Environment & Society

White Horse Press

Learning in Sustainable Agriculture: Food Miles and Missing Objects

ALASTAIR ILES

Energy and Resources Group
310 Barrows Hall
UC Berkeley
Berkeley CA 94720-3050, USA
Email: iles@nature.berkeley.edu

ABSTRACT

Industrial production imposes geographical, economic and cultural distances between producers and consumers. The concept of constituting 'missing objects' can help shrink these distances by enabling actors to engage in discourses and practices about contexts beyond what is materially present. Since the mid-1990s, food miles have emerged as an example of missing objects, representing the distance that agricultural products travel from the farm to the dining table, and the environmental effects of transportation. I analyse how consumers, farmers, activists, industry and policy-makers in the United States and Europe are building agency in making and using food miles.

KEYWORDS

Environmental representations, food miles, missing objects, sustainable agriculture.

INTRODUCTION

After 35 years of activism and regulation, environmental problems appear more intractable than originally perceived. One reason is that production systems in the United States, Europe and other industrial nations create geographical, economic and cultural distances between producers and consumers (Princen 2001). Consumers buy and use products that are designed and manufactured far away. The environmental impacts occur far from their places, or are generated invisibly in their lives by remote decisions. The industrial agricultural system exemplifies this phenomenon. The American food analyst Rebecca Spector argues: '[T]his distance serves to block feedback between producer and consumer, so consumers

have little knowledge about the production practices used in creating their food or the impact of these practices on their health or the environment' (Spector 2002). Proponents of sustainable agriculture therefore demand shorter distances so that consumers will be concerned about what they eat and can demand greater producer accountability for ecological degradation.

How can consumers, farmers, retailers and transporters learn about the environmental problems of agriculture? How can they engage in environmentally beneficial behaviour if they do not know about the impacts of their actions? These challenges raise the issue of how agency is created. In the U.S. and Europe, policy-makers and activists have recognised that environmental education may change the behaviour of people as consumers, politically active citizens and producers. The dominant approach, however, has been uni-directional, namely technical experts telling lay people what actions to take. Often methods such as eco-labels or recycling pamphlets are ineffective because consumers are not motivated to use the information, or work under pressures of finite time, resources and cognitive capacity. Producers may not provide adequate information, or label requirements may not match what consumers are interested in. The advocated solutions to blocked agency include refining messages to consumers, decreasing the barriers to use, and mandating industry to provide better information.

In the 2000s, environmental representations (or means of capturing and communicating data in accessible forms) are emerging as a new way to provide, and even empower, people with knowledge for action. In many areas, ranging from pollution prevention, chemicals in consumer products and climate change to biodiversity, representations increasingly can stimulate multi-directional and interactive exchanges of knowledge between industry, citizens and governments. In the area of sustainable agriculture, they may help reduce the distances between producers and consumers. How do these representations work? The concept of missing objects, uniting representation and agency, can provide fertile insight. By constituting missing objects – representations, tools, practices or artefacts that stand in for something that cannot be easily experienced or envisaged – people can speak about things that they previously could not. They can visualise the workings of industrial systems, bridge distances, catalyse dialogue and interact with each other via missing objects that serve to extend their cognitive and social capacity. In doing so, they may become agents with the ability to create alternatives.

The concept of food miles can be used to analyse how missing objects work, how they are made, and what social, political and institutional changes they can generate. Since the mid-1990s, food miles have emerged as a new environmental representation supporting sustainable agriculture. In using food miles to represent the distance that foods travel from the farm to the dining table, actors in Europe and the U.S. are developing new resources for people to visualise the environmental impacts of agriculture, impose accountability on producers and change their growing, selling and eating practices. This article investigates how

food miles are represented, incorporated into dialogue and everyday production and consumption, and used to create greater accountability.

REPRESENTING ENVIRONMENTAL PROBLEMS THROUGH MISSING OBJECTS

Environmental representations are discursive objects and processes that convert complex environmental and social phenomena into forms that people can access and use. Representations provide visual, quantitative, or auditory summations of data that may otherwise be too intractable to understand and act on. In scientific research, representations have proven important in making experimental results more transparent, communicable and persuasive beyond the immediate situation in which experiments are done (Lynch and Woolgar 1990). In the environmental field, representations are increasingly recognised not only as key components making regulation and policy workable, but also as mechanisms to mobilise people, metamorphose political debates, convey the norms and values of protection and support knowledge production. Citizen groups, governments, industry and scientists have therefore begun to develop representations in many settings.

Food miles are only one of the many representations being used, or tested, in sustainable agriculture alone. Wackernagel and Rees (1996) designed the ecological footprint concept to capture consumption impacts in an accessible frame: that of the quantity of land needed to provide the resources for a specific productive activity at scales ranging from the individual to the nation. Redefining Progress, a NGO based in Oakland, California, has developed methods and Internet systems that enable people to estimate their personal or household ecological footprints without expert assistance. Similarly, the 'ghost acres' concept was first developed in the 1960s to show how much land is used up to satisfy human needs such as timber, food, cars, housing or energy, or is not available because of degradation. The Rainforest Alliance uses the idea of 'shade coffee' to demonstrate how coffee is produced unsustainably.[1] The amount of shade available in a forest is connected to habitat quality and to migratory bird and mammal species numbers. These methods can reveal land use, labour, welfare, environmental and trade problems. They enable people to draw links between their consumption and environmental problems, understand more about the industrial and market dynamics driving degradation, and identify where and whom to aim their action at.

Such artefacts are premised on the idea that participating in knowledge production can empower people to act. Traditionally, human perception, cognitive capacity and societal resources do not mesh well with remote time and space horizons (Gunderson and Holling 2002). Social psychology and anthropology has found that people are less able to grasp (or to be engaged by) processes

or events that occur further away from them in time and space (Kempton et al 1995). Conversely, assessments of energy efficiency education programs have found that making energy usage more observable at individual and community levels (such as through meters visualising energy use in real time or bill data highlighting energy use over time and with reference to neighbourhood averages) lead to greater conservation efforts (Mileti and Peek 2002). The conclusion is that 'people are more apt to follow an agenda if they work out a solution themselves, with helpful information from specialists' (Mileti and Peek 2002). If people can not only see the effects of their consumption, but also compare these with other people and observe what alternative actions can do, they are more likely to act.

Artefacts such as food miles can be understood theoretically as attempts to make missing objects. To investigate how students learn, the education researcher Rogers Hall has developed the idea of constituting 'missing objects' in science education (Banach et al 2002). Missing objects are things that people create to help materialise, or make more accessible, otherwise invisible phenomena in their everyday lives. These things refer to 'contexts beyond what is materially present'. People can bring them into existence through the development and use of discourses, artefacts, practices, body gestures, models and databases. Drawing a graph, for example, can illustrate an abstract physics theorem. Such missing objects enable people to engage in dialogue and interaction regarding the phenomena, potentially leading to learning and agency. They may also create new feedback capabilities in which people can probe a problem through the newly constituted object and elicit new data that they can use in their practices.

Many objects may not be open to testing or dialogue in everyday educational settings. Hall notes: 'The objects in a domain may be too expensive or too risky to provide, the circumstances of learning and teaching may be 'sequestered' in ways that reflect deeply entrenched academic divisions of labour, and the domain of practice, itself, may involve learning to participate in the interactional work of constituting technical objects that are not available to the untrained eye' (Banach et al 2002). Nonetheless, science teachers have developed numerous methods and artefacts to overcome these constraints, enabling students to learn about physics, chemistry and mathematics. Moreover, investigating learning practices outside schools reveals that textile makers, doctors, lighting designers and artists make their own missing objects in the course of their work and teaching.

Within the environmental policy field, many objects are not readily observable. In industrial agriculture, these constraints include the commercial confidentiality that pervades food design and processing, the technicality of ecological knowledge, obscure market processes for setting meat prices, and operating procedures hidden in organisations. The underlying structural causes of environmental damage in industrial agriculture are missing because they are too remote for most people, even inside the production system, to visualise or to interact with. This is compounded by disempowering many people from challenging the

assumptions on which the production system is based. Environmental problems are framed in ways that divide technical experts and lay people, discouraging interaction and reinforcing established practices. In industrial agriculture, food technologists, processors, distribution specialists and safety inspectors determine how environmental problems are identified and incorporated, if at all, into food production. Much literature on participation underscores the control by experts over science and technology (Fischer 2001; Irwin 1995). Technical experts and industry may therefore not recognise consumers and farmers as having the ability to decide on environmental action.

In such circumstances, constituting missing objects can create new information, break down divisions between experts and lay people, and develop agency. Agency is the capacity of people to mobilise resources, engage in dialogue with others, challenge or reinforce established routines and institutions, demand accountability from powerful actors, make decisions after deliberation and build material objects or systems. Agents can affect their living situations and the broader structures they are embedded in, while also acting within and against their constraints. The American sociologists Mustafa Emirbayer and Anne Mische explain that agency is created through the 'communicative processes of challenge, experimentation and debate by which actors formulate new temporally constructed understandings of their own abilities to engage in individual and collective change' (Emirbayer and Mische 1998). The ability of people to be innovative or thoughtful in the face of entrenched structures and social habits depends strongly on how they see 'their worlds as more or less responsive to human imagination, purpose, and effort'. Actors become able to communicate, coordinate actions with and against others, establish collective ventures and engage in demonstrations (Sewell 1992).

Methods to stimulate agency exist on a spectrum from uni-directional to multi-directional modes. Uni-directional, one-way interaction characterises most policies in the consumption arena. For example, experts design eco-labels, information and ratings aimed at telling consumers what to do when buying products (Lydon 2002). In such approaches, experts identify and translate technical knowledge into terms accessible to consumers. Consumers then carry out their 'scripted' action, buying on recommendation. Emirbayer and Mische (1998) and Swidler (1986) observe that much agency occurs in the form of habitual behaviour reproducing established patterns of social behaviour and institutions. Despite repeating established routines, people act as agents because they need to recognise the situation at hand, adapt patterns to exigencies, and remember what to do. Uni-directional methods are not inferior. Sometimes, they may be the most appropriate means to reach some people who are not inclined to be pursuers of data. It may be more effective to use tools or practices that people unthinkingly adopt each day because these fit better with people's experiences and capabilities.

ALASTAIR ILES

Nonetheless, uni-directional methods presume that consumers are the public: comprising circles of people who vary according to their supposed levels of understanding. The majority may be ill-informed, uncaring onlookers, while a smaller group is interested and somewhat knowledgeable, and a small group is knowledgeable but not expert. This mirrors the models of public understanding of science that governments, research foundations such as the U.S. National Research Council and academic researchers invoke (Jasanoff, 2005). These models treat people as inert, static receivers of information that experts provide, implying that ignorance can be corrected by re-formulating knowledge in appropriate language and forms to match people's referents. Yet this classification denies the agency of people who participate in deciding what counts as knowledge and understanding.

Conversely, reflexive democracy methods can generate agency through multi-directional, interactive, experiential learning among many actors, not just consumers. Such methods encourage the capacity of people to ask questions, generate their own experiences and analyses, engage in political and technical debates, make decisions, solve problems, and negotiate constructively with other community actors (Ramsey and Hungerford, 2002). They include people doing their own observations, experiments, calculations and comparisons. Summing up recent U.S. National Research Council conclusions on environmental education, Schulz (2002) argues that education has been framed too narrowly as information provision to people. Andrews, Stevens and Wise (2002) call for community-based education that 'builds local skills and supports voluntary actions' using communication strategies, including demonstrations, media marketing, employee training and group efforts to pool knowledge.

Missing objects can stimulate such learning because they do not necessarily depend on experts telling people what to do, but grow out of the everyday efforts of people to represent environmental issues. Drawing on the ability of people to teach each other, new information flows and links can be created throughout a production system. Missing objects, however, can still be framed in uni-directional, expert-controlled terms that inhibit the ability of people to reshape production and markets. They can still reinforce established relationships and production system features.

REPRESENTING DISTANCE BETWEEN FARM AND DINNER TABLE

In industrial agriculture, consumers buy food at a supermarket, but they rarely know where it originates because few details are provided at the point of sale. The retailer also seldom knows because the food passes through so many distributors and processors that it becomes untraceable. The structures and processes behind agricultural production are invisible to consumers, as well as to retailers and producers in many regards. How farmers produce vegetables, the specifications

that retailers insist that farmers use, the ecological impacts of pesticide use, the life cycle of a cow, the polluting semi-trailers used to carry food long distance, and the design of processed foods are not easily seen or linked together (Kimbrell 2002). Consequently, the various actors in the production chain cannot collectively evaluate environmental and social impacts (their own or those of others), verify information flows, and demand accountability from each other.

To address such information gaps, the concept of food miles originated in the United Kingdom in the early 1990s. Andrea Paxton, a technical expert at Sustainable Agriculture, Food, and the Environment (SAFE), a NGO based in London, wrote a research report demonstrating that produce could generate deleterious pollution and energy use effects if transported over long distances (Paxton 1994). She introduced the phrase to make highly technical analysis accessible to politicians and consumers. This reflects a strategic shift by activists to highlight the point that: 'The key issue is not just what diet consumers eat, but *how it gets to them* – how the ingredients for that diet have been produced and distributed' (Lang 1996; italics added). Two recent examples highlight how food miles are defined. Researchers at Iowa State University specify a food mile as 'the distance food travels from where it is grown or raised to where it is ultimately purchased by the consumer or end-user' (Pirog et al. 2001). Friends of the Earth Scotland explains: 'Food miles describes the distance travelled by agricultural produce, food and food ingredients on the journey from farms to the consumer' (Friends of the Earth Scotland 2002). To work, however, food miles need definition in terms of what they reveal about industrial agriculture, representations need to be designed to communicate food miles in everyday interaction, and norms and values need to be attached to the use of food miles.

Food miles help make the environmental impacts of long-distance transportation more visible over space and time. NGOs and academic researchers contend that the transportation of food over long distances – compared to locally sourced foods – causes excessive energy use, air pollution and climate change (Paxton 1994; Jones 1998 and 2001; Boge 1996; Pirog et al. 2001). They associate food transported by air and trucks with very high carbon emissions and energy use compared to cargo ships and railways. Long distance transportation uses energy-intensive technologies like refrigeration, packaging and preservation. Iowa State University researchers calculated that Hawaiian pineapples flown to California and trucked to Iowa (a total of 4,234 miles) used up 250 times more energy and emitted 260 times more carbon dioxide per pound of produce than apples grown in Iowa (Pirog and Schuh 2002). The human energy gained is far outweighed by the energy used for transport. An example that NGOs frequently cite is that transporting lettuce by airplane from California to the U.K. yields 1 calorie of human energy and consumes 127 calories of fuel energy (Sustain 2003).

Looking at trends over time, NGOs and academic researchers also argue that long-distance food freight is rapidly increasing as a result of global sourcing, exacerbating environmental impacts. In the U.S., for instance, food is estimated

ALASTAIR ILES

to account for 20% of commodity transportation, leading to 120 million tons of carbon dioxide emissions (Pirog et al 2001). The average food item travels between 2,500 and 4,000 kilometres, 25% more than in 1980. Similarly, in Britain and Germany, food transportation has grown as a leading source of pollution and carbon emissions since the 1970s (Boge 1996). The former U.K. Department of Environment, Transport and Regions found that food miles in Britain grew by 50% between 1978 and 1999 (Jones 2001). In 1998, food accounted for a burgeoning 40% of U.K. road freight, 74 million tons of carbon emissions, and 1.6 billion litres of petroleum.

In turn, activists and researchers use food miles to expose the extent to which large corporations have re-configured the food production system. They reveal irrational externalities that people could not previously see or debate. Previously, it was difficult to discuss how distribution systems worked in terms of their environmental impacts, and to show how industrial agriculture had displaced regional food economies. Food miles make the structural movements of food across the production system more seeable. They measure how centralised or dispersed the production system is. The Capital Area Food Bank found that all produce sold in Safeway supermarkets on the East coast of the U.S. pass through vast warehouses in Upper Marlboro, Maryland for inspection and distribution (Hora and Tick 2001, Halweil 2002). Produce grown near Atlanta travels 2,000 miles to Maryland and back before being sold in Atlanta. In parallel, food miles can demonstrate that corporate power has helped destroy local farming, supply and processing infrastructure. In Britain, Sustain argues, thousands of small abattoirs existed in proximity to beef farms, allowing farmers to supply their local populations (Sustain 2003). With increasing corporate control over beef production, centralised factories replaced these abattoirs, weakening local economies.

To reduce distance for people, food miles need to be turned into representations that people can use in their dialogue and interaction. NGOs and academic researchers have created representations ranging from physical action, maps and graphs, to narrative stories that children, consumers, farmers and politicians can employ in their everyday lives to question why industrial agriculture generates high food miles. These representations convert the quantitative analysis underlying food miles into more accessible forms. Researchers at Iowa State University developed the 'Weighted Average Source Distance' method to calculate food miles (Pirog et al 2001; Carlsson-Kanyama 1997). This dense quantitative procedure is likely to be arcane to citizens, but the food industry can readily provide the required tracking data for researchers to use. Increasingly, local food providers, farmer groups and local governments are making multi-directional, interactive representations, as they seek to prove not only that high food miles are deleterious, but that local foods are superior. The spread of representations illustrates the social and cognitive changes in agency that constituting missing objects can cause. They generate agency through actors deciding to create

and use representations, critiquing other actors' efforts, charting distances and documenting the environmental impacts of food miles.

Sometimes the representations are literally physical. For example, ALLES (Artenreiches Land Lebenwerte Stadt, or 'Diversified Countryside – A Town Worth Living In) is a German farmer group that campaigns to publicise the problems of the countryside (IATP 1998). In the late 1990s, ALLES placed milk cartons on the roads leading from Feuchtwagen, the town where the group is based, to dairy processing plants and farms, to illustrate how far milk travelled to the town. This use of 'milk miles' is performance art that situates people within the landscape where their food is produced. The campaign has catalysed significant dialogue among local residents and farmers. Drivers inquire what the milk cartons next to the road mean and realise that milk can travel much longer distances than they believed. Farmers understand that their milk is taken by corporations to regional processing plants, instead of local plants, leading to more pollution and less income retained within their locality. Multi-directional learning occurs as these disparate actors are brought into contact through representing food miles.

Perhaps the most dominant representation mode is the geography map. Technical experts at NGOs or universities typically depict food miles in maps representing the distances over which food travels. Such maps draw on referents that people are familiar with, such as airline route maps, travel maps or car mileage charts for travel between points (Monmonier 1997). The numbers that comprise food miles are thought to be most accessible to lay people in this form. Maps enable consumers, farmers and governments to picture the magnitude of food movements and to resurrect the places of food production in their consciousness. NGOs and journalists design maps with features that they believe will resonate with their targeted audiences. These features include foods that people frequently eat in their diet, or a basket of foods that is culturally meaningful, like 'Christmas Dinner' or 'Thanksgiving Dinner'.

One example is the map that the Worldwatch Institute published in its 2002 report on local foods showing the distances that a typical Iowa dinner travels to reach the table (Halweil 2002, originally in Pirog et al. 2001). The average distance was 2577 kilometres, with purple cabbage moving 2720 km from California, chuck roast travelling 1080 km from Colorado, and potatoes 2800 km from Idaho. In contrast, a meal with ingredients wholly produced inside Iowa had an average distance of 74 km. Such maps show the distance and origins of foods without detailing ecological and health impacts. They are also often uni-directional in that technical experts design the maps without giving consumers the opportunity to generate their own maps or to interactively question a database.

Food miles are also represented through narratives about the foods found in supermarkets. These stories cite the statistics of the miles that food travels, picture the products involved, outline the energy consumed in calories and gigajoules,

and stress that the foods are imported, or are imported when the same foods are locally available. Countless examples can be found in newspaper articles, academic and non-profit research reports, activist statements and politicians' speeches, notably in Europe. One example is the British group SAFE's description: 'In early September, home-grown seasonal fruits and vegetables like apples, onions, carrots and green beans were available throughout the country. But, so too, in the central London supermarkets, were apples 4,700 miles from the USA, onions over 12,000 miles from Australia and New Zealand, carrots from South Africa (5,100 miles) and beans from Kenya (3,600 miles)' (Rao 2002; Sustain 2003). Many other representations of food miles are possible, but maps, narratives and physical performance have predominated in experimentation thus far.

Through food miles, activists call for the food supply to be re-localised to create an alternative production system to meet consumer needs. They seek to reframe production by turning 'local' into a highly desirable norm, devaluing long-distance sourcing as unsustainable. In promoting a 'Buy Local Food' campaign, the Oregon Environmental Council urges: 'By supporting local farmers and ranchers, you support your local economy' (Oregon Environmental Council 2003). Constituting missing objects, therefore, can raise questions about the operational assumptions of the production system, such as global sourcing, year-round availability, processing, centralised distribution, retailer control over production conditions, and large volume commodity movements. They can also be used to make alternative production chain features and consumption practices more appealing and 'normal'. These include local sourcing, seasonal availability, decentralised distribution, artisanal production and farmer control over retail.

MAKING AGENCY OUT OF GROWING, SELLING AND EATING.

Food miles are a means to represent some of the environmental impacts of growing, selling and eating food. They can make the transportation choices underlying agricultural production more open to critique. Whether or not food miles can help expose the production system and expand alternatives depends on the nature of the agency being created. In making and using food miles, who is being mobilised, by whom, and for what? How are food miles embedded into everyday business, consumption and production systems and practices? What are the users of food miles targeting in the production system? Can food miles be linked to mechanisms for changing production?

In industrial agriculture, a number of actors make the decisions that shape the food miles of what is grown, sold and eaten. Some actors are much more economically powerful and structurally dominant than others (Kimbrell 2002). Retailers and processors control sourcing and seek to standardise production conditions. They can choose to import lettuce from California, or to send milk to central factories. Farmers can elect to send their crops to a processor far away,

or direct to a farmer's market, depending on what returns they think they will receive and their access to local infrastructure. Chefs and fast food chains can decide whether to provide locally sourced food preferentially to their customers. Conversely, consumers may not be able to spend time reading labels in supermarkets (Lydon 2002) because of deeper structural constraints. Consumers vary greatly in their resources and capabilities according to their socio-economic class, demography, geographical location, work life and values. A key issue, therefore, is how much scope specific actors have to change the structure of the production system. Consequently, it is crucial to distinguish between the supply, infrastructure and demand sides of production when considering the agency that food miles may create.

Food miles are powerful missing objects because they are fungible. They can be turned into a multitude of representations and practical tools that consumers, farmers, retailers, activists and governments can employ in their everyday decisions and institution-building. At this point, food miles are still emerging as missing objects, with uncertain influence and agency. Many experiments are occurring in Europe and the U.S. in using these objects in consumer campaigns, corporate sustainability programs, small business, farm marketing efforts and local government projects. For example, the Devon region in Britain has created a number of local food programs and farmer markets. The strategies of activists, researchers, industry and governments are still taking form. These incipient, fragmented strategies reflect ideas about who controls or has power in the industrial agriculture system, and about how production alternatives may be opened up. Some strategies that NGOs and community groups have used thus far include reports aimed at changing government policies on transportation subsidies, establishing consumer campaigns aimed at influencing retailers and producers, scrutinising retailer choices and creating local food institutions like farmer markets. To a much lesser extent, the food industry is using food miles to reach consumers, persuade governments of its sustainability credentials, rework logistics with sustainability tools, and influence suppliers. Food miles therefore are being targeted at many parts of the production system and at many audiences, but not in coordinated concert.

On the supply side, large institutional buyers like school systems, governments, food chains, retailers and restaurants can invoke food miles to make their purchasing decisions. In 2000, Geetie Singh and Esther Boulton opened the first two organic pubs in London, aiming to use organically grown produce, wild-caught meats and seafood, and locally-sourced raw ingredients (Himmelfarb 2002). To ensure that their food choices are more sustainable, they calculate the food miles of potential purchases by examining labels, bills of lading and trade publications, and by speaking with distributors. They are more likely to reject or substitute foods with high food miles because, they assert, their transport has generated pollution and energy use. The Chef's Collaborative in the U.S. campaigns for fewer food miles by scrutinising the known food choices of restaurants

through peer pressure.[2] These efforts aim at commercial purveyors influencing their suppliers. Thus far, relatively few large-scale purveyors (particularly not government agencies) are using food miles to do so.

Similarly, British (but strikingly not American) food supermarkets such as Sainsbury, Tesco and Marks & Spencer are increasingly incorporating food miles in their corporate sustainability programmes and starting to redesign their transportation and production systems to reduce distances and emit less pollution.[3] As major purchasers, they have the resources to compare between sources of foods worldwide and to choose how to deliver foods to stores. Their sourcing criteria fundamentally affect what foods are made available to consumers. Their choices of delivery methods also shape the ecological and health impacts associated with transportation. The retailers can apply calculation methods, computer databases and decision tools to generate internal analyses. Several European logistics companies now include food miles as a criterion in designing distribution systems. The Birmingham-based Logistics Business Ltd asserts: 'It is our belief that food miles will reduce in the future either as a result of legislation…or by the industry improving the supply chain…' (Logistics Business Ltd 2002). Shorter chains lead to faster times to market, greater quality and flexibility and increased shelf life. The company is developing tools to measure distribution performance in terms of food miles.

On the demand side, consumers can be trained to demand fewer food miles from farmers, distributors and supermarkets in ways that they could not previously. Consumer campaigns based on food miles are still nascent. American researchers have proposed that eco-labels can enable consumers to judge the ecological and energy impacts of products sold in supermarkets. Rich Pirog with the Leopold Center for Sustainable Agriculture at Iowa State University has designed an eco-label that details distance, the source, the mode of transportation and the carbon emissions that transporting the item has generated (Pirog and Shruh 2002). Different eco-label formats are being tested on consumers to evaluate what works effectively (Pirog 2003). These labels, however, represent a uni-directional strategy that may succeed only for some consumers because they may not motivate consumers to make purchasing decisions. Further research is needed to determine whether this is the case. In Oregon, several community groups and food banks are endeavouring to compile data on food consumption and origins to provide consumers with statistics to use in their purchasing decisions. In a 2003 campaign, they asked consumers to measure where their tomatoes came from, thus differentiating between local and long-distance produce in an experientially rich way (Ecotrust 2003). Consumers can also devise methods to document their food miles. A household can maintain a log of the foods that it produces and consumes, thus creating feedback on its ecological impacts.

A different strategy is to use food miles to shape food supply markets and stimulate dialogue between producers and consumers. In farmer markets, consumers can interact directly with farmers, learn about production conditions,

help finance alternative supply networks, and tell farmers what they want to see in their foods. Farmer markets commonly give priority to locally sourced foods, and use food miles to define the threshold of 'localness'. Community-supported agriculture schemes have begun to report to consumers on the food miles they generate. For instance, Small Potatoes Urban Delivery (SPUD), a company based in Vancouver, British Columbia, established a local organic food delivery system in 1997.[4] The company researches the environmental impacts of different modes and routes of delivery. It contends that delivering food to 80 houses by a small van is less environmentally polluting than 80 individuals driving to the supermarket. Each customer receives a food miles tally with her delivery, varying according to basket contents and season. This educates customers about food production and underscores the advantages of local sources.

A vital issue in creating alternatives to industrial agriculture is the development of infrastructure. Without infrastructure, supply and demand cannot be joined, nor brought to bear on the overall production system. In Europe and the U.S, farmers, activists, businesses, local governments and banks are developing institutions such as delivery networks and food cooperatives, creating local food markets, and regenerating local infrastructure like abattoirs (Spector 2002). They examine whether consumers will buy local produce instead of supermarket fare if given the opportunity. They persuade municipalities to hire staff to build local food supplies.

Food miles can be used to make the investment case for shorter supply chains, local food systems, and access to locally produced food. In Bremen, Indiana, a farmer market was established as a way 'to shop local, reduce food miles, cut vehicle expenses, reduce packaging, and think more environmentally about what we eat and how it is produced' (Havens 2001). In the 1990s, to counter intensive production methods and increasing food miles, farmers in Devon developed direct marketing links, including home delivery schemes, supply networks aimed at schools, hospitals and workplaces, and consumer-farmer outlets.[5] Local government highlights the number of new jobs generated for local farms and businesses, the increasing retention of revenue within the region, the growth of business turnover and other indicators of community benefits because of fewer food miles.

ACCOUNTING FOR SUSTAINABILITY THROUGH FOOD MILES

Food miles are circulating across the U.S. and Europe, helping catalyse new dialogue over the environmental impacts of long-distance transportation, and aiding the resurrection of local food systems. The politics of making representations, however, shape the forms that food miles take and what they make visible about the production system. Do food miles enhance the capacity of people to ask questions, generate their own analyses, engage in political debates, and make

ALASTAIR ILES

decisions? Do they lead to new information flows and interaction? Namely, how can we know that agency is developing and that it is having an impact on the production system? Such questions have not yet been integrated into the making and use of food miles. Most actors have not given much thought to how they can assure that food miles are indeed creating new accountability in the food industry and advancing sustainability. Reducing food miles is assumed to be inherently sustainable and transformative.

Food miles raise several broader issues regarding the constitution of missing objects. First, who makes food miles and oversees their use? What expertise and knowledge is involved? Importantly, food miles are being generated at the borders between scholarly research and policy action, so they comprise a non-traditional research area. To date, policy non-governmental organisations (NGOs) like Sustain and technical experts at academic and quasi-governmental research centres such as the Leopold Center for Sustainable Agriculture based at Iowa State University have influenced the development of food miles the most. Food miles reflect 'a hybrid of research journalism and academic research' (Pirog 2004) that does not fit easily within established scholarly disciplines. Food miles represent the development of new, original kinds of expertise. Nonetheless, technical actors still largely do the work of calculating food miles and designing representations. To develop food miles further, they survey consumers to determine their attitudes and responses, but do not yet investigate how food miles can be used to change their engagement with food production and community development (e.g., Pirog 2003). Conversely, industry experts contend that food miles are exorbitantly costly to calculate and that consumers are not interested in knowing how far their foods have travelled. Both groups of experts assume that food miles are best represented in uni-directional ways and that consumers are recipients of their technical knowledge, not producers of data.

In these circumstances, consumers, farmers and other lay people may not become experts in calculating and representing the distances of agricultural production in accessible terms. Few institutions and processes exist in which lay people can be assisted to calculate food miles, pool ideas and experiences, or request food miles estimates for their geographic and economic locality. Food miles, then, may not become meaningful in their situation, or politically persuasive to others who have the power to change the production system. An important part of constituting missing objects is that people need to develop interpretive conventions, standards of proof, preferred evidential forms and criteria to collectively determine what missing objects mean (Jasanoff 2002). To do so, lay people require experience and practice in using representations, and the capacity and right to negotiate with governments, producers, retailers and fellow citizens on what will count as persuasive uses of representations. The ability to ask questions depends on people being recognised and empowered as experts. Otherwise people may not be motivated to scrutinise their consumption, or to demand accountability from producers.

LEARNING IN SUSTAINABLE AGRICULTURE

Second, food miles are associated with attempts to reframe production as preferably local. People should buy locally because it is ethically and ecologically superior to food sourced over long distances. Yet 'local' foods may not be locally produced, or may have many components that travel long-distance (Ermann 2002). The barley or fish spawn used to make Bavarian foods in Bavaria, Germany may originate in other German Lander or countries. In turn, activists argue that local food is best, but local production may not be feasible for many products because of climate, resources, ecology, society and infrastructure. Local production can be environmentally damaging through pollution, biodiversity loss and resource extraction. Many ingredients may need transportation because they are available only in other locales. Cultural preferences also matter: consumers in Berkeley, California may believe that gourmet Spanish cheeses are essential to their way of life and therefore import them over thousands of miles.

The food industry, primarily in Europe, challenges the calculations, data and arguments purporting to show the superiority of locally produced foods compared to long-distance foods. Industry contends that environmental effects are greater for foods imported from closer to home. In Britain during 2001, the industry group Transport 2000 released the Wise Moves Modelling Report, summarising less energy intensive food transportation options (Transport 2000, 2002). The business participants argued that local sourcing must operate within the existing distribution system, and that it was more efficient to centralise the processing and distribution of foods, thus maximising economies of scale. It was better for supermarkets to be supplied by a few large trucks from distribution centres rather than by numerous small trucks from local suppliers, which emitted far more carbon dioxide and pollution. The East Anglia Food Link countered by pointing out that large truck loads are frequently only 40% full, and that the supposedly efficient distribution system depends on heavily subsidised energy.

More broadly, emphasising local production (as in farmer markets) may lead to other equally important sustainability issues being overlooked, limiting the alternative production approaches that could be tested. Sustainable agriculture also calls for fairer trade, by assuring that producers in developing countries receive adequate returns on their labour and crops, and that livelihoods and community development are not inhibited through exploitative trade. Fair trade coffee exemplifies this approach, by creating standards for retailers and coffee purveyors like Starbucks to adopt in verifying that producers are treated equitably, and using certification to monitor and enforce the system.[6] Is it better to purchase food sourced remotely but grown organically and providing jobs where they are most needed? Or to support local food producers at the farmer market? How does this link with the threshold for considering the sustainability of food miles? Should it be a quantitative decision, namely 100 miles or 500 miles? Or should it depend on a broader matrix of ecological and social welfare factors? A tension between fair trade and local food may exist, because they make different claims about what sustainability demands, and provide divergent

ALASTAIR ILES

alternative models for production. It is, therefore, important not to make food miles the only arbiter of sustainability.

Third, food miles may not provide a full picture of the environmental impacts of transportation or agricultural production. Sheer distance does not mean that environmental damage results, since alternative food sources may produce greater overall pollution and energy use, or different modes of transportation from the same source may vary markedly in their energy use (Jones 1998). Food miles may not reveal the full costs of local sourcing because they exclude the energy costs of agriculture. Supermarkets point out that importing tomatoes from Mexico into Britain is infinitely more energy intensive than importing from Spain if only transportation costs are considered (Transport 2000, 2002). Yet Spain uses heated glasshouses to grow tomatoes, and the overall energy consumption may far exceed the savings in transportation energy use.

Additionally, some British activists argue that processed foods demand attention: '[T]here is a whole range of further hidden miles that these calculations ignore. To grow the strawberries for the jam for the yoghurt, the farmer uses fossil fuels to plant, spray and harvest the fruit, and the sprays he uses have themselves been manufactured and distributed at some environmental cost. The aluminium for the yoghurt jar lids has come from mines many thousands of miles from the packaging plant' (Lobstein 1999; Boge 1993). The materials, chemicals, energy and equipment used to produce food may make it unsustainable whereas considering only food transportation may make it sustainable. Thus far, food miles have been primarily made and used to evaluate produce, rather than including livestock, seafood and processed foods. This reflects the problems of finding out about how fungible foods are sourced and how processed foods are manufactured.

Fourth, the impacts of food miles on the production system and its accountability are uncertain. Do the missing objects catalyse interaction that helps change production and consumption? Are the distances between consumers and producers being diminished? Who are making changes in terms of food miles – and being held accountable for these? Restructuring the food system to accommodate alternatives is a highly complex challenge. Policy, market demand, producer incentives, structural constraints, the absence of processing infrastructure and other dimensions affect the emergence of sustainable agriculture. It is critical to determine whether or not change is occurring, and who is making the changes.

The food industry may simply use food miles as a symbolic approach to sustainability. Tesco, for example, claims that it now chooses to buy organic milk from inside Britain instead of importing from Europe, in order to reduce food miles (Rao 2002). However, the company recently reorganised its distribution system so that the milk must travel to a central processing plant in Essex before delivery, so that the distance may still be excessive. Despite the tentative moves of some U.K. supermarkets and logistics firms, the food industry largely

does not use food miles to evaluate its environmental impacts. Employees and processors are not encouraged to internalise food miles by doing their own calculations. Instead, they are trained to make procurement decisions within existing production chains. This means that the food miles impacts of corporate decisions are likely to be opaque. Similarly, purveyors and retailers may use food miles when making purchasing decisions, but this may never be apparent to consumers.

Simply creating representations and internal tools may not yield enduring changes in the production chain without also developing means and institutions to make the impacts of food miles visible and measurable. In the sustainability area, making missing objects needs to be coupled with monitoring and processes for debating and adjudicating on what food miles means and whether or not specific actors are doing enough. Thus far, making and using food miles have not yet focused on developing these resources.

CONCLUSIONS

The concept of food miles can generate reflexive democracy in which consumers, farmers, retailers and governments make and test claims about food production. Debates over how to understand and use food miles have spread through rural towns, regional food economies and farmer markets in the U.S. and Europe. What is 'local' food, and how can it be identified? Which, and whose, miles matter for activism? Who controls the choices that lead to mass distribution and product availability? Answering these questions involves not simply the uni-directional provision of information to guide people but processes of people seeing, discussing and acting on knowledge that they help create in multi-directional, interactive ways. As a result, the energy and ecological costs of long-distance transportation, and the inefficiencies of distribution systems, can become visible and open to political debate and practical action. Rich learning can occur. Food miles therefore illustrate the possibilities of constituting missing objects and stimulating agency to change production systems.

Nonetheless, a lack of analysis of how missing objects are constituted, used and evaluated can limit their potential for learning and change. How far missing objects can enable people to visualise and critique the very assumptions on which production systems operate needs to be questioned. The widespread absence of institutions, processes and actors doing the work of food miles calculation throughout Europe and the U.S. reflects the uni-directional genesis of food miles. The expertise involved in making and using food miles remains largely dominated by technical experts and policy NGOs, although there are promising signs of take-up by farms, local governments, food suppliers and consumers in testing different representations and practical tools. Making claims about food miles leads to the problem of how their impacts on the production system can

ALASTAIR ILES

be made visible and open to evaluation. The issue of who should be doing the evaluation and monitoring of food miles, and how, has been absent in debates over food miles. The ways in which supply, demand and infrastructure sides link up in the production system also have been inadequately considered in the strategies used thus far. Where consumers do not generate their own food miles, NGO campaigns may overlook the need to create channels of pressuring institutional or corporate food purchasers, leading to an important lacuna for learning and impeding the targeting of production structures.

To develop food miles further as missing objects, it is important to move beyond uni-directional modes of creating agency to multi-directional modes. Practical steps include developing methods and tools that people in all parts of the production system can use to calculate food miles and ecological impacts. Industry and government can make data on the movements of foods much more available, so that consumers, retailers and institutional buyers can do their own calculations. Food companies can make new indicators to report their transportation performance, as Sainsbury and Marks & Spencer already do in Britain. Above all, food miles can be coupled with policies that take aim at the structures of the food industry. In Europe, governments are beginning to study how food miles can be used to impose taxes as incentives for industry to shrink long distance transportation. Food miles have their limitations, but they can help challenge the distances between producers and consumers by catalysing learning about sustainable agriculture.

NOTES

[1] See for example www.seattleaudubon.org/shadecoffee/aboutsc/aboutsc.html.

[2] See www.chefscollaborative.org.

[3] For example, Sainsbury states that it has sourced 3.5 percent more products with 0.2 million less kilometres travelled during 2000–2001. The company claims to have a policy of selling produce close to their place of origin, such as supplying the south of England with vegetables from Sussex and Surrey. See Planet Art, 15 October 2002, www.planetark.org.

[4] Details can be found at: http://www.spud.ca/index.cfm.

[5] See for example, www.devonfoodlinks,ork.uk for examples.

[6] See for example www.globalexchange.org/campaigns/fairtrade/coffee.

BIBLIOGRAPHY

Andrews, Elaine, Mark Stevens and Greg Wise. 2002. 'A Model of Community-Based Environmental Education' in T. Dietz and P. Stern (eds), *New tools for Environmental Protection: Education, Information, and Voluntary Measures* (Washington DC: NAS Press) pp. 161–82.

Banach, M., N. Brown, C. Carroll, N. Gillepse, D. Glaser, R. Hall and A. Ryu. 2002. 'Constituting 'missing objects' in learning conversations.' In *Keeping Learning Complex: The Proceedings of the Fifth International Conference of the Learning Sciences* (ICLS 2002). Mahwah, NJ: Erlbaum. 606–610.

Boge, Stephanie. 1993. *Road Transportation of Goods and the Effect on the Environment.* Wuppertal, Germany: Wuppertal Institute.

Boge, S. 1996. 'Freight Transport, Food Production and Consumption in the USA and Europe', *World Transport Policy & Practice*, 2(4): 28–31.

Carlsson-Kanyama, Annika. 1997. 'Weighted Average Point Sources and Distances for Consumption Origin Tools for Environmental Impact Analysis'. *Ecological Economics*, 23: 15–23.

Dietz, Thomas and Paul Stern (eds). 2002. *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Washington DC: NAS Press.

Ecotrust 2003. Available at http://www.ecotrust.org/foodfarms/tomatoinitiative.html, accessed on 3 April 2005.

Emirbayer, M. and A. Mische. 1998. 'What is Agency?', *American Journal of Sociology*, 103(4): 962–1023.

Ermann, Ulrich, 2002. *Localizing Products, Producing Localities: Commodification and Authentification of Local Food and Rural Nature*. Working Paper, Institute of Geography, University of Erlangen-Nuremburg, Germany.

Fischer, Frank. 2001. *Citizens, Experts, and the Environment*. Durham, NC: Duke University Press

Friends of the Earth Scotland, 2002. *Food and Farming: Time to Choose!*, available at www.foe-scotland.org.uk/press/pr20020602.html, accessed 3 April 2005.

Gunderson, Lance and C.S. Holling (eds). 2002. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press.

Halweil, Brian. 2002. *Home Grown: The Case for Local Food in a Global Market*. Washington DC: Worldwatch Institute.

Havens, Cory. 2001. 'Bremen to Test Farmers' Market Plan', *South Bend Tribune* (Indiana), 7 September 2001.

Himmelfarb, Ellen. 2002. 'Going Green is More Appealing than Ever at London's All-Organic Pubs', *National Post* (Canada), 23 November 2002.

Hora, Matt and Jody Tick. 2001. *From Farm to Table – Making the Connection in the Mid-Atlantic Food System*. Capital Area Food Bank of Washington D.C. Report.

IATP (Institute for Agriculture and Trade Policy). 1998. *Marketing Sustainable Agriculture: Case Studies and Analysis From Europe*. Minnesota: IATP.

Irwin, Alan. 1995. *Citizen Science*. London: Routledge.

ALASTAIR ILES

Kimbrell Andrew (ed). 2002. *Fatal Harvest: The Tragedy of Industrial Agriculture*. Washington DC: Island Press)

Jasanoff, S. 2002. 'Citizens at Risk: Cultures of Modernity in the US and EU', *Science as Culture*, 11(3): 363–80.

Jasanoff, Sheila. 2005. *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton, NJ: Princeton University Press.

Jones, Andy. 1998. 'An Environmental Assessment of Food Supply Chains: A Case Study on Dessert Apples', *Environmental Management*, 30(4): 560–76.

Jones, Andy. 2001. *Eating Oil: Food Supply in a Changing Climate*. London, SAFE.

Lang, Tim, 2003. 'Manufacturers and Retailers are Locked in a War for the World's Markets', *The Guardian*, 17 May 2003.

Lang, Tim. 1996. *Consumers and European Agri-Food Policy: Problems and the Future*. Paper delivered at Consumers' and Producers' Roles in European Agri-Food Policy-Making Seminar at the University of Siena, November 7–9, 1996.

Lobstein, Tim, 1999. 'Measuring Food By the Mile', *Living Earth and Food Magazine*.

Logistics Business Ltd, 2002. *Reducing Food Miles – Green Propaganda or Sound Business Sense*, available at www.logistics.co.uk, accessed on 3 April 2005.

Lydon, Betsy. 2002. 'Eco-Labels: Promoting Alternatives in the Marketplace' in A. Kimbrell (ed), *Fatal Harvest: The Tragedy of Industrial Agriculture* (Washington DC: Island Press), pp. 367–72.

Lynch, Michael and Steve Woolgar (eds). 1990. *Representation in Scientific Practice*. Cambridge, MA: MIT Press.

Kempton, Willett, James Boster and Jennifer Hartley. 1995. *Environmental Values in American Culture*. Cambridge, MA: MIT Press.

Mileti, Dennis and Lori Peek. 2002. 'Understanding Individual and Social Characteristics in the Promotion of Household Disaster Preparation' in T. Dietz and P. Stern (eds), *New Tools for Environmental Protection: Education, Information, and Voluntary Measures* (Washington DC: NAS Press) pp. 125–40.

Monmonier, Mark. 1997. *Cartographies of Danger: Mapping Hazards in America*. Chicago: University of Chicago Press.

Oregon Environmental Council, 2003. Buy Oregon Campaign, available at www.orcouncil.org/Partnerships/Agriculture/Pledge.htm

Paxton, Andrea. 1994. *The Food Miles Report: The Dangers of Long Distance Food Transport*. London: SAFE.

Pirog, Rich, Timothy Van Pelt, Kamyar Enshayan and Ellen Cook. 2001. *Food, Fuel, and Freeways: An Iowa Perspective on How Far Food Travels*. Ames, Iowa: Leopold Center for Sustainable Agriculture.

Pirog, Rich and Pat Shruh. 2002. 'The Load Less Travelled: Examining the Potential of Using Food Miles in Eco-Labels'. Available at www.leopold.iastate.edu.

Pirog, Rich. 2003. *Ecological Value Assessment: Consumer and Food Business Perceptions of Local Food*. Ames, Iowa: Leopold Center for Sustainable Agriculture.

Pirog, Rich. 2004. Personal communication with the author, 18 August 2004.

Princen, Thomas. 2001. 'Consumption and Its Externalities: Where Economy Meets Ecology' in T. Princen, M. Maniates and K. Conca (eds), *Confronting Consumption* (Cambridge, MA: MIT Press), pp. 23–42.

Ramsey, John and Harold Hungerford. 2002. 'Perspectives on Environmental Education in the United States' in T. Dietz and P. Stern (eds), *New Tools for Environmental Protection: Education, Information, and Voluntary Measures* (Washington DC: NAS Press) pp. 147–60.

Rao, Sujata. 2002. 'Organic Food-hungry Britons Pile on the Air Miles', *Planet Ark*, 15 October 2002.

Schulz, John. 2002. 'Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change' in T. Dietz and P. Stern (eds), *New tools for Environmental Protection: Education, Information, and Voluntary Measures* (Washington DC: NAS Press) pp.67–82.

Sewell, W. 1992. 'A Theory of Structure: Duality, Agency, and Transformation', *American Journal of Sociology*, 98(1): 1–29.

Spector, Rebecca. 2002. 'Fully Integrated Food Systems: Regaining Connections between Farmers and Consumers' in A. Kimbrell (ed), *Fatal Harvest: The Tragedy of Industrial Agriculture* (Washington DC: Island Press), pp. 351–6.

Swidler, A. 1986. 'Culture in Action: Symbols and Strategies', *American Sociological Review*, 51(2): 273–86.

Sustain, 2003. 'Why Run a Food Miles Campaign', www.sustainweb.org/chain_fm_why.asp, accessed 3 April 2005.

Transport 2000. 2002. *Wise Moves Modelling Report*. London: Transport 2000.

Wackernagel, Mathis and William Rees 1996. *Our Ecological Footprint: Reducing Human Impact on the Earth*. Philadelphia, PA: New Society Publishers.