Richard Heinberg's MuseLetter: The Food and Farming Transition

01 Nov 2008
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MuseLetter 199
November 2008 by Richard Heinberg

The only way to avert a food crisis resulting from oil and natural gas price hikes and supply disruptions while also reversing agriculture's contribution to climate change is to proactively and methodically remove fossil fuels from the food system.

The removal of fossil fuels from the food system is inevitable: maintenance of the current system is simply not an option over the long term. Only the amount of time available for the transition process, and the strategies for pursuing it, can be matters for controversy.

Given the degree to which the modern food system has become dependent on fossil fuels, many proposals for de-linking food and fuels are likely to appear radical. However, efforts toward this end must be judged not by the degree to which they preserve the status quo, but by their likely ability to solve the fundamental challenge that will face us: the need to feed a global population of 7 billion with a diminishing supply of fuels available to fertilize, plow, and irrigate fields and to harvest and transport crops.

If this transition is undertaken proactively and intelligently, there could be many side benefits—more careers in farming, more protection for the environment, less soil erosion, a revitalization of rural culture, and more healthful food for everyone.

Some of this transformation will inevitably be driven by market forces, led simply by the rising price of fossil fuels. However, without planning the transition may be wrenching and destructive, since market forces acting alone could bankrupt farmers while leaving consumers with few or no options.

The Transition

To remove fossil fuels from the food system too quickly, before alternative systems are in place, would be catastrophic. Thus the transition process must be a matter for careful consideration and planning.

In recent years there has been some debate on the problem of how many people a non-fossil fueled food system can support. The answer is still unclear. But we will certainly find out, because there is likely to be no alternative, given that substitute liquid fuels—including coal-to-liquids, biofuels, tar sands, and shale oil—are all problematic and cannot be relied upon to replace cheap crude oil and natural gas as these deplete.

There are reasons for hope: a recent report on African agriculture from the United Nations Environmental Programme (UNEP) suggests that "organic, small-scale farming can deliver the increased yields which were thought to be the preserve of industrial farming, without the environmental and social damage which that form of agriculture brings with it."

Nevertheless, given that we do not know whether non-fossil fuel agriculture can in fact feed a population now approaching seven billion—and given that current fuels-based agriculture cannot be relied upon to do so for much longer, given the reality of fuel depletion—the prudent path forward would surely be to tie agricultural policy to population policy.

Indeed, coordination will be essential also between agriculture policies and education, economic, transport, energy policies. The food system transition will be comprehensive, and will require integration with all segments and aspects of society.

This document is intended to serve as the basis for the beginning of that planning process. Our aim is to develop a template that can be used to strategically plan the transition of food and farming across the world, region by region, and at all scales (from the farm to the community to the nation), beginning here in the UK.

Elements of Transition

The following are some key strategic elements of the food systems transition process that will need to be addressed at all levels of scale, from the household to the nation and beyond.

Re-Localization

In recent decades the food systems of Britain and most other nations have become globalized. Food is traded in enormous quantities—and not just luxury foods (such as coffee and chocolate), but staples including wheat, maize, meat, potatoes, and rice.

The globalization of the food system has had advantages: people in wealthy countries now have access to a wide variety of foods at all times, including fruits and vegetables that are out of season (apples in May or asparagus in January), and foods that cannot be grown locally at any time of year (e.g., avocadoes in Scotland). Long-distance transport enables food to be delivered from places of abundance to areas of scarcity. Whereas in previous centuries a regional crop failure might have led to famine, its effects now can be neutralized by food imports.

However, food globalization also creates systemic vulnerability. As fuel prices rise, costs of imported food go up. If fuel supplies were substantially cut off as the result of some transient event, the entire system could fail. A globalized system is also more susceptible to accidental contamination, as we have seen recently with the appearance of toxic melamine in foods from China. The best way to make our food system more resilient against such threats is clear: decentralize and re-localize it.

Re-localization will inevitably occur sooner or later as a result of declining oil production, since there are no alternative energy sources on the horizon that can be scaled up quickly to take the place of petroleum. But if the transition process is to unfold in a beneficial rather than a catastrophic way, it must be planned and coordinated. This will require deliberate effort aimed at building the infrastructure for regional food economies—ones that can support diversified farming and reduce the amount of fossil fuel in the British diet.

Re-localization means producing more basic food necessities locally. No one advocates doing away with food trade altogether: this would hurt both farmers and consumers. Rather, what is needed is a prioritization of production so that lower-value food items (which are typically staple calorie crops) are mostly sourced from close by, with most long-distance trade left to higher-value foods, and especially those that store well.

This decentralization of the food system will result in greater societal resilience in the face of fuel price volatility. Problems of food contamination, when they appear, will be minimized. Meanwhile, revitalization of local food production will help renew local economies. Consumers will enjoy better quality food that is fresher and more seasonal. And transport-related climate impacts will be reduced.

Each nation or region will need to devise its own strategy for re-localizing its food system, based on a thorough initial assessment of vulnerabilities and opportunities. The following are some general suggestions that are likely to be applicable in most instances:

- The process will benefit enormously from policy support at both national and regional levels. This could include, for example, the provision of grants to towns and cities to build year-round indoor farmers' markets.
- Food-safety regulations should be made appropriate to the scale of production and distribution, so that a small grower selling direct off the farm or at a farmers' market is not regulated as onerously as a multinational food manufacturer. While local food may have safety problems, these will inevitably occur on a smaller scale and will be easier to manage because local food is inherently more traceable and accountable.Governments can require that some minimum percentage of food purchases for schools, hospitals, military bases, and prisons are sourced within 100 miles of the institutions buying the food. Channelling even a small portion of institutional food purchasing to local growers would greatly expand opportunities for regional producers while improving the diet of people whom these institutions feed.
- Cities and towns can rework their waste management systems so as to collect food scraps that can then be converted to compost, biogas, and livestock feed—which can in turn be made available to local growers.

But government can do only so much. Consumers must develop the habit of preferentially buying locally sourced foods whenever possible, and they can be

encouraged in this by "Buy Local" educational literature distributed by retailers—who can also assist by clearly labeling and prominently displaying local products.

Growers themselves must rethink their business strategies. Instead of growing specialty crops for export, they must plan a transition to production of staple foods for local consumption. They must also actively seek local markets for their food. The Community Supported Agriculture (CSA) movement provides a business model that has proven successful in many communities. Small producers can also create informal co-ops to acquire machinery (such as small threshing machines for cereal and oilseed processing or micro hydro turbines for electricity).

The strategy of re-localizing food systems will be more challenging for some nations and regions than others. Given that the food footprint of London encompasses essentially all of England, the challenge for Britain is greater than is the case for many other nations. More urban gardens and even small animal operations (with chickens, ducks, geese, and rabbits) within London and other cities should be encouraged, but even then it will be necessary to source most food from the countryside, delivering it to the city by rail. Thus re-localization should be seen as a process and a general direction of effort, not as an absolute goal.

Energy

As society turns away from fossil fuels, the energy balance of farming must once again become net positive. However, the transition process will be complex and problematic. Farms will still need sources of energy for their operations, and will need to provide much or all of that energy for themselves. Meanwhile, farmers could also take advantage of opportunities to export surplus energy to nearby communities as a way of increasing farm income.

Farms must be powered with renewable energy. However, many energy needs on farms—such as fuel for tractors and other machinery—are currently difficult to fill with anything other than liquid fuels, which currently come in the form of diesel or petrol made from crude oil. Farmers should first look for ways to reduce fuel needs through efficiency or replacement of machines with animal power or human labor. This is most likely to be economically feasible in dairy, meat, vegetable, fruit, and nut operations. Where fuel-fed machinery is still required, which is likely to continue being the case for grain production, ethanol or biodiesel made on-site could supplement or replace petroleum. Farmers could aim to apportion one-fifth of their cropland to production of biofuels for their own use.

Many other farm operations require electricity, and this can be generated on-site with wind turbines, solar panels, and micro-hydro turbines. Effort first must be devoted to making operations more energy-efficient. Because these technologies require initial investment and pay for themselves slowly over time, assistance from government and from financial institutions in the form of grants and low-interest loans could be instrumental in helping farmers overcome initial economic hurdles toward energy self-sufficiency.

Eventually farmers are capable of being not just self-sufficient in energy, but of producing surplus energy for surrounding communities. Much of this exported energy is likely to come in the form of biomass—agricultural and forestry waste that can be burned to produce electricity. While farmers can also grow crops for the production of biofuels, the ecological and thermodynamic limits of this energy technology require that the scale of production be deliberately restricted. Otherwise, society's demand for fuel could overwhelm farmers' ability to produce food—and food must remain their first priority. In exporting biomass from the farm, growers must always keep in mind the productive capacity of sustainable agricultural systems, and they must strictly monitor soil health and fertility.

The transition of farms to renewable energy will require planning. Farmers, ideally with the assistance of regional and national agencies, should plan to increase energy efficiency, to reduce fossil fuel inputs, and to grow renewable energy production according to a staged, integrated program designed for the unique needs and capabilities of each farm. As a general guideline, the plan should aim to reduce oil and natural gas inputs by at least half during the first decade.

Soil Fertility

In industrial agriculture, soil fertility is maintained with inputs provided from off-site. Of these inputs, the most important are nitrogen and phosphorus. Nitrogen comes from ammonia-based fertilizers made from fossil fuels—principally, natural gas. Phosphorus comes from phosphate mines in several countries. While sufficient low-quality phosphate deposits exist to supply world needs for many decades, high-quality deposits that are currently being mined are quickly depleting, which means that phosphate prices will likely rise within the next few years. [Phosphate Primer]

Both nitrogen and phosphorus are essential to agriculture. And our current ways of supplying both are clearly unsustainable. Unless alternative ways of maintaining soil fertility are quickly found, a crisis looms.

The long-term solution will surely depend on a two-fold strategy: designing farm systems that build fertility through crop rotations, and recycling nutrients.

Crop rotation can help with maintaining nitrogen levels. Simply planting a cover crop after the fall harvest significantly reduces nitrogen leaching while cutting down on soil erosion. Meanwhile, introducing leguminous crops into the rotation cycle replaces nitrogen.

Cleverly designed polycultures can sustainably produce large amounts of food, as has been shown not only by small-scale "alternative" farmers in Britain and America, but also by large rice-and-fish farmers in China and giant-scale operations (up to 15,000 acres) in Argentina. There, farmers employ an eight-year rotation of perennial pasture and annual crops: after five years grazing cattle on pasture, farmers then grow three years of grain without applying fertilizer. The need for herbicides is also dramatically reduced: weeds that afflict pasture cannot survive the years of tillage, and weeds of row crops don't survive years of grazing.

Most industrial farmers have left behind the practice of cover cropping because commercial fertilizers have become the cheaper option. That cost equation is about to shift. It is therefore important that farmers begin planning for higher fertilizer prices now by gearing up their rotation cycles and building natural soil fertility ahead of the immediate need.

In industrial agriculture, the soil is treated as an inert substance that holds plants in place while chemical nutrients are applied externally. Without efforts to maintain natural fertility, over time organic matter disappears from the soil, along with beneficial soil micro-organisms. In the future, as chemical fertilizers become more expensive, farmers will need to devote much more attention to the practice of building healthy soil. But rebuilding nutrient-depleted soil takes, at minimum, several years of effort.

Traditional farmers increase organic matter in topsoil through the application of compost—which not only builds soil fertility, but also improves the soil's ability to hold water and thus withstand drought. There is also mounting evidence that food grown in properly composted soil is of higher nutritional quality. Currently, in typical modern cities, consumers, retailers, wholesalers and institutions discard enormous quantities of food. Some communities have already instituted municipal programs for composting of food and yard waste; such programs could be expanded and made mandatory, with compost being given free to local farmers. This would reduce the amount of garbage going to land fills, as well as farmers' needs for fertilizers and irrigation, while improving the nutritional quality of the British diet.

In addition, recent research with "terra preta" (also known as "bio char"), a charcoal-like material that can be produced from agricultural waste, suggests that its introduction to soils could reduce plants' need for nitrogen by 20 to 30 percent while sequestering carbon that would otherwise end up in the atmosphere.

The potential of composting and the use of terra preta to mitigate the climate crisis is hardly trivial: a one-percent increase of soil organic matter in the top 33.5cm of the soil is equivalent to the capture and storage of 100 tonnes of atmospheric CO_2. per square kilometre of farmland.

Ultimately, there is no solution to the phosphorus supply problem other than full-system nutrient recycling. This will entail a complete redesign of sewage systems to recapture nutrients so they can be returned to the soil—as Chinese farmers learned to do centuries ago. But if sewage systems (or simpler variants) are to become primary sources of phosphorus and other soil nutrients, they cannot continue to be channels for the disposal of toxic wastes. It is essential that separate waste streams be developed for the disposal of all pharmaceuticals, household chemicals, and industrial wastes. Thus the problem of soil fertility is one that farmers cannot solve on their own: it is a crisis of the food system as a whole, and must be addressed contextually and holistically.

Diet

The consumer is as important to the food system as the producer. During recent decades, consumer preferences have been shaped to fit the industrial food system through advertising and the development of mass-marketed, uniform, packaged food products that, while often nutritionally inferior, are cheap, attractive, in some cases even physically addictive. The advent and rapid proliferation of "fast food" restaurants has likewise fostered a diet that is profitable to giant industrial agribusiness, but disastrous to the health of consumers. However lamentable these trends may be from a public health standpoint, they are clearly unsustainable in view of the energy and climate crises facing modern agriculture.

Because processed and packaged foods and fresh foods imported out of season add to the energy intensity of the food system, rich and poor alike must be encouraged to eat food that is locally grown, that is in season, and that is less processed. Public education campaigns could help shift consumer preferences in this regard.

A shift toward a less meat-centered diet should also be encouraged, because a meat-based diet is substantially more energy intensive than one that is plant-based.

Government can help with a shift in diet preferences through its own food purchasing polices (see "Re-Localization," above). The process can be helped even further by a more careful official government definition of "food." It makes no sense for government efforts intended to improve the nutritional health of the people to support the consumption of products known to be unhealthful—such as soda and other junk food.

Farming Systems

During the past few decades farming has become more specialized. Today, a typical farm may produce only meat of a single kind (turkey, chicken, pork, or beef), or only dairy, or a single type of grain, vegetable, fruit, or nut.

This narrow specialization seemed to make economic sense in the era of cheap transport and cheap farm inputs. But because nature is diverse and integrated, the deliberate elimination of diversity on the farm has led to problems at every step. For example, animal feedlot operations (also known as concentrated animal feed operations, or CAFOs) produce enormous amounts of waste that end up in massive manure lagoons that pollute ground water and foul the air. Meanwhile, grain diets fed to the animals result in digestive problems requiring the large-scale administration of antibiotics that find their way into both the human food system and ground water, and that lead to antibiotic resistance among disease organisms that afflict humans.

Farm specialization also impacts the grain or vegetable grower: soils that annually produce these crops need a regular replenishment of nitrogen; but if the farmer keeps few animals, there may be no option other than to import fertilizers from off-site.

By switching to multi-enterprise diverse systems, farmers can often solve a range of problems at once. Feeding much less grain to livestock while giving them access to pasture that is in rotation with other crops maintains soil fertility while leading to better animal health and higher food quality. The farmer, the environment, and the consumer all benefit.

The post-hydrocarbon food transition may also compel a rethinking of the size of farm operations. The mechanization of farm operations and the centralization of food systems favored larger farms. However, as fuel for farm machinery becomes more costly, and as farming once again involves more labor, smaller-scale operations will once again be profitable. In addition, a smaller scale of operations will be needed as farms become more diverse, since farmers will have more system elements to monitor. Agriculture will thus become more knowledge-intensive, requiring a curious, holistic attitude on the part of farmers.

In urban areas, micro-farms and gardens—including vertical gardens and rooftop gardens that in some cases include small animals such as chickens and rabbits—could provide a substantial amount of food for growers and their families, along with occasional income from selling seasonal surpluses at garden markets.

Farm Work

With less fuel available to power agricultural machinery, the world will need many more farmers. But for farmers to succeed, some current agricultural policies that favor larger-scale production and production for export will need to change, while policies that support small-scale subsistence farms, gardens, and agricultural co-ops must be formulated and put in place—both by international institutions such as the World Bank, and also by national and regional governments.

Currently the UK has 541,0001 farmers, depending on how the term is defined. In the UK in 1900, nearly 40 percent of the population farmed; the current proportion is less than one percent. Today, the average farmer is nearing retirement age.

In nations and regions where food is grown without machinery, a larger percentage of the population must be involved in food production. For example, farmers make up more than half the populations of China, and India, Nepal, Ethiopia, and Indonesia.

While the proportion of farmers that would be needed in Britain if the country were to become self-sufficient in food grown without fossil fuels is unknown (that would depend upon technologies used and diets adopted), it would undoubtedly be much larger than the current percentage. It is reasonable to expect that several million new farmers would be required—a number that is both unimaginable and unmanageable over the short term. These new farmers would have to include a broad mix of people, reflecting the UK’s increasing diversity. Already growing numbers of young adults are becoming organic or biodynamic farmers, and farmers’ markets and CSAs are also springing up across the country. These tentative trends must be supported and encouraged. In addition to Government

policies that support sustainable farming systems based on smaller farming units, this will require:

- Education: Universities and community colleges must quickly develop programs in small-scale ecological farming methods—programs that also include training in other skills that farmers will need, such as in marketing and formulating business plans. Apprenticeships and other forms of direct knowledge transfer will also assist the transition.
- Financial Support: Since few if any farms are financially successful the first year or even the second or third, loans and grants will be needed to help farmers get started.
- A revitalization of farming communities and farming culture: Over the past decades UK rural towns have seen their best and brightest young people flee first to distant colleges and then to cities. Farming communities must be interesting, attractive places if we expect people to inhabit them and for children to want to stay there.

Seeds

Today's seed industry is centralized and reliant upon the very fuel-based transport system whose future viability is in question. Most commercial seeds are of hybrid varieties, so that farmers cannot save seed but must purchase new supplies each year.

Worldwide, a growing proportion of the commercial seeds that are available are genetically modified. GM seeds have primarily been developed by chemical companies to support the sale of their proprietary herbicides. The promise of more nutritious foods, or crops that can produce biofuels more efficiently, is years from realization. Given that the need for transition is immediate, efforts to build a post-fossil fuel food system cannot wait for new technologies that may or may not appear or succeed. In any case, the GM seed industry is based upon current systems of transport, and fuel-based inputs such as chemical fertilizers and herbicides, that are all inextricably tied to the wider fossil-fuel based provisioning systems of society. Thus GM crops would be unlikely to be of much help in the transition in any case.

What is needed instead is a coordinated effort to identify open-pollinated varieties of food crops that are adapted to local soils and microclimates, and a program to make such seeds available to farmers and gardeners in sufficient quantities. In addition, local colleges must begin offering courses on the techniques of seed saving.

Processing and Distribution Systems

The transition process will undoubtedly be fraught with challenges to food processing and distribution systems, which currently rely on large energy inputs and long-distance transport.

For example, the meat industry now depends upon centralized facilities for slaughtering livestock—which must be transported long distances to these facilities. Re-localizing food systems will entail creating incentives for the emergence of smaller, more localized slaughterhouses and butcher shops. One interim solution would be for a fleet of mobile abattoirs to go from farm to farm, processing animals humanely and inexpensively.

Many health regulations were originally designed to check abuses by the largest food producers, but such regulations may now inhibit the development of smaller-scale and more localized processing and distribution systems. For example, farmers should be able to smoke a ham and sell it to their neighbours without making a huge investment in nationally approved facilities. A small producer selling direct from the farm or at a farmers' market should not be subject to the same food safety regulations as a multinational food manufacturer: while local food may occasionally have safety problems, those problems will be less catastrophic and easier to manage than similar problems at industrial-scale facilities.

Food processors must look for ways to make their present operations more energy efficient, while government, consumers, and retailers find ways to reduce the need for food processing and also for food packaging. This gradual shift will require institutional support for families in storing, processing, cooking, and preserving food within the home.

Meanwhile, in view of inevitable problems with existing transport systems, national and regional food storage systems must be reconsidered. Reserves of grain, sufficient to provide for essential needs during an extended food crisis, should be kept and managed to avoid spoilage.

Packaging of food should be regulated to minimize the use of plastics, which will become more scarce and expensive as oil and gas deplete—and which are implicated as sources of toxins in any case.

Government should institute policies that prioritize the distribution of food within the nation by rail and water, rather than by road, as trucks are comparatively energy inefficient.

Supermarkets are currently the ultimate distribution sites for food in most instances. However, this model presupposes near-universal access to automobiles and petrol. A resilient food system will require smaller and more widely distributed access points in the forms of small shops and garden or farm markets. Government regulations and tax incentives can help accomplish that shift.

Wholesalers and distributors will have a changed role in a transitioning food system. They will still be needed to manage the supplies of various seasonally produced foods moving from producers to consumers. However, rather than favoring large producers and giant supermarket chains, they must alter their operations to serve smaller, more distributed farms and gardens, as well as smaller and more distributed retail shops.

Resilience Action Planning

The transition process will succeed by creating more resilience in food systems. Resilient systems are able to withstand higher magnitudes of disturbance before undergoing a dramatic shift to a new condition in which they are controlled by a different set of processes. One quality of resilience is redundancy—which is often at odds with economic efficiency. Efficiency implies both long supply chains and the reduction of inventories to a minimum. This "just-in-time" delivery of products reduces costs—but it increases the vulnerability of systems to disturbances such as fuel shortages. As more attention is paid to resilience and less to economic efficiency, redundancy and larger inventories are seen as benefits rather than liabilities. Other resilience values include diversity (as opposed to uniformity), and dispersion (rather than centralization) of control over systems.

Building resilience into our food systems as we move toward a post-fossil fuel economy will entail all of the Elements of Transition detailed above. It will also require planning at four levels: Government, Community, Business, and Individual or Family. At each level the planning process will necessarily be somewhat different. The purpose of this section is to delineate the main planning steps that will make sense at each of these levels. In some instances, steps within an action plan can or should be undertaken concurrently. In any case, what is offered here is merely a skeletal outline for a process that must be developed to fit unique needs of those it will serve.

Government

The following steps are applicable at any level of government—national, regional, or local. At the highest level of scale (the nation), each step will itself be the subject of planning and delegation. At the lowest level of scale (small villages), government may lack the capacity to undertake any of these steps and can do more than offer symbolic official support to volunteer citizen initiatives.

1. **Assess the existing food system.** Begin with a study of current systemic vulnerabilities and opportunities. How are farm inputs currently sourced? How much food is currently imported? What proportion of those food imports are staples, and what proportion are luxury foods? What are the environmental costs of current agricultural practices? How would the current food system be impacted by fuel shortages and high prices?
2. **Review policies.** How are current policies supporting these vulnerabilities and environmental impacts? How can they be changed or eliminated? Are there policies already in place that are likely to help with the transition? How can these latter policies be strengthened?
3. **Bring together key stakeholders.** Organizations of farmers, food processing and distributing companies, and retailers must all be included in the transition process. Many will wish simply to maintain the existing system; however, it must be made clear that this is not an option. Many companies involved in the food system will need to change their business model substantially.

4. **Make a plan.** The transition plan that is formulated must be comprehensive and detailed, and must contain robust but attainable targets with timelines and mechanisms for periodic review and revision. A scoping exercise must be undertaken to assess the impact of the plan on agricultural output and to quantify the changes in kinds of commodities produced and in their volumes and prices. Simon Fairlie's paper, "Can Britain Feed Itself?", is an initial attempt at such an exercise, and can be used as a model to be built upon and supplemented.
5. **Educate and involve the public.** The public must not only be informed about the government-led aspects of the transition process, but must be included in it to the extent that is practical. Citizens must be educated about food choices, gardening opportunities, and ways to access food from local producers. Their successes and challenges in adaptation will inform new iterations of the plan.
6. **Shift policies and incentives.** This is the key responsibility of government, as it either limits or enhances the ability of community groups, businesses, and families to engage in the transition process. Policy changes must reflect stakeholder input, but must nevertheless be designed primarily to further the Elements of Transition, rather than the short-term interests of any particular stakeholder group.
7. **Monitor and adjust.** An undertaking of this magnitude will inevitably have unforeseen and unintended impacts. Thus it is essential that progress be continually be reviewed with an eye to making adjustments to pace and strategy, while maintaining absolute adherence to the central task of methodically removing fossil fuels from the food system.

Community

The following are action steps for adoption by voluntary community groups, as opposed to governments (see above). The Transition Network provides an excellent model for this kind of community action. Such efforts seem to work best when the scale of community is such that meetings are manageable in size and meeting participants need not travel long distances. Thus in large cities, neighborhoods could apply Resilience Action Planning while sending delegates to occasional city-wide coordinating meetings. The overlap and mutual support between community organizations and local government efforts must be a matter for discussion and negotiation.

1. **Assess the local food system.** This assessment process should be undertaken in cooperation with government, so as not to duplicate tasks. Volunteer citizen groups are in position to provide perspectives that otherwise might elude government assessment efforts—such as opportunities for community gardens, or problems with access to food from local producers.
2. **Identify and involve stakeholders.** Local growers, shop owners, public kitchens, restaurants, schools, and other institutions that produce or serve food should all be contacted and invited to join a voluntary re-localization initiative and to offer input into the process.

3. **Educate and involve the public.** Community groups can stage public events to raise awareness about food transition issues. "Buy local" brochures and pamphlets, paid for and distributed by a consortium of local businesses (but organized by volunteer groups), can list local producers, farm markets, restaurants, and shops.
4. **Develop a unique local strategic program.** This can include farmers' markets, CSAs, school lunch programs, and public kitchens, networked with local producers, including community gardens. The program, based on input from stakeholders, should feature targets and timelines developed through a "backcasting" process, beginning with a collaborative exercise aimed at envisioning the local food system as it might look in 2025 after fossil fuels have ceased to play a role.
5. **Coordinate with national programs.** Local volunteer efforts can play a significant role in informing national government policies, and in implementing the national transition strategy. However, this will require the maintenance of open channels of communication, which in turn will be the responsibility of both government and the local groups.
6. **Support individuals and families.** Individuals are likely to change food habits and priorities only if they see others doing so as well, and if they feel that their efforts are supported and valued. Community groups can help by establishing new behavioral norms through public events and articles in local newspapers. Practical help can be offered via canning parties, garden planting and harvest parties, and gleaning programs. Local food and gardening experts can be made available to answer questions and concerns. Neighborhood food storage facilities can also be created to supplement household cupboards.
7. **Monitor and adjust.** All of these efforts must be continually adjusted to assure that all segments of the community are included in the transition process, and that the process is working as smoothly as possible for all.

Business

Relevant businesses include farms, shops, processors, wholesalers, and restaurants. However, the following steps could also be useful to organizations such as schools, colleges, and hospitals that dispense food as an ancillary part of their operations.

1. **Assess vulnerabilities.** Every business or organization that is part of the food system must take an honest look at the inevitable impacts of higher fuel prices, and fuel scarcity, on its operations. Examine scenarios based on a doubling or tripling of fuel costs to highlight specific vulnerabilities.
2. **Make a plan.** Develop a business model that works without—or with continually shrinking—fossil fuel inputs. Then "backcast" from that imagined future condition, specifying time-related targets.
3. **Work with government and community groups.** Given the fact that government will be developing regulations to reduce fuel use in the food system, and that community organizations will be offering support to local

farmers and food shops that spearhead the transition, it makes good business sense to lead the parade rather than lagging at the rear.
4. **Educate and involve suppliers and customers.** No business is an island. The transition will flourish through strengthened relationships on all sides.
5. **Monitor and adjust.** For businesses, one obvious and essential criterion of success is profitability. The bottom line will help indicate which adaptive strategies are working, and which ones need work. However, negative financial feedback is no reason to abandon the essential goal of transition.

Individual and Family

1. **Assess food vulnerabilities and opportunities.** Whether at a family meeting or by oneself over a cup of tea, take a long honest look at your typical monthly food purchases and give careful thought to the implications. How much of your food comes from within 100 miles? How much is packaged and processed? How many meals are meat-centered? Where do you shop? How would you be impacted if food and fuel prices doubled or tripled?
2. **Make a plan.** Create an ideal food scenario for yourself, including diet, shopping habits, and gardening goals. Then "backcast" a series of time-related goals. Write these prominently on a calendar and attach it to the front of your refrigerator.
3. **Garden.** Even if you don't have access to a plot of land, you can still grow sprouts in a jar or a few food plants in a window box. Look for opportunities to contribute work to a community garden. Develop your skills by seeking out gardening mentors.
4. **Develop relations with local producers.** Even if you have a large garden you probably can't grow all the food you eat. Rather than shopping at a supermarket, begin to frequent your local farmers' market, or join a CSA.
5. **Become involved in community efforts.** Get to know your neighbors and compare gardening experiences with them. Together, form a "tool library" from which members can check out garden tools and gardening books. Organize or participate in planting, harvesting, food-swapping, gleaning, and canning parties.
6. **Monitor and adjust.** At the end of each month, revisit your plan and revise it if necessary.

(This essay is excerpted from a larger document-in-process, a co-publication of the Soil Association and Post Carbon Institute, that will be released in somewhat different versions in the UK and in the US, both in mid-November.)