What Will We Eat as the Oil Runs Out?

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Our global food system faces a crisis of unprecedented scope. This crisis, which threatens to imperil the lives of hundreds of millions and possibly billions of human beings, consists of four simultaneously colliding dilemmas, all arising from our relatively recent pattern of dependence on depleting fossil fuels.

The first dilemma consists of the direct impacts on agriculture of *higher oil prices*: increased costs for tractor fuel, agricultural chemicals, and the transport of farm inputs and outputs.

The second is an indirect consequence of high oil prices—the *increased demand for biofuels*, which is resulting in farmland being turned from food production to fuel production, thus making food more costly.

The third dilemma consists of *climate change and extreme weather events* caused by fuel-based greenhouse gas emissions.

Finally comes the *degradation or loss of basic natural resources* (principally, topsoil and fresh water supplies) as a result of high rates, and unsustainable methods, of production stimulated by soaring demand and decades of cheap energy.

Each of these problems is developing at a somewhat different pace regionally, and each is exacerbated by the continually expanding size of the human population. As these dilemmas collide, the resulting overall food crisis is likely to be profound and unprecedented in scope.

I propose to discuss each of these dilemmas briefly and to show how all are intertwined with our societal reliance on oil and other fossil fuels. I will then argue that the primary solution to the overall crisis of the world food system must be a planned rapid reduction in the use of fossil fuels in the growing and delivery of food. The organics movement is uniquely positioned to guide this inevitable transition of the world's food systems away from reliance on fossil fuels, if leaders and practitioners of the various strands of organic agriculture are willing to work together and with policy makers.

Structural Dependency

Until now, fossil fuels have been widely perceived as an enormous boon to humanity, and certainly to the human food system. Chemical fertilizers, plus powered farm machinery, plus increased scope of transportation and trade, have led to enormous increases in crop yields, supporting a similar explosion of human population, which has grown over five-fold since dawn of industrial revolution.

However, in the process, our food system has become overwhelmingly dependent on fossil fuels. According to one study, approximately ten calories of fossil fuel energy are needed to produce each calorie of food energy in modern industrial agriculture.[3]

Today, in the industrialized world, the frequency of famine that our ancestors knew and expected is hard to imagine. Food is so cheap and plentiful that obesity is a far more widespread concern than hunger. The average mega-supermarket stocks an impressive array of exotic foods from across the globe, and even staples are typically trucked or shipped from hundreds of miles away.

The fact that nearly all of this recent abundance depends on depleting, non-renewable fossil fuels whose burning emits climate-altering carbon dioxide gas means that the current situation is not sustainable.

The Worsening Oil Supply Picture

During the past decade a growing chorus of energy analysts has warned of the approach of "Peak Oil," the time when the global rate of extraction of petroleum will reach a maximum and begin its inevitable decline.

During this same decade, the price of oil has advanced from about US$12 per barrel to about $100 per barrel.

While there is some dispute among experts as to *when* the peak will occur, there is none as to *whether*. The global peak is merely the cumulative result of production peaks in individual oilfields and whole oil-producing nations.

How near is the global peak? Today the majority of oil-producing nations are seeing reduced output: in 2006, BP's *Statistical Review of World Energy* reported declines in 27 of the 51 producing nations listed. In some instances, these declines will be temporary and are occurring because of lack of investment in production technology or domestic political problems. But in most instances the decline results from factors of geology: while older oil fields continue to yield crude, beyond a certain point it becomes impossible to maintain existing flow rates by any available means. As a result, over time there are fewer nations in the category of oil exporters and more nations in the category of oil importers.[4]

Meanwhile global rates of discovery of new oilfields have been declining since 1964.[5]

These two trends (a growing preponderance of past-peak producing nations, and a declining success rate for exploration) by themselves suggest that the world peak may be near.

Clearly the timing of the global peak is crucial. If it happens soon, or if in fact it already has occurred, the consequences will be devastating. Oil has become the world's foremost energy resource. There is no ready substitute, and decades will be required to wean societies from it. Peak Oil could therefore constitute the greatest economic challenge since the dawn of the industrial revolution.

An authoritative new study by the Energy Watch Group of Germany concludes that global crude production hit its maximum level in 2006 and has already begun its gradual decline.[6] Indeed, the past two years have seen sustained high prices for oil, a situation that should provide a powerful incentive to increase production wherever possible. Yet actual aggregate global production of oil has stagnated during this time; the record monthly total for regular crude was achieved in May 2005, nearly 30 months ago.

The latest medium-term report of the IEA, issued July 9, projects that world oil demand will rise by about 2.2 percent per year until 2012 while production will lag behind, leading to a "supply crunch."

The Price of Sustenance

During these past two years, as oil prices have soared, food prices have done so as well. Farmers now face steeply increasing costs for tractor fuel, agricultural chemicals, and the transport of farm inputs and outputs.

An article by John Vidal published in the *Guardian* on November 3, titled "Global Food Crisis Looms As Climate Change and Fuel Shortages Bite," began this way:

> Empty shelves in Caracas. Food riots in West Bengal and Mexico. Warnings of hunger in Jamaica, Nepal, the Philippines and sub-Saharan Africa. Soaring prices for basic foods are beginning to lead to political instability, with governments being forced to step in to artificially control the cost of bread, maize, rice and dairy products.
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> Record world prices for most staple foods have led to 18 percent food price inflation in China, 13 percent in Indonesia and Pakistan, and 10 percent or more in Latin America, Russia and India, according to the UN Food and Agricultural Organisation (FAO). Wheat has doubled in price, maize is nearly 50 percent higher than a year ago and rice is 20 percent more expensive, says the UN. . . .
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> Last week the Kremlin forced Russian companies to freeze the price of milk, bread and other foods until January 31, for fear of a public backlash with a parliamentary election looming. . . .
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> India, Yemen, Mexico, Burkina Faso and several other countries have had, or been close to, food riots in the last year, something not seen in decades of low global food commodity prices. Meanwhile, there are shortages of beef, chicken and milk in Venezuela and other countries as governments try to keep a lid on food price inflation.[8]

Jacques Diouf, head of the FAO, said in London early this month, "If you combine the increase of the oil prices and the increase of food prices then you have the elements of a very serious [social] crisis." FAO statistics show that grain stocks have been declining for more than a decade and now stand at a mere 57 days, the lowest level in a quarter century, threatening what it calls "a very serious crisis." "Any unforeseen flood or crisis can make prices rise very quickly," Diouf warned.[9]

In its biannual Food Outlook report released November 7, the FAO predicted that higher food prices will force poor nations, especially those in sub-Saharan Africa, to cut food consumption and risk an increase in malnutrition.

Meanwhile, the cost of food aid is rising dramatically, just as the global need for aid is expanding. The amount of money that nations and international agencies set aside for food aid remains relatively constant, while the amount of food that money will buy is shrinking.[12]

Impact of Biofuels

The linkages between fuel and food prices are complex. One element consists of the increasing incentives for farmers worldwide to grow biofuel crops rather than food crops. Ethanol and biodiesel can be produced from a variety of crops including maize, soy, rapeseed, sunflower, cassava, sugar cane, palm, and jatropha. As the price of oil rises, farmers are finding that they can produce more income from their efforts by growing these crops and selling them to a biofuels plant, rather than growing food crops either for their local community or for export.

Already nearly 20 percent of the US maize crop is devoted to making ethanol, and that proportion is expected to rise to one quarter, based on existing projects-in-development and government mandates. The US is responsible for 70 percent of world maize exports, and countries such as Mexico, Japan, and Egypt that depend on American corn farmers use maize both as food for people and feed for animals. The ballooning of the US ethanol industry is therefore impacting food availability in other nations both directly and indirectly,

raising the price for tortillas in Mexico and disrupting the livestock and poultry industries in Europe and Africa.

Grain, a Barcelona-based food-resources NGO, reports that the Indian government is committed to planting 14 million hectares with Jatropha for biodiesel production. Meanwhile, Brazil plans to grow 120 million hectares of fuel crops, and Africa up to 400 million hectares. While currently unproductive land will be used for much of this new production, many millions of people will be forced off that land in the process.[14]

Lester Brown, founder of the Washington-based WorldWatch Institute and Earth Policy Institute, has said: "The competition for grain between the world's 800 million motorists, who want to maintain their mobility, and its two billion poorest people, who are simply trying to survive, is emerging as an epic issue."[15] This is an opinion no longer being voiced just by environmentalists. In its twice-yearly report on the world economy, released October 17, the International Monetary Fund noted that, "The use of food as a source of fuel may have serious implications for the demand for food if the expansion of biofuels continues."[16] Jean Ziegler, a UN special rapporteur went so far as to call the biofuel trade "a crime against humanity."[17]

Impact of Climate Change and Environmental Degradation

Beyond the push for biofuels, the food crisis is being also being driven by extreme weather events and environmental degradation.

According to the UN's World Food Program (WFP), 57 countries, including 29 in Africa, 19 in Asia and nine in Latin America, have been hit by catastrophic floods. Harvests have been affected by drought and heatwaves in south Asia, Europe, China, Sudan, Mozambique and Uruguay.[19]

Last week the Australian government said drought had slashed predictions of winter harvests by nearly 40 percent, or four million tons. "It is likely to be even smaller than the disastrous drought-ravaged 2006-07 harvest and the worst in more than a decade," said the Bureau of Agriculture and Resource.[20]

In addition, phosphorus, which is essential to modern industrial agriculture, is set to become much more scarce and expensive, according to a study by Patrick Déry, a Canadian agriculture and environment analyst and consultant, who found that "we have already passed the phosphate peak [of production] for United States (1988) and for the World (1989)." We will not completely run out of rock phosphate any time soon, but we will be relying on lower-grade ores as time goes on, with prices inexorably rising.[21]

At the same time, soil erosion undermines food production and water availability, as well as producing 30 percent of climate-changing greenhouse gases. Each year, roughly 100,000 square kilometres of land loses its vegetation and becomes degraded or turns into desert, altering the temperature and energy balance of the planet.[22]

Finally, yet another worrisome environmental trend is the increasing scarcity of fresh water. According to United Nations estimates, one third of the world's population lives in areas with water shortages and 1.1 billion people lack access to safe drinking water. Climate change has provoked more frequent and intense droughts in sub-tropical areas of Asia and Africa, exacerbating water shortages in some of the world's poorest countries.

In the face of all these daunting challenges, the world must produce more food every year to keep up with population growth. Zafar Adeel, director of the United Nations University's Canadian-based International Network on Water, Environment and Health (INWEH), has calculated that more food will have to be produced during the next 50 years than during the

last 10,000 years combined, even though global food production per hectare is already declining.[25]

What Is the Solution?

One hopeful sign is that governments and international agencies are beginning to take the situation seriously. This month the World Bank issued a major report, "Agriculture for Development," saying that, since half the world's population and three-quarters of the world's poor live in rural areas where food production is the mainstay of the economy, farming must be central to efforts to reduce hunger and poverty

In addition, there are calls for sweeping changes in how land use decisions are made at all levels of government. Because soil, water, energy, climate, biodiversity, and food production are interconnected, integrated policy-making is essential.

Delegates at a soils forum in Iceland this month took up a proposal for a formal agreement on protecting the world's soils. And the World Water Council is promoting a range of programs to ensure the availability of clean water especially to people in poorer countries.[28]

While these efforts are laudable, even essential, they largely fail to address the common sources of the dilemmas we face—human population growth, and society's and agriculture's reliance on fossil fuels.

The solution most often promoted by the biggest companies within the agriculture industry—the bioengineering of crops and farm animals—does little or nothing to address these deeper causes, since the bio-engineering industry itself consumes fossil fuels, and assumes the continued availability of oil for tractors, transportation, chemicals production, and so on.

To get to the heart of the crisis, we need a more fundamental reform of agriculture than anything seen in many decades. In essence, we need an agriculture that does not require fossil fuels, one that conserves water, builds soil, and preserves biodiversity.

The idea is not new. The aim of substantially or entirely removing fossil fuels from agriculture is implicit in organics in all its various forms and permutations—including ecological agriculture, Biodynamics, Permaculture, Biointensive farming, and Natural Farming. All have in common not only a prescription for the dramatic reduction or elimination of fossil fuel inputs, but also for the reduction or elimination of tillage, and the reduction or elimination of reliance on mechanized farm equipment. Nearly all of these systems rely on increased amounts of human labor, and on greater application of place-specific knowledge of soils, microorganisms, weather, water, and interactions between plants, animals, and humans.

What Will Be Needed

But how might we actually accomplish this comprehensive transformation or world agriculture?

Because ecological organic agricultural methods are often dramatically more labor- and knowledge-intensive than industrial agriculture, their adoption will require an economic transformation of societies. The transition to a non-fossil-fuel food system will take time. And it must be emphasized that we are discussing a systemic change. Nearly every aspect of the process by which we feed ourselves must be redesigned. And, given the likelihood that

global oil peak will occur soon, this transition must occur at a forced pace, backed by the full resources of national governments.

Without cheap transportation fuels we will have to reduce the amount of food transportation that occurs, and make necessary transportation more efficient. This implies increased local food self-sufficiency. We will need to grow more food in and around cities.

Clearly, we must also minimize indirect chemical inputs to agriculture—such as those introduced in packaging and processing.

We will need to re-introduce draft animals in agricultural production. Oxen may be preferable to horses in many instances, because the former can eat straw and stubble, while the latter would compete with humans for grains. We can only bring back working animals to the extent that we can free up land with which to produce food for them. One way to do that would be to reduce the number of farm animals grown for meat.

Governments must also provide incentives for people to return to an agricultural life. It would be a mistake to think of this simply in terms of the need for a larger agricultural work force. Successful traditional agriculture requires social networks and intergenerational sharing of skills and knowledge. We need not just more agricultural workers, but a rural culture that makes farming a rewarding way of life capable of attracting and holding young people.

Farming requires knowledge and experience, and so we will need education for a new generation of farmers; but only some of this education can be generic—much of it must of necessity be locally appropriate.

It will be necessary as well to break up the corporate mega-farms that produce so much of today's cheap food. Industrial agriculture implies an economy of scale that will be utterly inappropriate and unworkable for post-industrial food systems. Thus land reform will be required in order to enable smallholders and farming co-ops to work their own plots.

In order for all of this to happen, governments must end subsidies to industrial agriculture and begin subsidizing post-industrial agricultural efforts. Offering subsidies for education, no-interest loans for land purchase, and technical support during the transition from chemical to organic production would be essential.

Finally, given carrying-capacity limits, food policy must include population policy. We must encourage smaller families by means of economic incentives and improve the economic and educational status of women in poorer countries.

All of this constitutes a gargantuan task, but the alternatives—doing nothing or attempting to solve our food-production problems simply by applying mere techno-fixes—will almost certainly lead to dire consequences. All of the worrisome trends mentioned earlier would intensify to the point that the human carrying capacity of Earth would be degraded significantly, and perhaps to a large degree permanently. [41]

So far we have addressed the responsibility of government in facilitating the needed transformation in agriculture.

Consumers can help enormously by becoming more conscious of their food choices, seeking out locally produced organic foods and reducing meat consumption.

The organics movement, while it may view the crisis in industrial agriculture as an opportunity, also bears an enormous responsibility. The organics movement has most of the answers that will be needed to respond to this crisis; however, its message still isn't getting through. Two things will be necessary to change that.

1. The various strands of the organics movement must come together so that they can speak to national and international policy makers with a unified voice.

2. The leaders of this newly unified organics movement must produce a coherent plan for a global transition to a post-fossil-fuel food system. Organic farmers and their organizations have been promoting some of the needed policies for decades. Now, however, there is an acute need for a clearly formulated comprehensive alternative food policy.

To conclude, we *must* turn to a food system that is less fuel-reliant, even if the process is problematic in many ways. The transition to a fossil-fuel-free food system does not constitute a distant utopian proposal. It is an unavoidable, immediate, and immense challenge that will call for unprecedented levels of creativity at all levels of society. A hundred years from now, everyone will be eating what we today would define as organic food, whether or not we act now. But what we do now will determine how many will be eating, what state of health will be enjoyed by those future generations, and whether they will live in a ruined cinder of a world, or one that is in the process of being replenished.

Notes

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