting effects (long impact time) is an event that’s surprising, difficult to prepare for, and nasty.”
- “events with a short unfolding time and large impact, at least at the level of nations and societies, are almost always necessarily destructive.”
  - Exacerbated because scaffolded onto existing “wicked problems”

# Law of Requisite Complexity

- In order to fully regulate or control a system the complexity of the controller has to be at least as great as the complexity of the system that is being controlled
  - i.e. only complexity can destroy complexity





- By 2030: global demand for water up 30%, while demand for energy and food will be up by 50%
- World price of food has risen nearly 40% since early 2010



## Resilience to counteract an X-event

- Leverage points at appropriate scales
  - Bigger than backyard
  - Not too complex it can't be managed/how to manage regional complexity to feed a regional population (carrying capacity will need to be taken seriously in a post-Peak Oil world)

### Case Study: Charleston, SC

- Emerging food hub
- Ability to reduce vulnerability and create robust redundancies...?



## Vulnerabilities

- Natural disasters:
  - flooding (sea level) from tides and/or rain
  - Hurricanes—category 5, development so less buffers
  - Longer term: drought and heat waves
- Societal disasters:
  - Race relations/economic disparities
  - 365,000 (approx.) Chs. County residents, 2012
    - > 98% of food imported (even 90% of shrimp!)
  - Distance from major interstate corridor (I-95)
  - 3<sup>rd</sup> busiest port on East Coast

## USDA Definition of a Regional Food Hub

“A regional food hub is a business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand.”

## Operational Services

- Distribution
- Aggregation
- Brokering
- Branding and market promotion
- Packaging and repacking
- Light processing (trimming, cutting, and freezing)
- Product storage

## Producer Services

- Actively linking producers and buyers
- Transportation, on-farm pick up
- Production and postharvest handling
- training
- Business management, services and guidance
- Value-added product development
- Food safety and good agricultural practices
- (GAP) training
- Liability insurance

## Community/Environmental Services

- Increasing community awareness of “buy local” benefits
- Distributing to nearby food deserts
- Food bank donations
- Youth and community employment opportunities
- SNAP8 redemption
- Health screenings, cooking demonstrations
- Transportation for consumers
- Recycling and composting programs



GROWFOODCAROLINA.COM

## GrowFood Carolina

**“GrowFood Carolina promotes local foods, local farms and rural sustainability.**

GrowFood Carolina’s mission is to help the local food market reach its full potential by providing meaningful opportunities to rural farmers that will strengthen and secure the future of a regional food supply and ensure that local rural lands remain in agricultural use.”

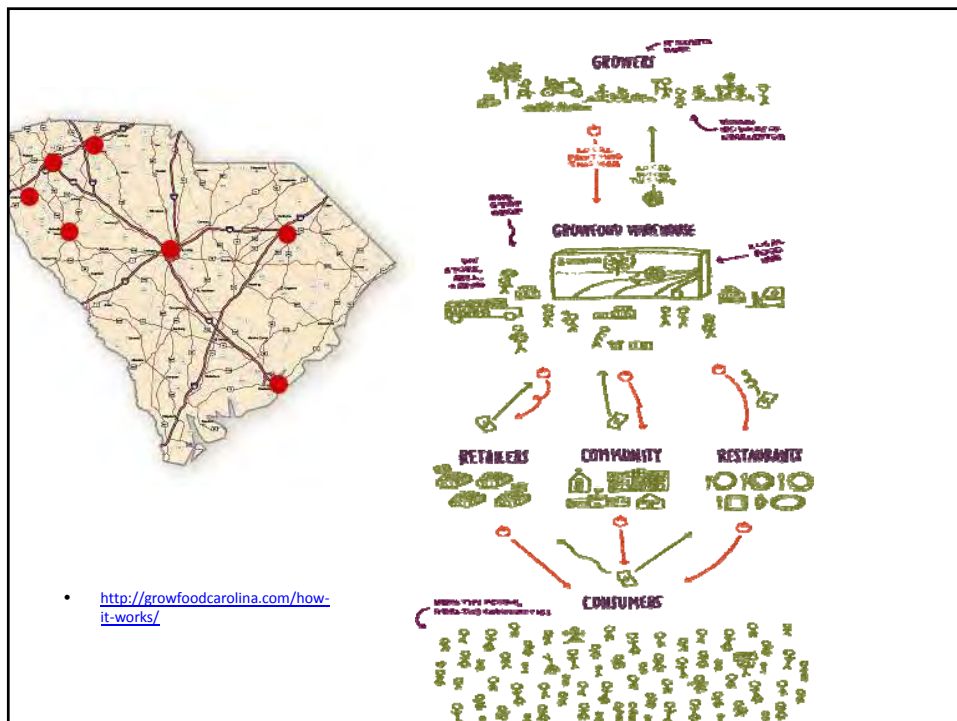
-“from land to hand”

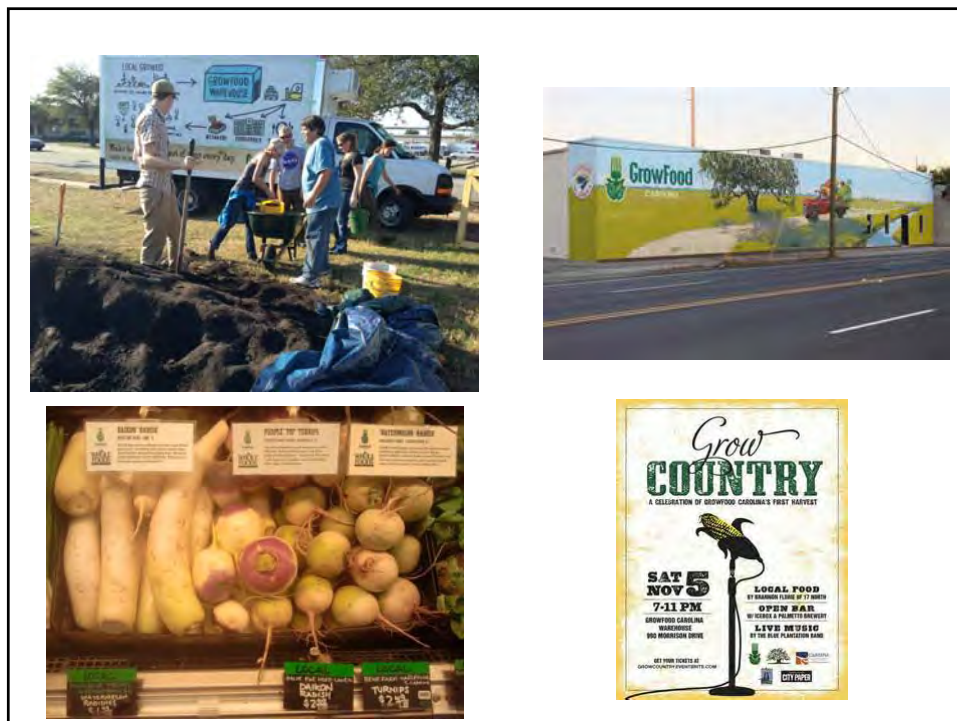
## “Why We Do It”

**The current model of food distribution relies on few large-scale producers, processors and distributors to provide the majority of the food that we consume which is highly processed and damaging our health, environment and rural economies.**

This model has failed to deliver prosperity to South Carolina’s rural communities and provides limited choices for consumers despite our rich agricultural history, abundance of fertile soil, available water, and a long growing season.

Food hubs have the potential to increase agricultural opportunities and revive our rural communities that are the cultural and economic fabric of our state.







- Currently > 200 food hubs in US
- Began 2010, use of building donated = hub
- Currently work with 43 farms and over 300 businesses
- GF = infrastructural help for local farmers, esp small to mid-size farms, so they can stay in business
- 6,500 square foot warehouse
  - 1 mile from downtown, near I-26 and Hwy 17
  - 800 sq foot collar with 600 more being added
  - Not climate controlled, no loading dock

## Sara Clow, General Manager

- Are a “non-profit, all local, wholesale distributor.”
- She visits every farm in 120 mile radius to guarantee “full transparency” so restaurants and retailers can market the grower
- 52 week calendar—strategize and market to manage supply and demand
- Main goal: “to build a consistent and diverse supply of local food to this market.”
- “cash flow is the most important thing for a grower.”

- 3 ways food hubs help a community:
  1. Environment—less carbon, smaller farmers tend to be better stewards
  2. Rural economy—people leaving state, must rebuild economic engine (avg. farmer in SC is 63)
  3. Health
- “All we’re doing is building efficiencies for the market.”
- Consumer messaging—every human eats 3 to 4 times a day—is lowest common denominator for all humans

- Goal/marketing—to get people to think about what goes in their mouth and health/env impact
- “we can’t think there are no consequences to our food choices anymore.”
- Food is great messenger—cuts across race, class, and educational lines
- “Clemson is a land grant university and they’re not teaching people how to farm.”
- “You have to make it economically viable.”
- “There is no silver bullet. We need to create and grow food.”
- Takes 5 to 10 to 15 years, with short and long term successes
  - Farms with bad business models will not make it

- Food Security: “Being able to have access to food.” (everybody)
- Food Resilience: [pause] shift away from annual perennials, reducing waste
- Do these concepts influence GF? Little of both, b/c building supply
  - Goal: “consistent and diverse supply of local food”
    - SC—year round potential to grow food
    - Increase supply and increase food security
  - FR + FS : “building consistent, diverse supply on consumer and grower side.
    - Must move beyond restaurants

- Catastrophic event? Hurricane
  - Even if 1 artery goes down, are others, unless bridges go out
- GF still new—only 2 years of building relationships with farmers
- Farming=“riskiest business in the world, so what can we do to support the people that feed us?”
- Basic motivation for her: “I like to eat.” “I love food.”
- Big goal: 15-20 years to have 80% of food in Charleston come from 120 mile radius

## Barriers to Success

- “If the President doesn’t take food seriously, why would the mayor of a smaller town?”
- CSA—most people don’t know how to cook seasonal food
- People don’t know the value of food and what goes into producing food
  - “People don’t get it.”
  - How food relates to health, insurance bills, farmers, and larger societal systems
  - “We’ve been taught to believe food should be cheap and plentiful and only grains.”
- “There’s just too many problems. Take small bites. Now my bite is ensuring small farmers can continue to farm.”



## Coastal Conservation League

- 25 years of advocacy work
- Programs:
  - energy and climate
  - land and communities
  - air, water, and public health
  - Legislative
  - sustainable agriculture
    - GrowFood
    - Food hub in Greenville region is next goal

## Lisa Turansky, Director of Sustainable Agriculture Initiatives

- Food resiliency: catastrophe/triggering event
- Food security: food deserts; supplying all members of the population with food so that cultural fabric can be maintained—urban and rural (commodity crops are not the same as food crops); public health issue—cost, nutritional needs

- Are closely related concepts
- Within 120 miles Charleston can grow a lot of its food
- Goal of CCL/GF: creating a pro-active movement to be resilient
  - Decades to go
  - 1 hub can't change current import/export food consumption patterns of Charleston

- To localize food system:
  - Capture year round growing potential
  - Diversify crops
  - Provide guaranteed market to farmers
  - Education and training of farmers and customers
  - Work on policy at state level
  - GF/CCL works on all of these fronts...25 year visioning process
- “very difficult because food is so globalized and subsidized at all levels.”
  - Biggest producers benefit from inputs of energy and subsidies

- GF able to be successful because of the work of Lowcountry Local First
  - “huge leg up on marketing”
  - Microlending
  - Incubator Farm
  - Farmers markets and CSAs
    - Indicators that a Food Hub might sustain itself:

I.E. we need to cultivate the cultural carrying capacity, especially couched in economic terms, where food issues are taken seriously, creating the room to strategize food resiliency issues

- Need infrastructure for a resilient economy
  - Protecting rural agricultural land
  - Better farming practices
  - Conservation perspective is important
  - Vs. industrial farming and food
    - Food safety issues/recalls
    - 100% on nonrenewable fuels
- CCL one of few institutions in Charleston thinking about resiliency: “not scared to take legislative positions and to make enemies to take a stand for our local community.”

## Values Needed to work towards Resiliency

- Develop a land-based culture
- Weaning off fossil fuels by buying local products
- Lisa’s personal values: natural systems are amazing, flawless, and worth protecting, and we need to base our cultural and agricultural models on natural systems
- Must take Precautionary Principle seriously
  - Need a major event to change consciousness (trigger: whatever disrupts oil/cheap carbon), and make small steps in the meantime
    - GF is a step to get us more room, but is not about 100% self-sufficiency
    - GF is symbolic and is moving the needle—shifting to 5% local would be huge but larger transition will take years



## Resiliency

- Many barriers
  - Scale
  - Education
  - Policy
  - Cheap energy
- Scholar Activists
  - Publish and research
  - Re-work campus contracts with food providers
  - Sustainable agriculture majors—interdisciplinary
  - Disinvest/invest
  - Transition campuses
  - Dialogue about “X-Events”...national security
  - Make it fun!

## **Teddie Phillipson-Mower, “Food Resilience and Community Building”**

An increasing interest in the role of food resources within society and as a vehicle for understanding sustainability leads me to think that college curriculum should include at least one course focusing on Food, Society and Sustainability for broad consumption at the undergraduate level. Within Western society - and American academia, particularly - we have become passionate about the discourse of food in society, and have become intellectually concerned about its role involving human sustainability. The discussion for this presentation is intended to raise ideas about developing curricula that draws on this growing interest and discusses the necessary background research that it should entail. I explore ideas that I have developed so far and will elicit input from conference participants to incorporate into application for my further scholarship. My purpose is to develop scholarly research in the field of Food, Society, and Sustainability, but my hope is to develop a full curriculum proposal for a new course aimed at a wide range of mid-level undergraduate students and to supplement the offerings in a new minor in Sustainability.

Wendell Berry led a March and Rally for Clean Energy and Healthy Communities in downtown Louisville called, “Energy for Change.” Wendell Berry is in my backyard. He’s always with us. He comes to every Sierra Club meeting. I’m very fortunate to live where I am. However, we still have problems with food resiliency. And our big problem right now is the word “resiliency”. People are caught up with... they’re used to the way we do things now and have done them. And, they are afraid of change and thinking about change. They don’t know how to think out of the box. They are afraid of thinking about what the future might bring, a future that is uncertain...a future that involves faster climate change, and working toward meeting the challenges that the 21<sup>st</sup> century will bring. We need to prepare to be resilient in the presence of these challenges.

Slide 2: That’s kind of where I come in, because I am an educator. And I say that in a room full of educators. But I am a professional educator, because I teach teachers how to teach science and environment and sustainability. My background is about how to communicate and “teach” science...the pedagogical end. I’m the Director for the Center for Environmental Education previously housed in the College of Education at my University. So the majority of my work is educating teachers and future citizens about the environment and contributing to local, state and national educational policy. I am involved with school gardens and community gardens. We have 154 schools in our public school system; I work with about 50 of those. I plan, implement and assess an environmental Youth Summit, where about ... 97 schools have participated over the years. We only allow 33 at a time because of space. And, we are involved in community events and organizations such as Bluegrass Bioneers, Transition Town Louisville, 15,000 Farmers and the Louisville Timebank, just to name a few.

But what I’ve been interested in ... I’ll show you ... this is the Center for Environmental Education, so you can see kind of the outreach here. In the middle is the Center...this is what I’m the Director for. These are all of our partners. We have a Kentucky Institute for Environmental and Sustainable Development on campus, and these are all centers that fall under it. I have responsibilities for teacher and community environmental education, so all

eight of these universities in Kentucky, each with their Centers for Environmental Education are part of that, which is called KUPEE or Kentucky University Partnership for Environmental Education. The state legislature has cut funding, so the road here has been difficult lately. Down here is the Environmental Education Committee, of the Partnership for a Green City, which is a partnership between the Jefferson County Public Schools, Louisville metro government, and U of L (University of Louisville). More recently, other entities (private and parochial schools, other colleges, and organizations...) have been involved in the Partnership. So, all of us come together to look at and take action on environmental education, health, policy, justice and other topics across the board in our bioregion.

My focus as a faculty member in the college of education was K through 12 formal educator training, basically. I also was responsible, as you can see from that, for informal education as well. My interests were more aligned with this larger picture that involves all learners. So I backed up from the more narrowly defined teacher training focus and have been involved in a transition to move the Center to a university wide/community based center, and with that I've been afforded the luxury for the last year and a half to really get involved with the community – the general population. And for those of you who are faculty, whoever has had that opportunity, it is such a rich experience. We are raised—trained for at least 8 years, during undergraduate and graduate school—we're raised in the academic institution, the “Ivory Tower” and we develop an academic perspective about our disciplinary work. But our little world doesn't allow us to really get entrenched in the general population – with the communities and individuals that enact the work that sometimes only stays in journals, theories, or in our head. We're, the people in this room, are really very fortunate to have an education at the level we have. I forgot about that. I was raised in a poor farming family, my parents never graduated high school. I'm first generation college student and I went all the way. I had lost my connection with community; now I get to get it back. And the things that I've learned over the year and a half have been really valuable and very rich.

Slide 3. So, what I'm going to do is frame this with Gerry's initial questions and then I'm going to give you a case study at the end of what we are doing through our community's efforts to raise resiliency. When I say resiliency I generally refer to overall but food is probably the most important component of that, because if we don't eat we don't live, we don't thrive. And I want us to thrive.

So, when Gerry brought us together ... these questions look familiar, for those of you who were with us yesterday. These are the questions Gerry asked us to use to frame our discussion and will bring into the discussion tomorrow too as well, kind of revisit these and see how we can come together as a research community. Before I go any further, I want to make sure that I share a book, a resource. Here. Rebuilding the Foodshed: How to Create Local Sustainable and Secure Food Systems by Philip Ackerman-Leist. You might want to get this book, it's very interesting. Ackerman frames the question in terms of how to create resilience, dilemmas, drivers for rebuilding local food systems, and new directions. So that kind of goes with Gerry's ideas, and he does advocate for the big picture, kind of from a systems standpoint, to look at multiple areas, although I'm going to focus on community and local, because that is where I

have the most ability to change things. But, in order to do so I have to understand the larger picture and the assumptions I hold. He doesn't discount the larger entities. He does not, nor do I, concentrate solely on the backyard gardener or put our entire food future in the hands of school and community gardens. Large agriculture is a necessary part of our move toward resiliency, bouncing back from the unexpected.

Slide 4. Some of the information ...the background for what I am working on comes from several recent documents that have come out about the Louisville Local Food System. There were others before 2007, but they were mostly smaller student projects as part of a university course and some of these were included in the documents here. But this was really the start of documenting and asking what our local food system looked like...bringing it all together. The Bridging the Divide document was the foundation that described the system and explicitly included talking about justice, justice issues. We have a large downtown section with the central and west end areas that are food deserts. This is where I live and the University is located...central east downtown area.

And so that's when the community began to investigate how to grow self-sufficiency in our food supply. That's really where resilience ideas began in our community, from the justice side. And the people of the downtown and west sides went to the government—metro government to begin the conversation at that point with this document in hand. And this one really came out of metro government (The State of Food). They have a different perspective than what the individuals in the community actually have when you get out there, when you start seeing and living it. But it's great, because you can kind of see where they're coming from in the second document, and they do go through the vulnerabilities and the ideas for increasing local foods for an economic future.

And then, what happened right here—and other communities experience this gap too - we had a change in mayors. Mayor Abramson and his administration were really tied into the idea of building a viable stable food shed, and they had done so much wonderful work. He had been mayor for like 20 years. He decided it was time to do other things. A new mayor, and in his first year is trying to establish himself, with his own ideas and his own administration. So there was a reshuffling ... some of this, the unfortunate thing is that without institutionalizing the work changes in administrations can leave gaps or move in directions that cause redundancy, which is not efficient. You are switching things up. A lot of people were not called to the table who had originally completed some of the work and in some cases the work of the citizens were duplicated by paid personnel. This took away from some of the social capital that would be needed later on.

So, to answer the first question that Gerry put out, what are the main lines of vulnerabilities of the food system in Louisville? According to the documents, three, basically: the food deserts is a big one, emergency food systems—they did tackle that—and farmers not making a living wage. They were emphasizing local economy, as you would kind of surmise from a government, metropolitan government. That's what this administration is focused on and from

their perspective everything can be measured by revenues and outputs which leads to their interpretation of program failure and success and also influences inputs to tackle the problems.

But, in my quest to challenge my assumptions and understandings of the local food system I went to the people, the citizens, who are “on the ground” working in the food system. In a semi-structured interview process, I asked these people their “perspectives of our food system and local resiliency, the ability to bounce back after an emergency situation. The interview process is not completed, but I have some tentative findings. I asked people who are actually in positions involved...running non-profits and other organizations...they’re out there doing the work, they’re out there getting their hands dirty. And so I asked them what are the vulnerabilities to our present system. And this is the list they came up with (slide 6). And if you look at it, it’s much larger, it’s much more rich, they identified the things that we don’t like to talk about in government, like urban soil quality. Urban soils have lead and other heavy metals. Yes, we have a power plant that toxins – heavy metals comes out of. Louisville is very old. We have houses that were painted with lead paint. In downtown Louisville almost all the houses are over 100 years old, and therefore they went through that transition with the lead paint, lead based gasoline, all of that. So urban soils are toxic, and compromise the ability to garden for food, unless there is education about how to mitigate and build soil. Also, World War II brought in Rubber Town. They needed rubber for the war effort, chemicals, everything and the factories on the west side were refitted to produce this. We have brownfields, as you can imagine as a result of this and other abuses to land that we didn’t recognize at the time. So we have those problems.

Looking down the list, you can see there’s a lot more. Lack of community interaction has decreased problem solving capacity. A couple of you had brought that up, earlier presenters. Have you heard of Andy Lipkis, founder of the Tree People in Los Angeles? He says to build capacity the most important thing isn’t that you are talking about resiliency and emergency preparedness and big disasters, because that scares people. But if you can bring people together on common problems that they can see right there in their community and help them work together and build that community, that’s the most important thing you can do to build resilience. A community that is used to working together is able to come together in times of trouble because they know how to problem solve.

(Slide 7.) OK, then leveraging points to reduce the risk. The documents say farmers markets were growing in 2007. They talk about 2009 with an increase of 27. Now there are only 19. I have no idea why it decreased, but I do know from some of the people that have told me, although I haven’t triangulated it yet, but it just wasn’t viable in terms of supply and demand. Farmers were showing up and people weren’t in some of the markets and this just wasn’t economical for the farmers.

Local food initiatives—that’s a leveraging point ... there are so many food initiatives going on. It also is a problem, because when you have a lot of small start-ups and people are passionate, they can’t get the money, they get discouraged. They’re doing all the work, they get

discouraged. Metro government offers small loans and help, but only to those who have the ability to fill out the paperwork in the very specific ways that government requires.

New Roots Fresh Stop project is a really interesting one and so is Grasshoppers Distribution. Both of them are heavily based in west Louisville to bring better access to food. In addition what they do is they have a wonderful preparation and preservation education program that they do there so that people can learn how to make their food last longer. New Roots worked with the west end community in determining what they wanted and needed to solve their food problems and from a rocky start has become very successful in their community work. However, from a financial position they are just breaking even. Grasshopper's Distribution has the backing of Metro Government and some of the more upper middle class people in the community and while they are economically solvent they do not have the connections or success with those in the west end. In fact, their business is primarily centered in the affluent places of town.

The documents cite Breaking New Grounds, which is one of non-profit organizations involved in composting and food literacy. They only mention Oxmoor farm, but there are so many others that are contributing and participating in our overall local food system, including a few university programs. They also talk about policy, the importance of policy and economic benefit. "Demand analysis shows that customers would pay up to twice as much for local food." But, these are the people who can afford it. This isn't about resiliency. It is about popularity among people of means who are not looking at the future of our food system and the ability to feed all of our people in this area. Paying twice as much for local and healthier food is NOT an option for many of the people in Louisville and will not solve our food system problems in case of an emergency.

The documents miss other leveraging points that are available in the community such as permaculture and other expertise in the region that goes beyond local food production and into sovereignty and resilience efforts. We have Peter Bane, a permaculture educator, living in Bloomington, IN, which is just to the north of us. He's one of the top permaculture people. He just brought out The Permaculture Handbook, is the editor of The Permaculture Activist, and has trained many Permaculture Designers. So we have a lot of expertise. Plus we have several universities in the community. The university-community interactions just ... the mission of the University of Louisville is to enhance the local community. Generous spirit of sharing, caring, and building community at various levels. Interest in alternate economies, moving toward the natural economy and bartering systems and away from the industrial economy, paper money... People are really looking for other ways of living a full life with bartering, local currencies, time sharing. And local economy and self-sufficiency. We do have community members who want to be able to be self sufficient and get off the grid.

So what is being done to reduce risk by government and civil society and the private sector? I asked that question in the interviews, and what I thought was really interesting was they told me that resiliency is high priority, 6 or 7, but Louisville's resiliency level on a scale of 1 to 7 is 2. Very, very low. So I thought that was very interesting, because a lot is going on but not a lot is

getting accomplished to meet the goals of resiliency. We have already discussed the several projects and events that take place in Louisville, but people who are a part of and interested in food resiliency give Louisville very low resiliency ratings. There is a feeling that current projects under the name of food resiliency are more interested in increasing the economy through local food and not looking at the actual resiliency of our food system.

So these are some of the things that I think that we can do in the university area, as far as what we can do for the community to build resiliency. I think our prime area is our courses and doing authentic learning, service learning, getting the students out there to interact with the community. That means that we're going to have to get out there with the community. And I know that some of you have community engagement offices and things like that you can work through, but really I think if you're going to run a course you really do have to get out there with your students to know what's going on, embed it in your coursework. And learning from nature. Get your hands dirty. Don't just tell people your grand ideas and how they should do things, because I think that's the biggest problem in working with community. I have to be careful when I tell people that I am from the university, they have the impression that university people come around and try to tell them what to do without ever having worked in the real world. It is all about relationships and listening to the wisdom that comes from the people who are living in the community that you want to serve. What do they want? What have they tried? What do they have to work with? What capacity can they bring to the table?

I'm just going to jump over this because the time is short ... permaculture principles have a lot of application to organizations, and Jaber was one of the people that started looking at extending Permaculture principles into this. Most think of permaculture in terms of gardening, it's so much more. It is a framework for living a resilient lifestyle. Organizational styles of governance, as I have been told during the interviews, have a lot to do with the success and/or failure of meeting the goals of community resiliency, and I'm sure other goals as well. Some of the stories I heard about things that didn't go so well for an organization could possibly be alleviated by building in these Principles.

The case study that I wanted to share with you—and it will be fast—is ... I'm the founder and the co-producer of Bluegrass Bioneers. And I don't know how many of you know Bioneers, but the national organization has several beaming sites, and we're one of the beaming sites. And one of our main missions is education. We are out of the University as part of community outreach. We found that we can get into the community ... and the best way of helping the community for resiliency is helping small community organizations with their idea and project upstarts. So we are a 501(c)(3), but the reason we are is so that we can go and assist and act as a fiscal agent to all these upstarts and help support them in anything they do. And because they are usually innovative, we can bring them into our conference with us in the fall and really showcase their creativity, innovation, and future possibilities. We ask the participants to help support them in problem solving and providing information about resources while there. People who do this begin to feel a part of these projects and begin to recognize the power in coming together as a community to support and extend what we have.



So what I have pictures of here is we have a Homesteading Tour that we give twice a year. So we really encourage people to do homesteading. We take the tour with bicycles, not carbon emitting automobiles. We visit various urban homesteaders who share what they are doing to collect and store water, rebuild soil, retrofit their houses for energy efficiency, to feed themselves... and it's a very, very popular thing. We do seed saving and information sharing sessions. Here we're showing people how to graft. Here he's showing how to grow mushrooms. Here is a whole lecture about where they can get resources to do seed saving. Seed saving is probably the most important thing local communities can do for local resiliency. Gathering seeds with the specific genetic traits that allowed the plant to be successful in that particular area is very important.

Here we're doing "Primp Our Garden" at Cochran Elementary School. We built lasagna gardens, sometimes called sheet gardens, which is a permaculture method that rebuilds soil starting as soon as you lay it down without having to wait to plant. We did this for 4 hours during the conference and anyone who wanted to participate and learn was included. We added some plants that would start an edible forest and the students and their teachers were able to come in in the fall and start using the gardens to learn right away. So it was very successful.

Another organization that we helped start...our first year Michael Pollan spoke...he was one of the keynote speakers, and we established 15,000 Farmers because two people in the audience decided that they had to take the challenge that Michael Pollan gave them, which was, What can you do to establish food resiliency in your community? The 15,000 Farmers have become one of the most active groups in Louisville. And this is great...every 15<sup>th</sup> day we get together to teach and learn about food at 1515 Algonquin Trail and our vision is to have 15,000 urban farmers or 10% of the population of Louisville.

Now, people say—in fact, this is where they got in trouble—farmers were like, "What, you're making everybody a farmer, you're going to take away from us?" One of the founders of the 15,000 Farmers said that this was a problem that he never anticipated...the pushback from actual farmers. His response was that he never knew how hard it was to farm. And he has a much bigger respect now for a farmer. And the idea is learning where your food comes from is one of the major key steps on the road to resiliency. People must understand where their food comes from in order to ensure that they are giving the support, directly or indirectly, to make sure the system continues to work.

There are so many unintentional successes that came out of this. Do we have 15,000 farmers? No. That was 10% of our population, that's why we chose that. We have about 2,000, which I think is pretty good.

The other offshoot of the Bluegrass Bioneers is the Time Bank, an hour for an hour, everybody's hours are equal. It doesn't matter who you think you are, everybody has something to give, everybody has something to receive. And you find people who have difficulty on both sides.

And it's a wonderful organization. I highly recommend checking out time banks. This organization is just going wonderfully.

And then Breaking New Ground. I would like to spend some time discussing the organizational structure of this because I think it holds several teachings about why organizations involved in resiliency efforts currently are not taking hold. They were a non-profit organization that was trying to provide an opportunity to meet the needs of preparation for the 21<sup>st</sup> Century by establishing 21<sup>st</sup> Century green jobs and traversing the gap between what we have now and the demands of the future. I can't get into that part because it's too late, but part of this current research is to ask what causes organizations with the mission of local resiliency to succeed or fail. And, this is one of the ones that a lot of people said had so much potential, and it failed.



## Food Resilience and Community Building

Teddie Phillipson-Mower

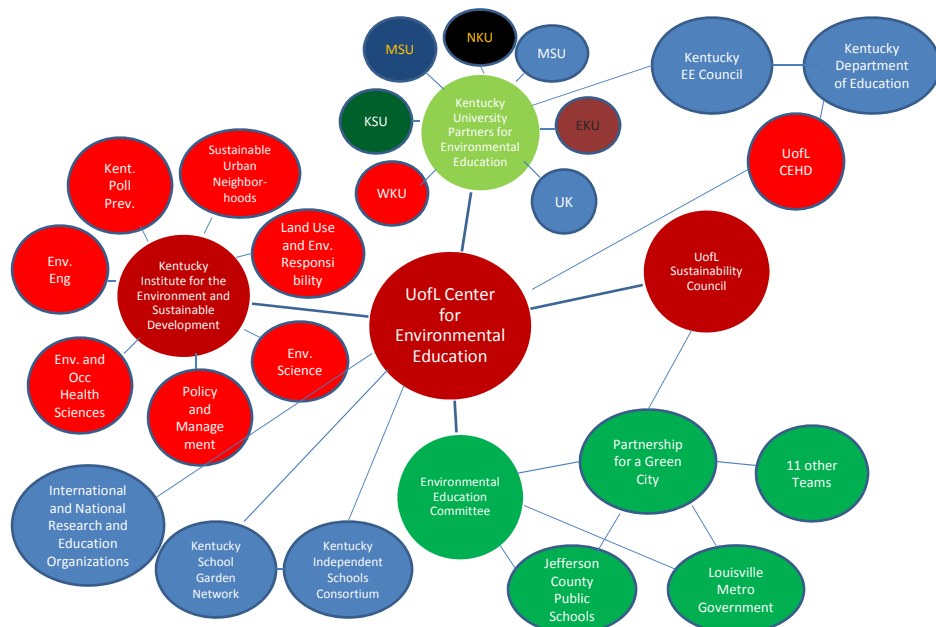
University of Louisville

AESS Conference; Food Resilience Session

June 21, 2013

Bluegrass Bioneers/Resilient Louisville

## UofL CEE Partners



## AESS Food Resilience Working Group Questions (Gerry Martin)

- What are the main lines of vulnerability in the food system (production and distribution)? How are the risks changing through time?
- What are leverage points for reducing the risks?
- What is already being done by government, civil society, and the private sector to reduce risks?
- What can environmental scientists, teachers, and other environmental professionals do through research, education, community action, or other means to reduce the risks?

Ackerman-Leist, Philip. (2013) ***Rebuilding the foodshed: How to create local, sustainable and secure food systems.*** Post Carbon Institute Santa Rosa – Uses Dilemmas, Drivers for Rebuilding, and New Directions to frame the book

## Louisville Local Food System Documents

- Bridging the Divide: Growing Self-Sufficiency in Our Food Supply – A Community Food Assessment (2007). (Justice)  
<http://www.communityfarmalliance.org/BridgingTheDivide.pdf>
- The State of Food: A Snapshot of Food Access in Louisville (2010) <http://www.louisvilleky.gov/NR/rdonlyres/E8C0D055-E234-489D-A592-7792E323D106/0/StateofFoodFINAL.pdf>
- Building Louisville's Food Policy Council (2011)  
<http://www.louisvilleky.gov/NR/rdonlyres/D796EC2E-18FA-4662-94D4-5A9DCF9675FF/0/FPACReportFinal.pdf>
- The Louisville Local Food Demand Analysis (2012)  
<http://jefferson.ca.uky.edu/sites/jefferson.ca.uky.edu/files/122861902-Demand-Study.pdf>

## Louisville Local Food System Vulnerabilities

**Food deserts** in West and Downtown East Louisville  
(1 full serve grocer/25,000 residents in WL; least access to a vehicle; saturated by fast food and convenience store)

**Emergency Food System** (Large size demonstrates failure of Food System; 2009 – Dare to Care delivered 13M lbs of food to 192,000 people; Kentucky Harvest (food rescue) delivers 2.7 M lbs of food annually that is donated)

**Farmers** not making a living wage

## Other vulnerabilities

- Climate change – heavy rains/drought; tree cover (urban heat island)
- Urban soil (heavy metals); WW2 Rubbertown; brownfields
- Changes in fossil fuel energy markets and availability
- Current policies for self sufficiency; Policies favor industrial economy (Preservation and land use)
- Lack of community interaction and therefore decreased problem solving capacity (Andy Lipkis of Tree People)
- Lost skills – food preparation and preservation techniques; basic understanding of fungus, plants and animals (foraging)
- Dependence upon grocery stores and weakening local system
- Increase in populations (competition) and migration (connection and caring)
- Food production and distribution “monopolies.”
- Many non-profits and other start-ups without organizational sustainability understanding

## Louisville Local Food System Leveraging Points to Reduce Risks

- **Farmers' Markets** Growing – In 2007 – 17; 2009 - 27; 2013 – 19 (2 in EDL and 2 in WL)
- **Local Food Initiatives** working on **access** (Community Supported Agriculture; New Roots Fresh Stop Project – 2009; **Local** production – Grasshoppers Distribution and Louisville Farm to Table Project; **Building community** through gardening – Breaking New Grounds; Food Literacy – Oxmoor Farms and many others
- **Policy** – buy local ordinance; artificial trans fat; obesity; Food Policy Council
- Perception of **Economic Benefit** – Demand Analysis showed that consumers across all incomes on average would pay up to twice as much for local food; analysis found that commercial buyers are buying local because of demand; support for farmers to build capacity for the demand

## Other leveraging

- Permaculture and other expertise and knowledge pockets in bioregion (university, business, leadership, nonprofit)
- Generous spirit of sharing, caring, and building community at various levels
- Interest in alternative economies
- Local autonomy and self-sufficiency

## Louisville Local Food System

What is being done to reduce risks by government, civil society (non-profits), and private sector to reduce risks?

When asked to rate Louisville's resiliency level on a scale of 1(low) to 7(high), surveyed food activists and educators gave an average score of 2.

## Louisville Local Food System

- What can/should be done by environmental professionals to reduce risks and build security?

Explicit course connections with the changing world – the, “so what” factor (relevancy); service-learning; authentic learning environments; problem solving with attention to alternative and multi scaled contexts; reconnect with the natural world (biomimicry, learning from nature to be a part of nature); “get your hands dirty with the natives.”



### Permaculture Principles (Holmgren, 1999) Applied to Organizations (Jaber, 2010)

- Observe and Interact – culture and social dynamics
- Catch and Store Energy – interest and motivation, social capital
- Obtain a Yield and produce no waste – everything for a reason; payoff; high efficiency
- Apply self-regulation and feedback – fundamental to knowing our limitations and relationships; helps us make better decisions
- Design from patterns to details – what are people’s natural “patterns” and how can you work best with them?

### Permaculture Principles Applied to Organizations (Jaber, 2010)

- Use Small and Slow Solutions – testing allows feedback, adaptation, and corrective action of any adverse impacts.
- Use and Value Diversity – diversity is resilience; multimodal approaches to complex systems ensures backup, overlap, and redundancy
- Use Edges and Value the Margins – the areas where ideas come together can be the most robust areas for growth
- Creatively Use and Respond to Change – draw on assets to turn obstacles into opportunities

## Bluegrass Bioneers



## 15,000 Farmers



15<sup>th</sup> Day Celebration; 1515  
Algonquin Parkway (Dismis  
Charities)

### Vision:

15Thousand Farmers helps create, empower, and inspire 15,000 new, sustainable, neighborhood backyard/front yard farmers in Louisville, KY to feed their families and themselves and to give away! How? By using simple and easy instructions, checklists and materials and ongoing support provided through local sustainable growers and resources that will provide everything needed to start Easy Farms in our yards, on decks or in community gardens.



## Session three: Planning discussion for the AESS food resilience working group

**Gerry Marten:** The theme of today's session is basically where do we go from here? Where do we go from here in terms of addressing the problem, and where do we go from here in terms of the working group doing something after this conference? [Request to pass the voice recorder around to each speaker, like a "talking stick."]

**Peter Jacques:** I can't believe you just said that, because I have a book coming out called *The Power of the Talking Stick* with my friend Sharon Ridgeway. It documents ... first of all, it's a critique of the larger global economic system using a concept from a geographer called "industrial," which conceptualizes an organized economic system with state-corporate alliance, that is, corporations and states work together to penetrate areas that have rich value to them in an organized network. And it also documents that there is a current world indigenous movement, which is the focus of the book and the reason for the title, because these groups are demanding to be heard and they are unapologetic about what they want. They unapologetically say we are killing Mother Earth, right? These are their words. And that we must stop the way that this system works.

At the same time, there is also a world peasant movement and a world social forum that is allied to these things, so that ... and a lot of it is kind of organized around this idea of *buen vivir*, living well. I can't go into it further, but I think one thing we can do is ... as scientists, social scientists and humanists, is that we can cast a light. And the things that we know about we can ... so for me, doing political economy is something that I think is useful in casting a light on the way in which the structure looks. I think that might be part of the leverage that we could have. I think that political science, my own disciplinary field, is best when it's peeking into the back rooms of the godfather, because the godfather can only really exist in secret, in secret networks.

And of course the world economic system is really not secret, but I think a lot of ways which ... like when Steve said that the farmer and consumer are completely alienated—the actual concept there that they are alienated from each other—that might be a leverage point to cast light on why that happens. And so if we understand how the system works a little bit better, we might be able to do something. That's just an idea I had as I was thinking here ... really inspired by his work.

But hopefully that talking stick book will be out in a few months. *The Power of the Talking Stick: Indigenous Politics and the World Ecological Crisis*.

**Bryan MacDonald:** I think one of the things that kept coming back to me as I listened for the last couple of days was something that the defense community is really struggling with right now in the work of the defense science board is that many of the challenges that are affecting the U.S. national security are not things that are going to

be solved, they are things that have to be managed over the long term. I think that's one of the reasons that resilience has started to get a lot of interest in trying to think about if you can't solve a problem, how can you build systems that are a little bit more adaptive? And this is financial pressure, mission drift, all the sorts of things the military has been dealing with in the past few years, really facing a need to kind of come up with systems that can be somewhat adaptive.

Just as one example, the Marines have a planning process that they use, so that basically whatever crisis you are dealing with, 90% of the process to deal with it everybody is trained on the same planning process. So it's the same steps—you break down problems, whether it's war fighting in Afghanistan or evacuating people from embassies in Asia in the event of bird flu pandemic. Because they're getting handed both missions at the same time, it doesn't make sense to have a totally separate process for humanitarian things versus war fighting. So you try to figure out ways that things come together.

And this brings me to the second point, which is something that Teddie and Kip brought up, is you don't have to do resilience ... you don't have to talk about resilience to do resilience. I think, Teddie, you pointed out that sometimes it's really scary when you're talking about the world's going to end and you have to prepare. And so a lot of the things that are happening around community food systems and the things that ... especially like the whole system that you're trying to build, Kip, in St. Petersburg, those are building resilience because they're building social trust, they're building social capital, they're doing the things you need to do. It's important to focus on the goal, not necessarily the label. And if you look at the national academy's report that came out in 2012 about building resilient communities, and they set out five goals for what would a resilient America look like in 2030, a lot of them are more about the federal government helping to provide resources and provide strategic guidance, but then sort of hoping the communities take it up and do things.

And I think that's where AESS can be really helpful is providing a lot of examples, a lot of stories, a lot of here's how this community has done it and here's how ... Some of the common problems that happen in a lot of cases, you've got a city administration that's really supportive of things that are going on, and they've put out dollar-a-year leases and then there's a change of office. Maybe it's not an ideological shift but it's just somebody who wants to put their own stamp on something, maybe it is an ideological shift and someone says hey, this community garden has really raised property values in this area, and so now we can do a really fancy redevelopment plan. This land that was worthless is now worth a lot; get that garden out of there and let's bring in the new urbanist town development to kind of take over. There are a lot of places that that's happened. And so developing those cases, being able to look at what happened, ways that people are able to negotiate ... Gerry, you have a great video on the EcoTipping Point Project about what was going on in New York with the gardens in the Bronx. I think those kinds of case studies that people can pull out, they can use them in class, but

they're also useful for community groups or professionals, I think are really good ways that things can be done to boost resilience even if that's not part of the labeling and the branding of what's going on.

**Sasha Adkins:** My research interest and my personal interest focuses around waste reduction and reconceptualizing what is waste, making closed loop systems. And when I think about food resilience, there is so much focus on how can we produce more food, find more land to grow more food, and do that more efficiently, when we're wasting about half—depending on the statistics you want to quote—of what we are growing. And so when I think about these things, sometimes they feel overwhelming and I feel I don't have the power to change them. I focus on the personal level first: what can I do to change my own life and the circles right around me?

This is my first year at AESS and I felt excited about working on bringing to this meeting local food, sourcing our meals from organic local farmers that we can invite in to talk with, have a relationship with. So we have an impact on the communities that are hosting us, and we get that feeling of success and we can scale it up at each level.

**Brian Thomas:** I'm going to attempt to be a little bit synthetic, I don't know. It seems to me there are two threads from the comments as well as the presentations, where we either strategically apply ourselves—and I guess these aren't mutually exclusive either—we either apply ourselves in sort of a destructive fashion when we look at the conventional food system and we try to make an argument that there are weaknesses in terms of resilience. I think that's legitimate and I have social movements in the back of my head too, in terms of potentially moving the project forward. And then the second framework is we give this sort of case study—here's ways in which resilience is being built, and some positive examples, right?

I'm perhaps sort of indifferent. I'm still kind of caught up in this ... we have to frame this in terms of something unique. Because these are good conversations and we should be having these conversations, but to come up with an argument why this group should exist versus joining other groups ... do you hear what I'm saying? In terms of even personal resource allocation, I think that there needs to be some delineation that says, we're talking about resilience to this, right? I'm not saying it has to be overly specific, but what we're being resilient to needs to be more specific than the weaknesses in the conventional food system. I kind of feel like there's a whole lot of people who are talking about that. And that if we need an argument as to why we are spending our time together, we need something more specific than that. But I think we can, I think there's real opportunity there.

I think we need to come up with something more than food resilience. We need to be a little more specific as to food resilience to what? I like the idea of discussing acute disturbances. That to me fits into sort of an ecological framework and I think offers some insight into social changes too. But if we talk about resilience to climate change

over a 50- or 100-year period, I kind of feel like there are some people who are talking about that. If we talk about ... frankly, even food deserts. I think there are a lot of people talking about food deserts. They're not talking about food deserts in terms of their weakness relative to acute disasters, they're talking about food deserts in terms of obesity, they're talking about it in terms of nutritional deficiency, they're not talking about it in terms of lack of calories, right? Because that's not a problem in food deserts. That's what I mean by getting more specific.

**Todd LeVasseur:** I want to begin by thanking you for getting us all together and all the phone calls and e-mails over the last year. It's great to be here together and work on this.

Going back to what you were saying, I think this year food collapse is how Gerry is framing it differently, which is intriguing. So thanks. Briefly, I would like to see all of us work together on a special issue journal edition. I think for sure we can do that and get some great articles. So I'd love to see us work towards that. And possibly working up some sort of manifesto, at least for AESS, and maybe we can challenge our peers around the country broader to deal with food resilience issues as professionals in some sort of at least symbolic platform where we have to talk about total collapse of our food system, in which case the universe as we know would cease to function immediately, and so I think we need to take this much more seriously, what's going on in worst case scenarios, and so that's something else we can also start an honest dialog about what's going on.

**Kip Curtis:** I think I've struggled all along with where I fit into this, because I'm not doing anything theoretical, I'm not working from a theoretical basis. In terms of what I think we are accomplishing here, I think of network theory and the kind of work that goes into building society, as it were, by these types of gatherings and sharing this type of information. So I think there's a whole lot of power in the conversations themselves. And I think we are building something ... and there's a movement out there that has risen over the last 5 to 10 years that in many ways I think we have an opportunity to ride, to participate in, and to shape, and we want to be mindful of all that.

My two main concerns coming into all of this ... and this is what I constantly sort of hit on ... is for me it's about praxis. For me this sort of theorizing is great, I love theory, I'm a theory geek. But if you cannot put it into action, it's just as meaningless as anything else. And under that I've always been deeply concerned with equity and the equity issues. And what I see sort of challenging this food movement is that it has tended to be a little more elitist than it wants to be. Not by intention ... we visited an urban farm yesterday in the midst of an African-American community that complains about the kids from the neighborhood killing their chickens and says they don't have time to build relationships with that community. And so I see a lot of disconnects taking place. My own work is designed to, rather than be an outsider with all this theoretical finesse, to be participant in a community, to build that actor network at a local level, to build that



capacity at a local level. So equity, equity, equity, equity, equity. And you forget ... we talk about it in the academy, but we forget that we are very privileged and ultimately elite people, and we need to challenge our own behaviors and our own assumptions. So equity is very important.

The other thing—and this was striking yesterday and I think that this is an interesting challenge in our food movement today—is that we have a tremendous amount of knowledge about how to do these things and yet there are all these new people coming into it who are ignoring that knowledge. Ignoring good science, ignoring good practices, and not engaging them in the best possible ways. And I think it's really critical that we pay attention to those as well. So as we're thinking about resilience, participating in and contributing to that movement is sort of where I'm coming from.

I think that's all I have to say. But Gerry, thank you for bringing us all together.

**Teddie Phillipson Mower:** All I have to say is ditto to what Kip just said. I really think that we can separate ourselves from the rest of the world and try to do the theoretical portion and speak out, but until we get our hands dirty right alongside of people and understand that they have wisdom too, and help them with that and learn from what they are doing, I don't think we're going to move ahead. And yes, we can go and come up with a manifesto, I like that idea. I also think we have to work outside of a .... I love the idea of having case studies and things like that from all of our backgrounds, because the interdisciplinary strength of this combined body is just amazing and I would borrow from something like that in terms of practicing and application.

I do theory in my own discipline all the time. I think this is a part where I can give back to community who do the actual practice.

**Krys Stave:** I was kind of struggling in a similar but from the opposite end of the spectrum about how I fit into this too. I come at this from, what is the problem we are trying to solve? And then how do we approach it? And so I've heard across the spectrum there's a lot of stuff I'm personally interested in—I want people to have gardens and support the local agriculture and stuff—but in thinking from the bigger picture, I think the way Gerry framed it in the beginning was when we talk about resilience, I guess I'm thinking we're talking about the overall food system and its ability to withstand different kinds of disturbances, whether those are short-term severe broad-scale or long-term chronic small-scale, and how do we think about building strength in the whole food network and system to withstand different kinds of shocks. Maybe we need to get more specific, as Bryan was saying, about the types of shocks ... maybe it's the types of shocks we're trying to understand better. Are we talking large-scale short-duration high-intensity natural disasters, or other things?

So I guess I'm thinking that that is an important part of the conversation in terms of going forward, to really get clear on what is the problem that we are trying to address. I

think that might speak to where we fit relative to other people that are talking about different parts of this. Because I think ... I've certainly noticed our conversation, we're very excited about the agroecology and the small-scale farming and so on. It gives us something to talk about ... I don't think that's actually ... what I see a lot in environmental problem solving is people jump to the solutions. You've already got an idea in your head about how to solve this problem, and what turns out is if you look at the big picture and all the stakeholders involved, there is a much broader description of the problem that has to be identified first before we can identify the solutions.

So I guess I would reframe this as saying let's talk about the problems and strategies for reducing risk. I would say we haven't identified or articulated the problem well enough yet. We can't go to strategies before we understand what exactly it is that we want a strategy for. So I would suggest that we spend a little more time talking about the specific problem that we're trying to address.

**Mohammed Rabbi:** I'll talk to you from a different cultural perspective, I'm from a different culture. The world is globalizing, it's a globalized world, we know that. So what happens in one part of the world eventually impacts the rest of the parts of the world. I agree that we need to think more about the problems in more detail.

The world is changing, and we may not realize it. Climate change is happening. In 50 or 100 years, in two generations time, we will see a big change. It's impacting many other parts of the world. I have an opportunity to go to Bangladesh, my home country, and to stay there for six months to teach, and my goal is to learn and understand ... My goal is to learn and understand how people, how the farmers, are adapting to various natural events, including the sea rise level and drought adaptivity and resilience. And I try to learn more about the social part of the things. And so ... because this country is so much highly urbanized, over the century this country has lost many of the old world values, things which we still may find in some of the other countries—in Africa, in South Asia.

... to talk about what happens when a man-made disaster, the ambassador from Uzbekistan talked about the Aral Sea. Probably many of you might know that in 1960, early '60s, the area around Aral Sea was one of the breadbaskets of Soviet Union, a highly agriculturally productive land. But Soviet government diverted .... world's largest inland sea, we can call it lake. They diverted the water to grow more cotton to export. And over the last 35 years we have seen .... So this is one of the things that ... man-made decisions, man-made disasters ... how they impact communities, very large communities. So we may learn a lot of things .... I am in a .... learning process, and I hope when I come back I will be in touch with you guys about some of the things that might be helpful regarding food resilience.

**Gerry Marten:** I have a few random comments. First of all, when I came here this morning before we started, a couple of things that were in my mind ended up getting a lot of attention from everyone, so they are clearly important. One was the

corporations. And it's much broader than food, of course. 1984 has come to pass, and Big Brother is not government. And the corporations have not done it on their own, it's been a co-evolution of the corporations and their customers, and that's all of us. So it's pretty massive].

So that was one thing. Another, the whole local food movement, agroecology movement, whatever you want to call it or think about it, which is a clear opening but not an easy panacea from many points of view. My impression is there are many things about the realities of the United States and Canada—if we think of that as our unit here, main geographic unit—that where although there maybe have been successes and successes are in the works here and there, scattered around, the settings are not welcoming for this sort of thing to happen. And also we can romanticize it, we can imagine what we would like it to be, but it's going to be ... once it ... it's going to grow further, regardless of what we think, one way or the other, for sure. But it's going to have a lot of ramifications, spinoffs, characteristics that are not what we want to imagine. Just as alternative energy which is referred to as green energy is not necessarily much better than fossil fuel energy, or may not be if it were happening on the scale that fossil fuel energy is happening now. It could be a nightmare.

I'm just expressing these possible ... these reservations about the whole agroecology local farm food system movement, though for me personally, I see it as one of the most promising openings, maybe the most promising. And when we're talking about leveraging, one aspect of that practically speaking is we're talking about openings.

And also Krys' point and Bryan's ... Bryan about being more specific, Chris about cart and horse and so on and being clear about the problem before jumping into solutions. There's a progression in those four questions we have; at the same time we can think about them simultaneously, proceeding with and refining each question as we refine the others.

I think one thing that's come out of the discussion today for me is to firm up the perception of the problem, what we as a group want to deal with. There's a lot of work to make things clearer in the coming months, to have something to offer. But I've been very encouraged from what I've seen in the presentations. The presentations are small fragments of this picture, but have a lot of substance to them and are suggestive of some of the material for putting the bigger picture together. A lot of work remains on the glue and the bigger picture.

The other night at dinner I just came out of that ... I thought that was great. So that's the end of my comments. We can open it up now, anybody can say what you want.

**Kip Curtis (?):** This point of co-evolution of the corporations and the customers reminds me of this thing I keep coming back to in all my classrooms, and I think it's been an oversight and it may be something that we want to include in this, but actually the

power lies in the ability of the state to support those .... and the state is still accessible I had a conversation with a chemist last night who is part of a large group that is going and lobbying ... 300 of them are going next week to lobby Congress for a carbon tax. And working on these ostensibly democratic power source to make different kinds ....

One of the things I feel, because I often hear "it's about consumption, it's about making the right purchasing decisions," we are not going to buy our way out of these problems, no way no how. We're essentially victims of the system. And I wonder if in thinking about food resilience we also say, well, "there is a power source there in the state, and part of defining the problem is understanding that we need—whether it's through getting people elected or lobbying the people who are elected—getting our voice into the halls of power, where that decision making takes place." Right now we know Monsanto essentially .... left and right, and we can stand back and whine and complain about it, or perhaps that's another avenue and another way of really kind of getting at the root, power wise.

**Brian Thomas (?):** In slide 2 the main message is that democracy is broken, and so I think on this point, it's a broader issue of democracy. Food is one way that it's manifest, but ... And I think that wherever there happens to be sort of the power of a movement, and I think the anti-fracking movement has some traction, so I think that should be a place where we look for mutual support, ideas, strategies, etc.

**Gerry Marten:** I'd like to move to process, but before doing that, if there's anything anybody really wants to say on this discussion level right now, that's fine, we can continue a few minutes if there's really something you want to say. Otherwise we can move into the question of process, like, what do we do from here with the working group.

Let me throw out a few ideas for how we can actually proceed from here on something that's so messy. For one thing, I think it may be a time to do a formal strategic planning for the working group. Strategic planning could be applied to the problem, and we may ... probably we'll be wanting ... that's one way that we can firm things up. And it can be applied to each step. Classical strategic planning is vision, obstacles, actions to overcome the obstacles, and then out of all that, catalytic actions, and then typically formation of coalitions for actually planning and implementing catalytic actions. But the strategic planning techniques can be applied to each step of the way, including the questions we have about what's the problem, that is, what are the lines of risk, what are the sources of risk, and then what can be done about it, and so on?

By technique of strategic planning what I mean ... I'm sure most of you have had contact with this ... the way of boiling down a bunch of ideas to clusters of ideas, right? So the classic thing is that you have a question you are trying to answer, like what should AESSE do to increase its membership? And then people write down their ideas individually, and then you might have a sifting and proving step where two people sort of look at

each other's ideas together and then they come up with the stuff that they want to put forward ... typically maybe five or six or something like that, it depends on how many people there are. And you put them on a piece of paper, write with letters big enough for people to see, slap them up on the wall, and then the facilitator says "Do you see two of the papers on the wall that are similar?" And you keep doing that and you end up with the papers grouped in columns on the wall, and then the really critical step, which is where the consensus comes in, is to ask "What's a name (two or three words) for each of these columns? For each column, different people make different suggestions until everyone says "That's it!" On the one hand it's really inclusive – you have all the specific ideas on the paper – and you have the names of the columns, which is what you carry forward from consensus, and you can refer back to the ideas of the papers for details. I've done that a lot. The last chapter of my Human Ecology book presents the strategic planning process for the Barataria-Terrebonne National Estuary Program (<http://gerrymarten.com/human-ecology/chapter12.html#p2>). I was on the planning team and it was a miracle. I use it in classes, like "What do we want to do this semester?" Although it took two years to do the estuary planning because it was very complex with lots of steps like this, a single round takes about two hours, and we could use it to map out what we think should be in a set of food resilience articles for JESS – though we don't have time to do it today. I'm trying to think how we can do this when we're apart. We can probably do it by online webinar. Lyle Berkey will set us up with webinar. We're also going to set up an online "shelf" for the working group. I'm going to transcribe your presentations into WORD, and I need your PowerPoints, and we'll get that onto the "shelf."

**Krys Stave:** This was really on my mind, because I'm in the midst of .... where we compared a problem that was addressed by a traditional strategic planning approach and this group model building approach. And what's really interesting to me and the reason why I had this little light bulb going off in my head was that we've been thinking about what's going on with these two cases and why are they different. But something that you just said made me think that it's a bigger problem. Strategic planning processes generally do that; they say what's our vision, and then what are our options for fixing this. They skip the step of what's causing the problem. So the process ... this approach ... collaborative modeling is a different kind of problem solving, but they're thinking very specifically about the problem and then taking the next step of saying what's causing that problem before we identify ideas about solving it. Because if we jump right to ideas about solving it ... as we've heard in these last couple of days, each one of us comes from a different context. Not that we don't see other people's context, but we know our own. And they're all great and they're all part of the system. I love the idea of the schools and the community gardens, and yours about the historical ... the victory gardens and how that fit in with everything else. But that's not looking at the whole elephant.

And we've heard from ... and so we have producers and ideas about how to fix producers; we have consumers and ideas about how to fix consumers. And there are

ideas about the distribution system and the .... system and how those all fit together. So from a systems perspective I was saying, we have this enormous system of interconnections and feedback mechanisms that are generating perhaps counterintuitive behavior. What I'm thinking is OK, great, we've strengthened the local farming system, but what counterintuitive results are going to ... or consequences are going to result from that that may end up not solving the problem?

So this idea of generating ideas for solutions and then using our collective wisdom to decide which ones are the best ones in the end ... in the case study we were just looking at ends up with people feeling very frustrated that they haven't addressed the nature of the problem. They've just picked somebody's solution. So I guess I'd like to suggest that, even though we want to move this forward to get some ideas out, can we spend a little more time deciding ... I'm still not comfortable with this idea of OK, we're looking at risks for the system. What exactly does that mean? What are we ... we have lots of different ideas for what this problem is, but if we don't say this is the one we're focusing on, or this is the set of problems we're focusing on—specifics—and this is what we think is causing those problems, we're not going to necessarily find the leverage points we want.

**Gerry Marten:** Let me generalize that. What I had in mind for a first step of using the strategic planning methodology ... and so basically I'm just talking about a methodology for taking a lot of ideas and pulling something out of them ... was ... so when you do that, you have a question you're addressing. And the question that seems to me we should be addressing first with that is, what do we want to do during the coming months? You suggested one thing to do, to clarify the problems.

**Peter Jacques:** I like that idea. We can clarify "What are the risks?" What are costs? We can connect it to political-economic systems, ecology, climate, soils. I wonder what's going to happen when we tap out the Ogallala Aquifer, There are different social/ecological risks that we can start to think about at different scales.

**Krys Stave:** Maybe we can apply strategic planning for (food resilience problem solving?) How about we do that?

**Gerry Marten:** Yes, I think yes. But what I'm suggesting is that we apply it initially to what we want to do. So in other words, we can have a discussion right now about what should we do. Be more specific about really what food resilience is, what we want to deal with, be specific about sources, get some depth into sources ...

So what I was thinking was that ... so we could have the discussion and have these ideas, and it may be that there would be one theme that would just come right out and we'd say OK, we really should focus on that. And that's fine. I think the problem definition is

right there. Does everybody agree that's a good one to be clear about when moving on?

But I think there are a number of things we could do. When we leave here, we could individually make a list of things we think we should do, like we just said, and others have said. And then go through a process to pull it all together, and probably get out four or five themes that, OK, these are the things that we really want to be doing. Does that make sense, or not?

**Krys Stave:** Are you talking about how we're going to think about this problem or what were going to do ...

**Marten:** Tasks.

**Krys Stave:** ..... There are different kinds of solutions depending on the different kinds of shocks.

**Unknown:** .... maybe you've identified something that capitalizes on some momentum that said is ... or the National Council for Science Education, I should say, has began, so if you were to look at it from the point of view of natural disasters, you might be able to put together a set of papers for JESS.

**Marten:** I'll come up with an idea about to handle this. I think what we want to do is address certain questions together. That's what I was suggesting. And I think one of those questions is "What do we want to do in the coming months?" And then there will be specific questions about the content, what is the problem more precisely, and so on.

**Unknown:** It's a group agreement that we have to come to.

**[End of the group discussion]**

## **Question and answer period with Steve Gliessman**

**Marten:** I told Steve when you ask him questions, because he hasn't been a part of this up to this point, if he's not clear what it's about, that he should feel very free to shoot questions back at you to clarify so he can see how to connect to it.

**Gliessman:** My wife's in charge of the market this morning. We sell our agroecologically grown wine at our local farmers market. It's our primary outlet for sales. For me it's just been a great experience developing that connection, that way of relating to the consumer. I'm a firm believer in farmers markets and the way they work as both an expression of ecological and social relationships between people who grow the food and people who eat it. Just amongst the folks at the market there's a



wonderful network, how they work together, and the way the community itself has built a whole support system for it. I think Santa Cruz might be a little unique in a sense, but I think it's also an indication of what's to come. There's at least one farmers market every day of the week in our region. It's just phenomenal how it's grown, and it wouldn't have been possible without support from the consumers.

It's just been a great way for me to see that side, because I remember way back when I lived in Costa Rica on a private vegetable and coffee farm in the southern part of the country, and we sold our produce down in the lowlands where at that time United Fruit Company was in charge of things and had people located in little housing centers and we would actually drive down directly to the people at their homes or at little stores on the plantations. And I remember the challenges and difficulties of being a farmer trying to sell stuff to people with a 3 ½ hour drive back up the mountain to the farm you had to get rid of your produce before returning. And they wouldn't pay what they should pay at the market. Early on that kind of stuff impacted me, and just seeing the inequities of the market system.

The development of alternative food systems, networks, or whatever we want to call them, bringing equity to the system that is so inequitable.

Alan Chadwick was the founder of the school garden in Santa Cruz, the living laboratory for teaching basically these concepts of science, ecology, agroecology, nutrition, and using a curriculum-based approach that can be used in any classroom.

**Kip Curtis:** I have a question about your farmers markets. I was struck yesterday on our tour by the farmers complaining about their chickens being attacked by kids. I asked a question about the relationships, there are no relationships .... farmers market in St. Petersburg. There is a tension .... How was that overcome in Santa Cruz?

**Gliessman:** It depends on where you are. There are communities who really have found ways around it ... Oakland, Berkeley, the People's Grocery is a really good example. And some of the community garden systems where the transition of management and control .... struggle .... what's going on in Burlington, Vermont, where there's a big market Saturday and Sunday in the town square downtown where all the tourists go. On Monday, thanks to support from the city, there's a market in the poor part of town where all the farmers who go on Sunday are committed to going and selling their produce at probably half price or less. And a lot of stuff that didn't sell is still good. But a lot of it, the market's good. They do an extra harvest and add to it. And the location and the support for it is all provided by the city, and the market's right there and it's directly in the community and there are programs to inform and educate the community about the value of the market. So things like that make a difference. It takes some policy change, I think, to .... prices ....

**Unknown:** .... argument that farmers markets are overpriced?

**Gliessman:** Well I think some of them are. Because, number one, people just take advantage of others sometimes. But I think number two, the main problem is the volume is still so low in the markets .... at the end of the day .... how much you've got left, what are you going to do with it? .... We're lucky with our wine and our olive oil, we can put it back in the box and take it home. So .... prices are only half of what they'd be at the market, at the regular store.

**Unk:** We live in a northern climate. Our farmers market season is very short. And we and some friends have a start-up cooperative. What do you think of sort of a new way of food cooperatives playing a role in ... we care very much about how the particularly young farmers, start-up farmers, marketing, finding a steady market. And so that's part of what's really driving us and our mission, otherwise .... Do you have any thoughts about the way a cooperative ...

**Gliessman:** Are you talking about a marketing coop?

**Unk:** It's like a consumer-owned food cooperative.

**Gliessman:** There are some really good examples of that happening now.

**Unk:** Finally to withstand that, to solve that problem about what about all the extra at the end of the day.

**Gliessman:** There would be an ideal thing if there were a city program that would take that food and distribute it. There are so many ... Second Harvest is countrywide now .... link them, put them together .... big farmers .... food stamps and food aid. Lots of local initiatives.

To give you examples of how to do that, I can think of ALBA program—Agricultural Land Based Association—in Salinas Valley, California, lettuce bowl. This is a program for mostly Hispanic farmers who've been trained through a program to become farmers on their own, helps them with practices, helps them with access to land, helps them with the market. And the big market thing they've done is a cooperative. A cooperative of their produce which functions as a hub that brings their produce together from all of the farmers. And one of the first incentives to do that was our students at UC Santa Cruz, who pressured our campus to let go of the contract with Sysco, who was the food provider. The university took it over, and at the same time accepted the demands of the students to start increasing the percentage of the food served in the dining hall coming from local farmers and being organic. They have weekly ... the student organization, the food system working group ... students, primarily, they have meetings in one of the dining halls and talk about the whole issue. And our non-profits worked closely with those student groups as well. And so the coffee that comes directly from

communities in northern Mexico is served all across the campus as well. They are our main customer. But we had to really struggle to find the right way to get their buying policies to be shifted in order to accept it. But it was thanks to a combination of researchers and students negotiating with the campus to come up with it. And the campus used the argument on produce that we need volume, we need security of delivery. We can't afford to go to each individual farmer and buy from them separately. Well .... together. And now they're selling not just to the university, but the whole .... and how to work around the rules that inhibit the opportunity.

**Marten:** Steve, I have a question. Near the beginning of your talk last night you said we need to make some changes. And the way you said it sort of suggests you had in mind some big changes, and they were burning inside of you. You addressed that somewhat in the talk and your introductory messages today, but is there more that you can say about that? About important changes?

**Gliessman:** There are some big changes that have to happen in terms of bringing justice to the food system. Practices—how to grow things—that's minor compared, in my opinion, to the social changes that need to occur. Social changes are I think the things you guys are talking about in terms of sovereignty, security, and justice. Opportunities in the food system need to be equitably distributed amongst everyone from those who grow the food to those who eat it.

In my opinion, what we've seen happen in the food system, especially in the last two to three decades, is that the two most important parts of the food system .... are so isolated from one another. They don't know who each other is, at all. And that has allowed this conglomeration in the middle to exploit both .... access to the food on the consumer side, and the price and opportunity on the production side. Those are the changes that need to occur. We've got to stop this monstrous corporation that has captured the food system. But the way I go about trying to do it ... I know I can't convince them to change, that's a waste of time. But I can certainly work with all of the alternatives around the edges, on the margins and even in the middle although they're kind of under the radar, to start building these alternatives. And they are happening. Things like food policy coalitions, food hubs, lots of different alternatives starting to develop.

With a strong what I call agroecological foundation, grounded in the practice, number one, grounded in the science, number two, and committed to social change, number three. All are happening together. Our biggest problem is that we're a dispersed movement. We're a dispersed movement. They are so organized and so well funded, that they'll find every way they can to block it. I was just looking at a report this morning. The USDA yesterday approved allowing meat and dairy producers to label stuff as not containing GMOs. The USDA approved it. Part of this ... there's a groundswell across the country right now of wanting things labeled. It's not far enough, it's just saying what's not there. What we want is what is there. We need to know.

Why can't we know? What's the deal? Of course they don't want anybody to know. It's a continuing process .... These movements. California lost an initiative in the last election because of the millions and millions of dollars and all the lies that were put out to convince the public that it was not the thing to vote for. The group JustLabelit.org is a pretty strong group, and one of the founders and leaders of that group is Gary Hirshberg, who is still the CEO of Stonyfield Yogurt, although he did own the company. But he's maintained ... and I've been surprised at how well he's been able to maintain independence from his owners in terms of ... I think part of the terms of the sale is he's continuing to be outspoken and investing a lot of time and money into some of those changes that ...

**Marten:** Steve, if I understand what you said, you said—and think we're all impressed if we look at a list of possible sources of failures in the food system to supply—the corporations are a part of a lot of those items. And you suggested that instead of taking them head on ... maybe do what you can there, but don't count on it to get you very far ... try to develop the alternative. So this is my question: What obstacles do you see in the realities of the American scene and American culture to really developing that alternative on a scale that would be any more successful than how you'd do taking them head on?

**Gliessman:** I wish I knew more about how to promote social movements. That's to me ... if we knew that better, studied those things, with lots of information about what is one and how do you make it organic [?] and it takes on a life of its own based on the situation or issue ...

**Marten:** You and I lived in one when we were young, right? The civil rights movement.

**Gliessman:** Yeah. And the Vietnam war protest movement. All of those were powerful movements with pretty impressive impacts. We need a food movement. And I think people like Michael Pollan and others have been pretty impressive. But I don't know that .... directly .... how much in charge are we? To me, where I'm really trying to create more movement has been, say, in the research community. Convincing researchers that they have a responsibility for action. When there are injustices in the society that are connected to the kind of research they're doing, they need to step up and focus on those injustices and apply their research to it.

[inaudible comment]

**Gliessman:** Well then there's an obligation to not accept those funds, and to struggle and find other ways. One thing I didn't mention last night, although Phil did, is that probably one of the things over the years that allowed me to speak out and to focus on building this alternative .... agroecology is the fact that in 1982, right after arriving at Santa Cruz, I connected up with a family of means, involved in different aspects of the California environment for many years, and they established on our campus the first

endowed chair that the campus ever got, and that was agroecology chair and it was for me to occupy. I occupied it for more than 30 years. Over the years as that endowment grew, it gave me discretionary funds. Not a lot of funds, but for all the little things that you can't get funding for, whatever it was, from money for a student scholarship to go to Costa Rica .... or a barbeque that brought students together ... It was enough to move things, to make things happen, where I wasn't totally dependent on ... It wasn't until 5 years before I retired that we finally got money from USDA. But that's because there was a change, finally some funds for organic research.

And that's why we established the relationship we did with the strawberry grower I mentioned last night. He just was starting his first 2 acres of strawberries over the fence in the field that I lived next to, and we started talking. And that's how we began our relationship. It started at a purely substitution level, we'd figure out how to farm and then how to redesign the system to bring resistance and resilience into the system, and then kind of went to the next level above that of OK, how do you now make this part of a social movement? Without even knowing it in those early days, I was kind of radical, I guess. If you want to say it that way, I don't know. Still kind of am, but ...

I always felt too that if I don't have an alternative to offer to something, I can't criticize it. I feel like we have tons and tons of examples. I learned so much from my time outside of this country, how agrarian movements work. And the things that are going on now with groups like Via Campesina and the campesino movement in Brazil, and all kinds of programs that are gaining ....

[inaudible comment]

**Gliessman:** ..... a lot to learn from how they're organized, how they work from the farmer up.

**Unknown:** Have you noticed a change with the internet helping to vocalize communications?

**Gliessman:** Yeah. But I've noticed the internet really goes the other way too ... I look at the things I automatically get put on, as far as internet sites that send me stuff about the conventional system .... the response from all these groups to the fact that the House of Representatives couldn't pass a Farm Bill. And I'm getting e-mails from the soybean growers association, the corn growers, sugar growers, you name it, and all these little farm groups that make it look like they speak for the farmer, the family farmer. But the other side too, look at the stuff that the Union of Concerned Scientists is putting out right now. Their whole food policy group has really done some powerful stuff, and they're right there in the belly of the beast with what they're trying to do.

**Unknown:** It sounds like .... vulnerabilities are .... investments and concentrated power that ...

**Gliessman:** Yeah. And how do we confront that concentration of power? Again, I come back to what Gerry just said. I think at this point .... what's the spark? I remember one time when I was in ... I guess it was Shanghai, China, this was back before the big economic boom. It was Mao's birthplace, and on the wall there was this little saying outside of this place that said "It only takes a spark to start a prairie fire." Not that I agree with or support the things that were going on all that time, but it definitely talks about how a movement can happen suddenly.

And look what's going on in Brazil right now. Where is all this protest coming from in a country with a supposedly left-leaning government and all that? It's amazing how suddenly something sparks things that lead off into others that start pointing out the inequities of the system. Where it's going to go, I have no idea, but working with agroecology groups in Brazil, some of the most advanced groups right now in terms of infiltrating the system. They've got it set up now that there's probably one of the biggest GMO producers in the world, especially soybeans. And there's a policy in the government to support that. But right alongside it there's a parallel policy that supports family farming and small-scale operations with agroecology as a basic principle guiding what they do with those families. Parallel policies. And what a wonderful experiment, in a sense, to see if this ... which of those is going to continue on, but the agriculturalists are not only are supporting the whole development of the movement on their side, they're also doing the research showing inequities, the lack of sustainability, the problems being generated by this GMO monoculture. Resistance to the BT-gene starts to continue to increase, the superweeds grow, the costs of production grow, the yield levels don't achieve what Monsanto promised, all those things together go beyond the hype that got us into it in the first place, and start pulling it back.

**Mohammed Rabbi:** [Question about GMO seeds and keeping original wild seeds]

**Gliessman:** Yeah, that's the foundation. All of the stuff going on right now around being able to patent life. There has been so many decisions at the level of the Supreme Court over the last couple of months, but that's where the farmers can organize and produce local seed networks. That's basic. You talk about vulnerability. When you lose your seed ... and I've always ... in my agroecology class teaching that section on genetics and all, the thing that I always think about is, how incredible it is that, even when people are starving, they save their seeds. And to give up your seeds—I don't care if it's a small-scale farmer in Africa or South America or a farmer in the United States—it's the same thing. Not to even mention the fact that locally adapted seed makes so much more sense from so many perspectives than the GMO seeds that's developed in a laboratory with one set of conditions. Lose the control of your seeds.

[inaudible comments]

**Gliessman:** Because the real organic growers are still using some of the older varieties that are sweeter, that are picked closer to ripeness, because the markets that they use are more direct and more immediate. It's a whole different strawberry. I won't buy these .... strawberries. They're large monocultures with nothing else around.

It's completely captured by .... They've got the power—the economic power—to provide the inputs that maintain those non-sustainable systems of monocultures. Just around the corner in this little valley where we grow our grapes and olives, Grimmway, Bunny-Luv, carrots ... organic carrots all over the country, right? Right down the little road in our valley, and there it is, 400 acres all at once, monoculture of organic carrots. They are drawing down the water table incredibly quickly. They treat their workers, you know how, it's a system, but it's organic. That's one of the things ... I got myself in big trouble with CCOF (California Certified Organic Farmers), when they were developing their standards, and didn't have any social justice components to it ... you've got to have these in .... that's what's happening. Now we're faced with what to do to get beyond organic. Now we're dealing with this whole concept of sustainable intensification.

[inaudible question]

**Gliessman:** I really think there is .... one of the best examples right now .... the strawberry grower I was talking about. Part of the reason for handing over ownership of his business is he had to be there all the time. Because he's got all these farms. And he's involved in a program right now called—check it out—foodcommons.org. He and a retired extension agent, who also for a long time was a county director in a county in California that was impacted by urbanization. He did everything he could while he was extension director to protect his agriculture, also the other partner in this thing foodcommons.org. The basis of it is ... in fact I was just talking to Jim, saw him a couple of days ago ... organization, they move into a city like Detroit or Pittsburgh, food deserts, it's got crime, it's got poverty ... poverty which you wouldn't believe in Fresno County, which is probably the richest county in economic value of agriculture in the country, highest indicators of poverty and crime. It doesn't make any sense. What they're doing, they're creating on one hand, using agroecology, this whole network of potential producers, everything, urban to urban fringe, to whatever distance ... and helping provide access to new farmers, to farmers, by working with land in the city. And buildings and processing and old restaurants that have closed down and all, to create those as opportunities for people to have them. And creating a food hub that aggregates the production of all these small farmers. The hub brings all this stuff together. They just purchased a closed-down giant supermarket in the center of the city, all outside the government to start with, small money groups and entrepreneurs. And they're going to use this as a big place to market throughout the city. But also they're networking out into all the different outlets of food, through a .... system that's managed as part of the commons. Get the food into hospitals, schools, jails, public institutions, but also make it available for small markets, small restaurants, other ways



where food gets through to consumers. Farmers markets, alternative markets. It's going to have a volume, it's going to have a whole system behind it.

The ideal, ultimately, is if you see things that ,,,, take on .... I thought about this as we were driving around yesterday, how many vacant lots and abandoned buildings and warehouses and everything else we saw in some of the parts of Pittsburgh. And most of that's in the hands of the city. Any garden group with city land, bought from the city or loaned to them by the city. It's all part of a little movement that sort of germinated and is starting to grow, and it's got a long way to go and is facing all sorts of problems, and it might collapse. But it's an attempt to do something that can eventually coalesce into something that will .... To the internet and our capacity to communicate .... ways to link those .... potential economic opportunity in something like that at the local level that recirculates money within the community .... about local economies, about how recirculating money adds so much to the local economy versus .... by a big market out of the community, like Walmart, which create jobs and a few taxes, but most of the money gone.

There are more Walmarts in Mexico than there are in the U.S. Many of them, the way they got their permits, they bought up a lot of the local market chains and kept the market chains' names, but it's Walmart, not to mention the ones with Walmart's name on them.

It's a crazy system, .... coalesced and developed this control of this food system... I'm just looking around to see how many Starbuck's coffee cups there are ...

**Nurcan Atalan-Helicke:** .... think about solutions in other parts of the world .... small farmers do not have access to .... think about seed and the right to seed. After 2011 the Turkish government banned the saving of seed. And in many countries .... resistance movement .... farmers markets .... hybridized seeds .... what can we do as scientists is actually talk to the farmers and provide them or connect them with .... look at ways how to improve the money value of these traditional varieties .... the assumption by the state is that, farmers if they are saving traditional varieties they are not making money .... think through such connections .... earlier comment when you mentioned Santa Cruz, it's the real food challenge, and they have campuses and universities to actually achieve a 20% real food—it can be local, organic, fair trade—by 2020, and they actually send ... they make workshops, they train students .... actually work with the dining halls .... growing movement .... 2009 ....

**Gliessman:** Lots of different components. In Mexico, despite what I mentioned about Walmart, there's also a pretty remarkable agroecological movement. The network of agroecologists is growing quickly. I'm part of that in the sense of having lived there and worked there, but just the fact that so many of those folks are people I've worked with over the years, mostly students of mine actually, and developed relationships that continue today. Some of them part of our non-profit, the Community Agroecology

Network, [www.canunite.org](http://www.canunite.org). These movements are locally based, community based, participatory; linking science, practice, and social movements; helping develop alternative markets; helping develop opportunities for youth to stay in the community rather than leave the community; networks within communities, between communities; overcome this pressure that you're talking about; resistance to it, create opportunities. Being linked closely to the Campesino a Campesino movement ([http://www.foodfirst.org/store/book/Campesino\\_a\\_Campesino](http://www.foodfirst.org/store/book/Campesino_a_Campesino)). Just in the last couple weeks a couple of publications have come out that completely demonstrate the reason why local varieties of corn need to be promoted, distributed, that we don't need GMOs. In fact, we need the diversity that exists, especially Mexico being such a center of the origin of corn. That awareness is developing more and more. But we have to get hit in the face first.

I don't know what to say about Turkey. I don't know ... it sounds like some of the same issues, but at an earlier stage, there has to be a local scientific movement. I know, for example, in Iran, right next door practically, there's a very strong agroecology movement. There's a Society of Agroecology. There's a Journal of Agroecology. There are agroecologists, some of them I have worked with in the past, trying to maintain this movement. They have published on the negative impacts of the narrowing of the genetic seed base and how to develop alternatives so that farmers can exchange seeds, and what different practices are all about. In a place like that, where it's a solid challenge to survive day to day, part of it is continuing developing these nodes and linking them together and creating a movement.

[Question about how to go about teaching this]

**Gliessman:** I don't know how to explain exactly the approach that I use. You've seen the textbook, as a participatory process for many years with the students. I've always kind of let them make the choice. I'd say here's the situation. About the final exam. take all of the stuff we've learned and design a sustainable food system. We don't spend a lot of time on what the social limitations to being able to do that might be. They know they're there. But I want them to just be creative and have an opportunity to .... designs. And as the .... evolve and we have the opportunity to talk more and more about how you bring this into a community and create this .... that's needed in food systems and have them go beyond intercropping and integrated animals. And really develop local markets and we're going to bring students to the farm, and we're going to develop this whole network which goes beyond the farm to the relationship once again that we've lost, which is that relationship between the people who grow food and .... Because that's going to be just as important .... you have to care, not only what they're eating, how it's connected to climate change and how you can change that ... on and on. There's all sorts of stories to tell.

[Comment about values]

**Gliessman:** I've found that by using a holistic systems approach to agroecology and realizing that the system is not just a farm system, it's a food system, all connected. That's what AESS is about, it's all connections and how connections either create inequities or how connections can create change. I have to come back to what I said, by just presenting lots and lots of examples of alternatives that are working, that could be expanded and ... I don't like to think so much of scaling up, I like to think of scaling out. The up part will just happen on its own with enough of us doing it. We need a lot more farmers. We need more farmers, period. The average age of a farmer anywhere—anyplace in the world ....

[Comment about food waste]

**Gliessman:** And there's technologies. Our farm is completely off the grid, and we have one of the newest kinds of compost .... everybody who uses it is educated as to what goes into the system. I guess that's just our own personal way, at our family's level, to get people to the farm all the time. At harvest we'll have 35 or 40 people helping, that's all part of the game.