Food Systems and Environment: Building Positive Rural-Urban Linkages

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Abstract

Urbanization increases the physical and mental distances between urban and rural residents and separates city people from knowledge about where and how their food is grown. We recognize an increasing interest in diet and health, as well as the environment, yet at the same time most urban consumers focus only on product quality and price in the supermarket. Broader issues of environmental health and the economies of families where their food originates are external to most food buying decisions. In most industrialized countries, less than 5% of the population produces food, and there is a relatively secure food supply. When consumers are distant from where food is produced, many lose any appreciation of food systems, become indifferent about agricultural landscapes, and are unaware of the multiple ecosystem services provided by rural areas. This is part of a general de-contextualization of the modern market and monetary focused societies. Contextualization and positive linkages between urban and rural people can be built, however, by promoting local food systems and establishing connections to the rural landscape. Viable examples of positive linkages include on-farm direct sales, community supported agriculture and farmers' markets, locally grown food in supermarkets, and ecobelts that help to link rural and urban areas with activities of common interest. Urban people who are closer to their food supply can become more engaged and informed consumers who will support an ecologically-sound food production system, as well as appreciate a healthy multifunctional rural landscape.

Introduction

There has been a growing separation of people from the production of their food since the industrial revolution, when

machines began to replace human labor on farms and people moved into cities that grew around the factories and became industrial centers. With an increase in food production labor efficiency, fewer people were needed to supply enough food for the entire population. The population of urban areas, defined as cities with over 2,500 people, increased from 200 million to over 2.5 billion during the period from 1950 to 1996 (Miller 1997). Urban migration also moved people away from rural and natural landscapes on which they had been dependent for food and other amenities for centuries.

Trade and delocalization of food have generally had positive effects on food availability in industrialized countries while having negative consequences in many developing countries (Pelto and Pelto 1985). There are notable exceptions to this situation in India, and South and East Asia. The trade of food raw materials from developing countries to industrialized countries, a trade between countries with different currencies of extremely different "buying-powers," will also act as a drain of natural resources from South to North (Brown 2003). Most people today live in places that are distant from production fields, an emerging trend that is a result of our transformation from urban to rural societies in all countries. As an urbanized species, humans have created a distinct division between agriculture and city life (Flora 2001). While we recognize that this boundary is often a blurred one, it may be more conceptual than physical, since there are obviously many areas of transition between farming and subdivisions, such as rural acreages.

Physical separation of people from food production has resulted in a degree of indifference about where and how food is produced, especially where food is plentiful and inexpensive as in most industrialized countries. The global system could be said to provide "unprecedented and unparalleled choice—any food, any time, anywhere ... [from a] global vending machine" (Halweil 2002). The food becomes a decontextualized industry product on the market, without any clear connections to either life support functions in ecosystems or social functions in the socio-economical production system—a "thing" without a history with ethical aspects to bother with. Furthermore, this food system is for the people who can afford it, and most undernutrition is a result of economic inequities that result in lack of buying power for the poor (Halweil 2004). The majority of people likewise are unaware of the environmental consequences of an industrial food system, both regarding its supply side and its waste production side (Johansson et al. 2000). But at the same time, there is growing concern about food safety, diet, and health (Nestle 2002).

One consequence of physical separation is a psychological distance of most citizens from production agriculture, as described by Kloppenburg et al. (1996, 34) in a testimony on the U.S. food system, "What is eaten by the great majority of North Americans comes from a global everywhere, yet from nowhere that they know in particular." A brief walk through a supermarket in any large city in the North, if the packing cases are visible, reveals fresh and processed products from northern and southern Europe, North and southern Africa, Latin America and the U.S., and often New Zealand. Most people select their purchases without concern about the source. When unconcerned about the source of food, people do not consider the consequences of the system for others who produce food nor for the environment (Kloppenburg et al. 1996). We discuss this psychological separation of people from their food supply, and the impacts this may have for long-term food system sustainability.

Another consequence of specialization and fewer people in farming is the creation of border areas, or city limits, between urban housing and agricultural production areas. People on opposite sides of this boundary have very different goals and needs for land use, and there are emerging conflicts between groups that may not easily understand each other. We discuss the concept of green areas or ecobelts that can create positive interactions to replace the conflicts in this interface (Schoeneberger et al. 2001).

One approach to better understanding of linkages between people and their food supply is the study of agroecology, a growing field that encompasses both education and research in all the steps in the food system (Francis et al. 2003). When we study resource use, efficiency, cycling of materials, global and local distribution of production and benefits in the food system, it is possible to more rigorously compare and contrast different alternatives (Friedland 1984, 2001). Such analysis can help lead to design of more efficient and equitable systems that can be valuable into the future, and thus can contribute to sustainable development in society.

The objectives of this paper are to describe some trends in the relationship between urban and rural areas and activities, to present some ideas on how positive linkages may be built, and to give some examples of these ideas in practice. We discuss the psychological separation of people from their food supply and the impacts this may have on the long term sustainability of food systems. We consider the potential of local food systems for counteracting some of the current negative trends. Similarly, we discuss the concept of green areas or ecobelts to create positive interactions and reduce conflicts between rural and urban areas. We also discuss the need for integrated research and education in the emerging field of agroecology to promote a holistic development of food systems that are ecologically, economically, and socially sustainable in the long term, including positive linkages between rural and urban areas.

Growing Separation of Urban People from Food Production

When everyone was involved with hunting and gathering there was obviously no separation of people from their food supply nor any rural/urban divide. With the gradual advent of agriculture starting about 10,000 years ago, there was the beginning of settlements in most desirable areas for food production. Non-mobile tribes could encourage greater attention to food production by those who were more skilled in agriculture, and these people could grow more than was needed for their families. This allowed for the specialization in communities with some people focusing on tools and crafts, some on support services for fledgling societies, and some on local government. For millennia people remained relatively close to agriculture and food, and only in the past two centuries have grown away more rapidly from this vital part of their existence.

Accelerating urbanization has accentuated this separation of people from food production. We have a situation today that was well summarized by Kloppenburg et al. (1996), as they described the growing separation of people from most knowledge about how their food was produced and who produced it. When distant from production fields, consumers are often completely unfamiliar with the impacts of production practices on the land and the overall ecology of that unknown place where others till the soil. It is unlikely that they could have much more than an abstract concept of farming, and certainly no in-depth understanding of the environmental and social implications of the types of systems where their food is grown. When the role of the consumer is confined to purchase of food from an unknown source, and a small fraction of their income is spent for this essential need, it is not surprising that most people are uninterested in any change in the food system, or even questioning why change might be needed.

In addition, the globalized, agro-industrial complex works to conceal production practices and environmental degradation from distant consumers (Buttel 1997). Although there is more information available today about food and nutrition—through the internet, local, national and international publications, health and nutrition classes in schools, and books and libraries—than in any period in history, this information is embedded in the industrial world with its standardized quality conventions and logic of mass commodity production (Murdoch and Miele 1999, 2002; Murdoch et al. 2000). In industrial countries, consumers have become increasingly dependent on intermediary systems of information. Confidence is to a lesser extent attributed directly to the farmer or the butcher or the baker, because we do not know them (Lieblein et al. 2001). Instead we must trust in abstract systems to provide us with relevant information (Giddens 1990). Although we have vast amounts of information about the components and nutritional value of food, this information is scattered, and *lacks context and linkages to both its site specific ecosystem supports and its human individual experiences.* The information is based on the same de-contextualized perspective as the market system that delivers the commodities: a thing is a thing and should be evaluated in terms of its component properties that are measured in SI-units (eg. kg, m, Nm), or be evaluated in monetary units without a history of connection, relations, and dependences. As consumers, we are expected to process a lot of abstract information about food, to take expert knowledge into consideration, and to conduct risk analyses as part of modern living (Beck 1972; Giddens 1991). We are often confused by conflicting reports in the popular media about what is safe and what is nutritious, compared to what may be harmful (Nestle 2002). In this situation, *transparency* of the food systems comes forth as an important criterion (Goodman 2004), promoting a change from industrial systems to domestic systems that support more differentiated, localized and ecological products (Murdoch and Miele 2002). Renting et al. (2003) call these "alternative food networks."

In today's global food system, it is no surprise that people who pull food off the supermarket shelf in Oslo or Chicago have little knowledge or concern about where their bananas were produced and what the effects of insecticides (perhaps banned in their own countries) had on the people at the other end of the supply line, or on their families who may have used the chemical containers for storage of food or water. They are unaware that their instant coffee was produced by small farmers in Viet Nam as a result of massive support from the World Bank, which promotes global political and economic decisions driving similar coffee farmers in Kenya and Costa Rica from the market, while helping international food companies to assure cheap supplies and higher profits. Furthermore, there is little concern about the potato farmer or apple grower several kilometers away from their homes who must compete with large farms in Germany or New Zealand for space on the supermarket shelves. If there is awareness of a rural/urban linkage, it is likely in the annoyance that comes from field cultivator dust or odors from hog confinement operations as city people drive by on a nearby highway. For instance, a survey in Norway showed that among 12 criteria, 63% of the consumers considered "Availability of high quality food" as very important when making purchases (Torjusen et al. 2001). "Availability of organically produced foods" and "locally produced foods" were considered very important criteria by only 13% and 8% of consumers, respectively, and were ranked number nine and 11 after other criteria mostly related to convenience in shopping and price. Nevertheless, the increasing number of people who buy ecological food are, in fact, more concerned about its ori-

gins than the average customer (Torjusen et al. 2001), perhaps indicating an increasing interest in this matter. There is also a growing movement for "fair trade" (http://www.fairtrade.net/) products where the source and methods of production are known.

Challenges at the Interface

At the boundary between rural and urban areas there may be more than indifference or lack of communication—there can often be outright hostility. To understand the types of problems and challenges that people face while living near the boundary between rural and urban areas, it is useful to explore briefly the different objectives, activities, and lifestyles of city folks and farm families. These are illustrated in Table 1, where people's goals and concerns are listed (after Schoeneberger et al. 2001). Many of these challenges would be faced by neighboring families at any interface between different properties and people with different goals, whether at the edge of the city or around acreages. The drastically different lifestyles and ways of earning a living between urban and rural people, especially farmers, emphasize problems that did not exist when most people lived in rural settings and understood farming and that way of life.

People who grow up on farms are accustomed to the odors and dust that are generated by producing crops and animals, while this may be foreign to people in cities. The need for early and late hours during peak times of planting and harvest are an accepted part of farming, yet these activities may interrupt urban people in their daily lives, as they try to sleep or have a party in their yard in the evening. The expectations of people who move to the edge of the city for quiet, pastoral scenes filled with wildlife may give way to shock at the sight of a modern monoculture industrial farm with its hundreds of hectares of one or two crops. Slow tractors and large equipment moving down the county road are part of farming, yet may be an unexpected annoyance to someone from the city who is late driving to work. Farm people are accustomed to livestock, and know how to open and close gates; this may be foreign to people in the city. Our discussion illustrates the differences between city and farm people, their goals and lifestyles. Often it is a lack of communication that causes problems. We propose innovative ideas that will help people communicate and work together toward common goals, and activities that will lead to bridging this interface in a positive way. A later section describes the ecobelt concept, which is one way of linking people and activities around common goals.

Ecological Principles

One approach to conceptualizing and planning an urban/rural linkage is to consider the organization of natural systems and how they function. Ecological principles of

Table 1. Goals of urban and rural people, and problems that are generated by different activities and lifestyles.

Goals of Urban People	**Problems from Farming Neighbors**
Quiet location near edge of city	Loud sounds from farm equipment, livestock enterprises, sometimes at all hours night and day
Clean environment far from city center	Dust from field equipment, chemical spray drift from field pesticide applications
Fresh air for healthy living	Odors from livestock corrals or confinement facilities, dust from field equipment
Easy access to home on good roads	Slow moving equipment that must move from one field to another, even at busy traffic times
Biodiverse habitat near home for wildlife	Monoculture crops and animal production enterprises, often in an industrial agriculture setting, and little habitat
Extensive views from home on edge of city	Lack of diversity in landscape, with monoculture crops in large fields
Goals of Rural People	**Problems from Urban Neighbors**
Economic production of crops and livestock	Complaints about large-scale farming operations, including use of large equipment and pesticides
Need to control insects, weeds, and pathogens	Pesticides drift across boundaries and damage home gardens or ornamental plantings around houses
Efficient movement of equipment & animals	High-speed traffic on nearby farm roads, lack of respect for livestock near roads
Health and safety of animals	Dogs that enter farming areas and bother livestock, garbage or yard waste put over fence from urban homes
Security of farm equipment and buildings	Children curious about farm equipment, farm buildings, livestock, trespassing and leaving gates open
Quiet and secure rural environment	High level of human activity, increased traffic on roads, noise from urban activities

structure and function can be useful because they represent centuries of evolution in survival and efficient resource use in natural systems, even though our human objectives as system managers differ from those of a natural system. How ecology relates to current and future farming alternatives has been discussed in several creative books (Jackson and Jackson 2003; Jackson 1980; Soulé and Piper 2002; Gliessman 1998). As these sources point out, farms can be made more ecologically friendly and less dependent on chemical fertilizers and pesticides, two of the major objections of urban neighbors. If we envision the interface between rural and urban activities as a vibrant and living zone of connection rather than a place that requires an inert barrier of separation, it is possible to apply some principles of ecology to the planning process. These can include both the biophysical components of the system as well as those that involve the human participants (Francis 2002).

Natural systems are open and interactive, and they function in a holistic way. As we learn more about their complexity and organization, it becomes clear that the unique combination of plants and animals in each place leads to resilience and dynamic permanence. The structure and functions of natural systems have evolved to fit the natural resources of a given location. Agroecology explores how these same functions can be incorporated into farming systems and food systems. Some of the changes to agroecosystem management can help us address the broad challenge of creating a positive interface with solutions that will address the multiple questions from each side of the boundary. A systems approach is different from our frequent reductionist and mechanistic perspective of isolating and solving one issue at a time, just as we would in repairing an isolated machine. For example, a well-designed perennial and woody area between urban and rural activities could have multiple functions that meet multiple goals, such as cleaning air, reducing sound and visual distraction, and producing economic plants that would benefit people on both sides.

Because natural systems are biodiverse, they have component plants and animals that play different roles in maintaining the ecosystem. Nutrients are taken up, used, and returned to the soil complex, and water is likewise cycled through the system. There is minimal extraction of biomass from the system, thus it can run on its own resources rather than requiring expensive inputs and imports of materials from elsewhere. An area that connects with other natural forests or fields can serve as valuable habitat for wildlife, a key part of integrated natural systems and a boon to those people who want to observe this aspect of the system. If a system is well designed using native species, it may be able to propagate new plants and attract animals from nearby, thus maintaining itself with minimal cost of upkeep, which would be desirable for everyone. A natural boundary could serve as an effective buffer area or separation between rural and urban people and activities, and could do so at minimal cost. Such an area could also host recreational activities that provide another "output" from the place. A well-designed interface area could serve as a forum for communication and education between rural and urban people, and potential economic interactions are outlined in the following sections. The concept of such "ecobelts" is expanded in a later section.

Alternative Food Networks

There is strong evidence that all over Europe new food networks are emerging (Renting et al. 2003). They represent a turn from the industrial world to the domestic world where food is embedded in face-to-face-interactions, trust, traditions and each unique place. There are more local and ecological products that support local economies (Murdoch and Miele 2002; Goodman 2004). Renting et al. (2003) call them short food supply chains (SFSC) because they cut short the long, anonymous supply chains that characterize an industrial food system. In addition, they bring producers and consumers closer and construct more transparency where common information may be shared. Renting et al. (2003) differentiate between *face-to-face SFSCs*, such as farm shops, farmers' markets, roadside sales, pick your own, box schemes, home deliveries, and mail order, and *proximate SFSCs*, such as farm shop groups, regional sales clubs, consumer cooperatives, community supported agriculture, restaurants, dedicated retailers, and catering for institutions such as business canteens, schools, and public institutions.

Close proximity of urban people to farms provides numerous opportunities for exchange of goods and services that build economic linkages as well as communication and rapport. The farm shop is a growing type of enterprise in the Nordic Region and in North America, where vegetables, meats, and crafts can be marketed directly to shoppers who are interested in buying food and other products made close to home. Those who are successful in this type of direct marketing find that a range of products, assured high quality and fresh produce, and prices that are competitive with local commercial stores can help build a consistent market. An essential factor is the sincere desire to work directly with customers and to build personal relationships. A real advantage of direct sales is that the farmer collects all of the value of the product, rather than having value added to raw products by processors, wholesalers, and retailers down the food chain. Most farm shops can move a wide range of products, but relatively limited amounts of each. They often require a person to be on duty for long hours, but have the advantage of building rapport with customers and neighbors. In Madison, Wisconsin the REAP Food Group recently published a "Farm

Fresh Atlas" (CIAS 2004) that shows where to find farmers, farmers' markets, cheese makers, cooperatives, and restaurants offering locally grown and locally produced food in the capital region.

Since many vegetable crops are labor intensive, and a change from producing cereals or other extensive crops increases the farm labor demand, the proximity of a farm to a town can enhance the potential for using urban labor for farm work. There may be limited opportunities for jobs in town, especially for young people, while a part-time job on the farm can be a valuable point of entry into the working world through a productive and satisfying work experience. Having city children working on the farm further builds relationships between rural and urban families, and may in fact create new markets for produce.

Consumer or community-supported agriculture (CSA) started in Germany and Switzerland, and was imported to the U.S. in the mid 1980s. In CSA, organic or environmentally safe farming is combined with bringing the consumer closer to the farmer and the farm. In a CSA organization, the farmer(s) and a group of consumers share both the risks of farm production and the harvest. A study by Cooley and Lass (1998) shows that CSA potentially can bring economic benefits to both farmers and consumers. Creative farmers in many areas have enlarged and assured their markets for vegetables by recruiting customers willing to sign a contract for one growing season. CSA initiatives usually include a payment of one lump sum for a season of vegetables, delivered to a central pick-up point or retrieved each week from the farm by the customers. In the case of Ames, Iowa, the consumers organized the CSA and went out to find and contract with farmers to supply their needs. The CSAs have been called "partnerships of mutual commitment between farmers and consumers" by Van En and Roth (1993). With this arrangement, the customer shares with the farmer both the risks and the bounty of a given year. This relationship is rarely found in a supermarket culture where even the price of local produce is so conditioned by the global food system that it usually appears unconnected to any changes in weather or markets on the local scene. Kloppenburg et al. (1996) describe the CSA as a useful model of how we can sell food while nurturing many other types of human relationships that include building friendships, finding pleasure in the process of shopping, sharing the aesthetics in food, developing loyalty to farmers, and all of these in addition to the consumer buying high-quality food from someone they know. The CSA is an example of positive rural/urban linkages that are growing in many parts of the world.

Less formal but equally important consumer commitments are established in the farmers' markets that are found in many cities on Saturdays and at other times during the week. Here there is a similar loyalty to farmers who consistently supply a quality product, and customers seek out growers with whom they have established rapport and who have good produce at a fair price. The new farmers' markets concept has been described as a success from the perspective of the producers (Feenstra 1997; Jervell 2001; Jolly 2002; Payne 2002), the customers (Holloway and Kneafsey 2000), and the local community (Latacz-Lohmann and Laughton 2000; Podoll 2002). At an international scale it is probably the most influential alternative outlet for food in terms of impact on production, customers reached, geographical spread and economic importance (Jervell et al. 2004). In the U.S. the number of markets, the number of producers and consumers attending markets, and even the proportion of farmers relying on farmers' markets as their main channel has grown steadily for more than 30 years (Payne 2002). Farmers' markets have recently spread to Europe, for example in Sweden in 1999 (certified as a trade concept "Farmer's Own Market," Adler et al. 2003) and beginning in Norway only in 2004, and can be seen as part of a "quality turn" among consumers (Goodman 2004). Because of a short growing season in northern latitudes, most farmers' markets are seasonal in these areas, often May through October, but some in places such as California run through the entire year. Cities such as Lincoln, Nebraska block off streets in whole city blocks, while Madison, Wisconsin dedicates the entire street system around capital square each Saturday morning through the growing season. Markets may be found in large parking lots of malls or even supermarkets, and the latter report increased sales on the days when customers are drawn to the farmers' markets even though these would appear to be in direct competition.

Some farmers establish longer-term relationships with customers at these markets, leading to sales direct from the farm through more of the year. Such arrangements for direct sale of produce seem to violate the principle of economy of scale found in the global system, but they certainly reduce the length of supply lines and transportation costs, and bring most of the value of produce directly to the one who grows and prepares it for the market.

Another innovative approach to bringing urban citizens in contact with farms and farmers is the *Selbsternte* (self-harvest) practice. This practice was developed in the 1990s in Austria by ecologically oriented consumers and organic farmers (Axmann and Vogl 2002). On agricultural land within the urban area, the farmers prepare the land and sow rows of different vegetables, one long row of each. Subplots are then constructed, perpendicular to the direction of the rows, so that each sub-plot will contain about 20 different vegetables. After the initial preparation and planting, the sub-plots are handed over to the consumers for further management and harvest. This practice was later taken up in Germany, and

in 2002 was also tried in Norway. Such a system initiates a powerful way of bringing consumers in close contact with agriculture and farmers, and builds an awareness and appreciation of the complexity of growing food.

A major challenge in developing alternatives to the dominant, de-localized food system is creating alternatives that become larger and more efficient. The different methods of direct sale offer interesting options, but only for a small proportion of all consumers. Most consumers are not willing to travel to farms, or to visit markets. Therefore, the alternatives become marginal in the overall system.

The challenge for the growth of alternative approaches is related to the difficulty in competing with the dominant system. In the current growth phase, there is a need for some protected space for the alternatives. Institutional buying represents one such protected space. Most institutions have common goals, beyond profit maximization, and can therefore protect initiatives that provide services other than cheap food. What comes from local producers will often be organically grown, fresh, and high quality. In the Nordic Region, there has been a rapid growth over the past ten years of institutional buying of organic food from local sources. Hospitals, kindergartens, schools, homes for elderly, and public canteens are the most common participants.

The direct sale of food from farmer to consumer need not be limited to weekend farmers' markets or CSAs of limited scope in small communities. A national initiative in Finland about localizing food was written by the stakeholders including the ministry of environment, farmers' association, consumers' association, and representatives of research and education (Anon. 2000). One outcome from this work was that especially in public catering, local food has good growth potential. The public caterers emphasize freshness of raw materials in local delivery, knowledge of food origin, lack of food additives, and good taste. Information about the origins and processors were considered by the caterers as adding to food safety. One-to-one marketing is seen as a good opportunity for producers who aim at adding value through high quality, and many suppliers are organic farmers. One of the challenges is to balance the demand and supply, as some public caterers operate relatively large kitchens and serve thousands of meals daily. It is obvious that seasonality needs to be accepted by the consumers. Seasonal food may become more appreciated as a quality by both caterers and by customers, depending on their values: some appreciate strawberries during the local season, while others demand this delicacy every morning.

Such examples of localizing food systems represent a growing trend in Finland, and especially among those who provide food for communal kitchens in schools, daycare centers, and hospitals. All the participants of the food chain have been challenged to view the system as a whole, and the process has awakened a need for emphasizing cooperation (Forsman and Paananen 2002). One of several research proposals in this area aims at identifying changes needed in the activity system at a county (municipality) level, in order to direct an increasing share of the county's budget for food to local purchases (Laura Seppänen et al. unpublished). Implementing a large scale local food system, such as one for a county, town or city, will require a number of elements to function well. Close collaboration between farmer organizations and those who currently market food in the city is essential, since it would be difficult and expensive to duplicate a food distribution and sales infrastructure that already is in place. There must be willingness to participate by a substantial number of people in the food system as well as motivation among consumers to give this new local system an opportunity to succeed. With a location at 60 degrees N. Lat., the growing season is relatively short, even with the moderating influence of the nearby Baltic Sea. Although a limited number of vegetable products can be grown successfully and profitably, maximum use must be made of low-cost energy such as passive solar heating or renewable wood burning to heat greenhouse structures. High-quality storage facilities will enhance the availability of local produce for a longer part of the year. There will be need for careful and targeted research on growing and processing vegetables and fruits, as well as small animals and their products, and the results of this work must be available to farmers interested in the program.

Both farmers and consumers would benefit from this system of food import substitution. The major benefits would be the availability of fresh and locally grown food at a price competitive with that which is imported; stimulating the local economy by substituting local food products for imports; and establishing closer links between farmers and consumers through the contacts in markets, field tours, and other activities used to publicize the program. Many see the importance of reconnecting people with their food supply, and programs are being implemented on a small scale.

Nordic and U.S. Models for Food Systems and the Urban—Rural Boundary

Danish Model: A "City-Wall Separation"

In Denmark there is a type of conceptual city-wall separation between the open landscape and the more continental city and village conglomerations. The separation is mainly based on the wish to develop something urban, and there are tools to develop already existing urban structures and to preserve them. The border for the built land in urban areas will become like a ring around historically urbanized areas. On the other side of the "wall," nature conservation laws for agriculture and open space are very strong. For example, if some-

one starts to build in this open space or agricultural land, even if there is consent from the local authorities, a non-government agency or individual can take them to court (Brandt et al. 2000).

An example of innovative thinking and futuristic planning for Denmark was presented in the conference on *Multifunctional Landscapes* in Roskilde in 2000. Tress and Tress (2000) presented a series of scenarios for the next 20 years in an urban/rural boundary area north of Copenhagen. The four options included business as usual and urban development, near-total conservation of natural areas and little development, and two intermediate scenarios that maintained most land in farming and natural conditions while including limited development within the landscape. They included active participation of stakeholders in planning for integrated activities, among them industrial agriculture, tourism, and recreation as well as places for housing. The authors used advanced visualizing techniques (eg. World Construction Set©, http://www.3dnature.com/) to illustrate the alternative options for the future. This was a powerful method of showing how the future could look as a way of helping communities make decisions.

Swedish Model: A Functional Approach

The rural/urban boundary in Swedish development has focused more on the built-up or urban side of the border, and true to national tradition this is a functional approach. The concentrated living area concept was and is central to planning. This was used in the Swedish "million project," a conscious effort to move one million citizens from rural areas to ready-built urban housing near industry. The focus has always been for efficiency and cost-saving on infrastructure and transport, as well as the physical concentration of services and cultural activities. Optimum size of the suburban cities around Stockholm was determined by the population size necessary to fill a five-star restaurant, which was also built in the middle of each housing development. A public transportation system was also integrated in the planning and implementation of those suburban cities.

The Swedish border for urbanization is not necessarily set around old city centers as in Denmark, nor is the location necessarily determined for saving soils and farmlands. The focus has been on conscious modernization that concentrates populations along main roads and railroads at suitable distances from industrial areas. One result has been leaving large, non-cultivated open spaces that were formerly agricultural lands between these housing concentrations.

Norwegian Model: Resource Conservation

In Norway the divide between urban and rural has always been motivated by resource conservation, both soil and land. The focus has been on preserving both cultivated crop land and recreation areas (such as the *friluftsområde* or "open air surroundings" of the Marka area north of Oslo with about 6000 km of ski trails), and to some degree cultivated forests. Rather than sprawl, there has been a concentration of housing and other structures in satellite areas located on forest land of low productivity. These developments have often come first, and then the infrastructure such as roads and railroads are built to them.

The motivation is currently shifting toward greater efficiency, with a national model that coordinates land and transportation planning. This is similar to the Swedish model described above. Since the great settlement period following World War II is ebbing, focus is turning more to the current built environment, with established urban areas and qualities, similar to the Danish model. A growing number of people recognize the value of the model for open space, especially forest open to the public established around Oslo, where unlimited sprawl could have occurred if there had not been such a border. Some details of Norwegian law are provided in Table 2.

Ecobelt Concept in North America and Europe

Agriculture and city living are generally separated in most of the Nordic Region and North America. In the U.S., rapid growth of cities and an accelerating takeover of productive lands near cities with what is called "urban sprawl" are serious problems (Olson and Lyson 1999). Along with growth of the human population at a rate of about 1.2% per year (due to births plus immigration) each new citizen is using land at a rate that is 40 to 60% greater than was the case a mere two decades ago (Olson 1999). Although these figures appear to be small when compared to the total land area of the continental U.S. (excluding Alaska), a continuation of this trend for two generations will result in a reduction from the current 0.8 ha of productive farmland per person to about 0.3 ha per person by the year 2050. If this trend is not altered, it means that food production per unit of land will have to triple to maintain current levels of food for domestic consumption as well as for export. There is a serious need to contain urban growth, to seek more intensive models of land use, and to plan effectively for a future when this resource will become even more scarce.

Most countries in northern Europe have a long history of maintaining a relatively fixed and stable boundary between urban housing and development and the agricultural production lands surrounding the towns, although the tradition is changing in some places. Greenbelts are put in place and respected by these cultures, and thus there is little purchase of lands adjoining towns and cities in speculation that this land will soon be used for more intensive building of houses or ex-

Table 2. Excerpts from The Land Act No. 23 (12 May 1995) from Norway.

Section 1. Purpose
The purpose of this Act is to provide suitable conditions to ensure that the land areas in the country including forests and mountains and everything pertaining thereto (land resources) may be used in the manner that is most beneficial to society and to those working in the agricultural sector.

Land resources should be disposed of in a way that ensures an appropriate, varied system of use with a view to the development of the local community and with emphasis on settlement, employment and effective solutions.

Ensuring that resources are used in a manner beneficial to society entails taking into account the fact that the resources shall be disposed of with a view to the needs of future generations. Land resource management shall be environmentally sound and, among other things, take into consideration protection of the soil as a production factor and preservation of land and cultural landscapes as a basis for life, health and well-being for human beings, animals and plants.

Section 9. Use of cultivated and cultivable land
Cultivated land must not be used for purposes that do not promote agricultural production. Cultivable land must not be disposed of in such a way as to render it unfit for agricultural production in the future.

Section 12. Division of property
Property that is used or may be used for agriculture or forestry may not be divided without the consent of the Ministry. The term property also includes rights appurtenant to the property and portions of common property. The prohibition against division shall also apply to tenancy, long-term leases entitling the lessee to build a house on the property and similar leases or right of use of part of the property when the said right has been established for a period of more than ten years or cannot be revoked by the owner (lessor).

pansion of industry. These permanent boundaries are respected as part of the current land use pattern, and there is a high level of public involvement and debate about any proposed change. Such a situation is quite different from the sprawl that occurs in countries such as the U.S. where individual land ownership is connected to a series of property rights and cultural libertarian norms. Focus is on the rights of each person to make decisions that are best for them as individuals, often connected to how much personal economic advantage can be gleaned from the situation, without regard for the public good or the wrongs that this may cause in the long term.

One proposal that would solve this land conversion problem is the establishment of ecobelts or green corridors surrounding towns and cities (Schoeneberger et al. 2001). This concept would guide the development of woody and mixed plantings in a strip that surrounds the city and establishes a permanent boundary between urban housing and development and rural land used for agriculture. An ecobelt would be wide enough to provide for buffering of most of the undesirable problems that arise from close proximity of houses and farming activities that are listed in Table 1. It could be a multiple use area that includes bicycle and walking trails, habitat for wildlife, and pleasing viewscapes for adjoining urban and rural residents. With agreement on how to use the common resources, there could be production of Christmas trees and other foliage plants for harvest, edible mushrooms and berries, and firewood, creating some economic or nonmonetary value-added advantages to such an area. The ownership of the ecobelts could be public, in private land trusts, or in organizations of those who live on both sides of the area. This positive rural/urban linkage could promote education and communication about agriculture for the neighbors, and serve as a means of finding labor for intensive agricultural production and a connection for sale of products from the farms. This type of win-win situation would not only solve the challenges that arise at an interface between two different lifestyles, it would preserve a permanent boundary and protect farmland from encroachment for other economically viable but less desirable types of growth.

University Education in Agroecology and Food Systems

The NOVA University Network in the Nordic Region has recently offered a course in *Agroecology and Food Systems* (PAE 303) through the Norwegian University of Life Sciences (UMB). This grew out of a farming and food systems course previously offered by NLH and NOVA University (Lieblein 1997). In this 8-week course, students study the food system as a whole, including energy and materials flows, transportation, distribution, values and attitudes of stakeholders, and resource cycling in the current food system. They apply knowledge and experience from prior courses in agroecology and production into a study of the entire food system and its ecology. Local food systems are found to contain elements of regional and global food sources. Yet it is useful to compare them to the current global food chain, in terms of resources used for production and transportation, the freshness and nutritional quality of products, economics, and the social impacts of alternative food systems.

During the course, a comprehensive field project is completed that involves a food inventory of one county by each student team. Students interview farmers, food processors, marketers, government officials, and consumers to better un-

derstand how they perceive the food system, how food moves through the system, and how much of the food is produced locally. They make use of recent surveys such as the consumer opinion research conducted in Hedmark County in Norway, one of the project areas (Torjusen et al. 2001). At the request of local government officials, students have calculated what percentage of the food consumed is locally produced, and have provided guidelines on the potentials for converting a certain percentage of the total local food system to an ecological food base.

Innovation plays a key role in this course, based on the recognition that past experiences will not bring us the necessary ideas for creating alternative and sustainable food systems. "You can not solve a problem with the same thoughts that created it," is a statement attributed to Albert Einstein. It is the combination of ecological literacy and creativity that can provide us the link to a sustainable future (Lieblein et al. 2001; Milbrath 1989; Parker 1990). Therefore, based on a comprehensive overview of the present system, the students launch into a three-day session where they use visionary thinking to clarify the desired future situation for that food system. The session on visionary thinking is followed up with sessions on dialogue and creative problem solving. We have already experienced that students apply these approaches in subsequent project work. Following the course, one Danish student was running sessions on visionary thinking for an organic dairy, including a process that involved all the stakeholders (40 people). The PAE 303 course has been a valuable learning experience in how an integrated food system works, as well as an educational activity for those who are interviewed, who participate in a focus group, or read the reports. It is focused on local food systems and rural-urban interactions.

Conclusions

The boundary between urban areas with concentrated houses, industry, commerce, and other intensive land uses and rural areas dedicated to agriculture and natural resource conservation has become less defined as cities expand, especially in North America. The place where cities end and farms begin is more uniquely identified in many European cities with a long tradition of separate uses of land and well defined borders. This is less apparent in U.S. cities with a surrounding ring of dispersed small acreages and commercial properties. Often there are conflicts between people who conduct very different activities on opposite sides of this interface, especially when there is limited communication and appreciation of each group for what the other does. Beyond these obvious differences in goals and lifestyles, there is a growing psychological separation of urban people from where and how their food is grown. This is no longer a part of urban dwellers' lives, when food is cheap and comes from a global everywhere—and they personally do not know any farmers involved in production.

To separate urban living and rural farming activities we have focused on physical barriers to mitigate some of the most immediate problems. These take the form of fences, walls, roads, or planted buffer strips that screen off or filter out problems from farms that can be prevented from reaching a nearby subdivision, or can keep out the dogs and snowmobiles that often trespass on farm and pasture land. Rather than creating barriers that only have costs and no apparent economic returns, we propose using ecobelts or other constructed plantings that will physically separate the two property uses in a permanent way, provide some products and services, and at the same time enhance positive linkages between people living on either side of the interface. Permanent areas or green belts around cities are more common in Europe, where centuries of conflict in land use have been resolved through consensus, common law, and most recently by statute. There is much to be learned from these patterns.

More concrete economic and social linkages between urban and rural can be established through local food systems that take several forms: direct sale by farmers to urban consumers, farmers' markets, community supported agriculture, and shared ownership or leasing of agricultural production activities by consumers. All involve an interaction of producer with consumer, and can result in education and better relationships between the two groups. Local food systems can also lend a degree of security to the food supply in times of political and economic uncertainty. Although it is unrealistic to advocate complete food self sufficiency in today's complex global context, a degree of self-reliance would be highly desirable to reconnect people with their food supply. It is this physical and psychological connection that is the focus of local food system initiatives in cities from Santa Cruz to Helsinki. It is the same connection that we are attempting in university courses on agroecology and food systems, where students work with farmers, processors, marketers, consumers, and government officials to first understand the current system and then design rational alternatives for the future. It is this innovative approach to education that will open our minds and equip the next generation of graduates to deal with complex challenges in the food system in very unique ways. Examples have been described from North America and the Nordic Region that are providing some useful models for this improvement in rural-urban linkages.

In spite of the success in these several model activities, as well as the growing awareness of the importance of healthy nutrition and a livable environment, we are continually impressed by the level of disinterest in the general population. One ongoing challenge is finding ways to motivate

skeptical and complacent consumers to vote with their food budget to encourage local production. Another is to encourage people's decisions to improve their current housing and surroundings and discourage city dwellers from moving out and converting farmland to acreages. Lastly we envision education as the best hope for people to learn about ecosystem services and the need to understand where and how food is produced, how this impacts the ecosystem, and how urban and rural people can work together across the boundaries that currently divide them. We propose development of environmentally-sound ecobelts to separate farming from urban housing, while at the same time providing connections through recreational and economic activities that will serve the entire population.

Endnotes

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References

Adler, S., S. Fung, G. Huber, and L. Young. 2003. Learning our way towards a sustainable agri-food system. Three cases from Sweden: Stockholm Farmers market, Ramsjö Community Supported Agriculture and Järna Initiative for Local Production. *Ekologiskt lantbruk* nr 38. http://www.cul.slu.se/information/publik/index.html#ekolantbruk. Uppsala, Sweden: Center for Sustainable Agricultural, Swedish University of Agricultural Sciences.

Anon. 2000. Opportunities for local food. Closing report of the working group for local food, 36. www.mtk.fi [in Finnish: Lähiruoan mahdollisuudet].

Axmann, P., and C.R. Vogl. 2002. Innovations in urban organic farming in Vienna (Austria) by the concept of "Selbsternte," 173. Victoria, B.C., Canada: Proceedings 14th IFOAM International Conference.

Beck , U. 1972. *Risk society: towards a new modernity*. London, U.K.: Sage Publications.

Brandt, J., B. Tress and G. Tress (eds.). 2000. Multifunctional landscapes: interdisciplinary approaches to landscape research and management, Proceedings. Roskilde, Denmark: Centre for Landscape Research, Roskilde University.

Brown, M.T. 2003. Resource imperialism: energy perspectives on sustainability, international trade, and balancing the welfare of nations. In S. Ulgiati, M.T. Brown, M. Giampietro, R.H. Herendeen and K. Mayumi (eds.), *Advances in energy studies—reconsidering the importance of energy*, 135-149. Padova, Italy: Serizi Grafici Editoriali.

Buttel, F.H. 1997. Some observations on agro-food change and the future of agricultural sustainability movements. In D. Goodman and M.J. Watts (eds.), *Globalizing food: agrarian questions and global restructuring*, 334-365. London, U.K.: Routledge Publishing.

CIAS (Center for Integrated Agricultural Systems). 2004. Farm fresh atlas. Madison, WI: University of Wisconsin.

Cooley, J.P. and D.A. Lass. 1998. Consumer benefits form community supported agriculture memberships. *Review of Agricultural Economy* 20, 1, 227-237.

Feenstra, G. 1997. Local food systems and sustainable communities. *American Journal of Alternative Agriculture* 12, 1, 28-36.

Flora, C.B. (ed.). 2001. *Interactions between agroecosystems and rural communities*. Boca Raton, Florida: CRC Press.

Forsman, S. and J. Paananen. 2002. Customer value creation in the short food supply chain: theoretical aspects and explorative findings. In J.H. Trienekens and S.W.F. Ompta (eds.), *Paradoxes in food chains and networks*, 153-162. Netherlands: Wageningen University.

Francis, C.A. 2002. Agroecology of water use at the field, farm, and landscape levels. Symposium on Sustainability of Water-Limited Agriculture, European Society of Agronomy, Cordoba, Spain, July 16.

Francis, C., G. Lieblein, S. Gliessman, T.A. Breland, N. Creamer, R. Harwood, L. Salomonsson, J. Helenius, D. Rickerl, R. Salvador, M. Wiedenhoeft, S. Simmons, P. Allen, M. Altieri, C. Flora, and R. Poincelot. 2003. Agroecology: the ecology of food systems. *Journal of Sustainable Agriculture* 22, 3, 99-118.

Friedland, W.H. 1984. Commodity systems analysis: an approach to the sociology of agriculture. In H.K. Schwarzweller (ed.), *Research in rural sociology and development, focus on agriculture*, Volume 1, 221-235. Greenwich, Connecticut: JAI Press.

Friedland, W.H. 2001. Reprise on commodity systems methodology. *International Journal of Sociology of Agriculture and Food*. 9, 1, 82-103.

Giddens, A. 1990. *The consequences of modernity*. Cambridge, U.K.: Polity Press.

Giddens, A. 1991. *Modernity and self-identity: self and society in the late modern age*. Cambridge, U.K.: Polity Press.

Gliessman, S.R. 1998. *Agroecology: ecological processes in sustainable agriculture*. Chelsea, Michigan: Ann Arbor Press.

Goodman, D. 2004. Rural Europe redux? Reflections on alternative agro-food networks and paradigm change. *Sociologia Ruralis* 44, 1, 3-16.

Halweil, B. 2002. *Home grown: the case for local food in a global market*. State of the World Library, WorldWatch Paper 163, November.

Halweil, B. 2004. *Eat Here: Reclaiming Homegrown Pleasures in a Global Supermarket*. WorldWatch Institute.

Holloway, L. and M. Kneafsey. 2000. Reading the space of the farmers' market: a preliminary investigation from the U.K. *Sociologia Ruralis* 40, 3, 285-299.

Jackson, D.L., and L.L. Jackson (eds.) 2003. *The farm as natural habitat: reconnecting food systems with ecosystems*. Covelo, California: Is-

land Press.

Jackson, W. 1980. *New roots for agriculture*. Lincoln, Nebraska: University of Nebraska Press.

Jervell, A.M. 2001. Farmers' market: direkt contakt mellom produsent og forbruker. *Landbruksøkonomisk forum*. Nr. 2/2001, 5-18.

Jervell, A.M. , G. Lieblein, M. Svennerud and K. Åsebø. 2004. The support for local food and farmers: evidence from customer surveys at Norwegian Farmers markets. XI IRSA World Congress, Trondheim, July 25-29.

Johansson, S., S. Doherty, and T. Rydberg. 2000. Sweden food system analysis. In M.T. Brown (ed.), *Emergy synthesis. theory and applications of the emergy methodology.* Proc. First Biennial Emergy Research Conference, September 2-4, 1999. Gainesville, FL: The Centre for Environmental Policy, University of Florida.

Jolly, D. 2002. Farmers markets: trends and prospects. *Small Farm News*, Vol. III, University of California, Davis.

Kloppenburg, J., J. Hendrickson, and G.W. Stevenson. 1996. Coming in to the foodshed. *Agriculture & Human Values* 13, 3, 33-42.

Latacz-Lohmann, U. and R. Laughton. 2000. Farmers' markets in the U.K. —a study of farmers' perceptions. *Farm Management* 10, 579-588.

Lieblein, G. 1997. From farming systems to food systems: third Nordic postgraduate course in ecological agriculture. Fokhol Farm, Stange, Norway: Agriculture University of Norway.

Lieblein, G., C.A. Francis, and H. Torjusen. 2001. Future interconnections among ecological farmers, processors, marketers, and consumers in Hedmark County, Norway: creating shared vision. *Human Ecology Review* 8, 1, 60-72.

Milbrath, L.W. 1989. *Envisioning a sustainable society: learning our way out.* Preface, xi. Albany, New York: State University of New York Press.

Miller, G.T. Jr. 1997. *Living in the environment: principles, connections, and solutions*, 10th edition. Belmont, California: Wadsworth Publishing.

Murdoch, J., T.K. Marsden and J. Banks. 2000. Quality, nature, and embeddedness: some theoretical considerations in the context of the food sector. *Economic Geography* 76, 2, 107-125.

Murdoch, J. and M. Miele. 1999. 'Back to nature': changing 'worlds of production' in the food sector. *Sociologia Ruralis* 39, 4, 465-483.

Murdoch, J. and M. Miele. 2002. The practical aesthetics of traditional cuisines: slow food in Tuscany. *Sociologia Ruralis* 42, 4, 312-328.

Nestle, M. 2002. Food politics: how the food industry influences nutrition and health. Berkeley, California: University of California Press.

Olson, R.K. 1999. A landscape perspective on farmland conversion. In R.K. Olson and T.L. Lyson (eds.), *Under the blade: the conversion of agricultural landscapes*, 53-95. Boulder, Colorado: Westview Press.

Olson, R.K., and T.L. Lyson (eds.). 1999. *Under the blade: the conversion of agricultural landscapes*. Boulder, Colorado: Westview Press.

Parker, M. 1990. *Creating shared vision*. DIALOG International, Oak Park, Illinois.

Payne, S. 2002. U.S. farmers markets—2000. A study of emerging trends. Corvallis, Oregon: Oregon State University Extension Service/ USDA.

Pelto, G.H., and P.J. Pelto. 1985. Diet and delocalization: dietary changes since 1750. In R.I. Rotberg and T.K. Rabb (eds.), *Hunger and history*, 309-330. Cambridge, U.K.: Cambridge Univ. Press.

Podoll, H. 2002. A case study of the Davis Farmers' Market: connecting farms and community. University of California Sustainable Agriculture Research and Education Program.

Renting, H., T.K. Marsden and J. Banks. 2003. Understanding alternative food networks: exploring the role of short supply food chains in rural development. *Environment and Planning*, 35, 393-411.

Schoeneberger, M.M., G. Bentrup, and C.A. Francis 2001. Ecobelts reconnecting agriculture and communities. In C.B. Flora (ed.), *Interactions between agroecosystems & rural communities*, 239-260. Boca Raton, Florida: CRC Press.

Seppänen, L. 2004. Learning challenges in organic vegetable farming: an activity theoretical study of on-farm practices. PhD Dissertation. Helsinki, Finland: Institute for Rural Research and Training, Helsinki University.

Soule, J.D., and J.D. Piper. 2002. *Farming in nature's image*. Covelo, California: Island Press.

Torjusen, H., G. Lieblein, M. Wandel, and C.A. Francis. 2001. Food system orientation and quality perception among consumers and producers of organic food in Hedmark County, Norway. *Food Quality and Preference* 12, 207-216.

Tress, B. and G. Tress. 2000. Scenarios for the management of multifunctional landscapes. In J. Brandt, B. Tress, and G. Tress (eds), *Proc. Multifunctional Landscapes: Interdisciplinary Approaches to Landscape Research and Management*. Roskilde, Denmark: Centre for Landscape Research, Roskilde University.

Van En, R. and C. Roth. 1993. Community supported agriculture. Amherst, Massachusetts: University of Massachusetts, Cooperative Extension