

Health Benefits of Urban Agriculture

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Abstract: Health professionals increasingly recognize the value of farm- and garden-scale urban agriculture. Growing food and non-food crops in and near cities contributes to healthy communities by engaging residents in work and recreation that improves individual and public well-being. This article outlines the benefits of urban agriculture with regard to nutrition, food security, exercise, mental health, and social and physical urban environments. Potential risks are reviewed. Practical recommendations for health professionals to increase the positive benefits of urban agriculture are provided.

Introduction

This article was motivated by the desire to build greater understanding among proponents of urban agriculture and health professionals. The authors are members of the Urban Agriculture Committee: North American Initiative of the Community Food Security Coalition. This national coalition is made up of a diverse group of advocates, practitioners, and professionals whose concerns are urban food systems and food security. We work together to move the public policy agenda towards a conscious embrace of urban agriculture as it affects areas of health, education, economic development, and urban planning.¹ Our goal is to broaden the connections between advocates of public health and those of urban agriculture with the objectives of instigating cooperative discussion, research, advocacy, and practice.

The paper presents research on the practical health benefits of farming in the city, with an emphasis on studies conducted in North America and Western Europe. The major points include:

- The experience of growing food is correlated with its consumption; the more experience people have growing food, the more likely they are to eat it.
- Urban gardening and farming involve city dwellers in healthy, active work and recreation.
- Urban agriculture builds safe, healthy, and green environments in neighborhoods, schools, and abandoned areas.

At the 1996 United Nations International Conference on Human Habitats in Istanbul, *urban agriculture* was formally recognized for the first time for its contribution to the health and welfare of fast growing urban populations worldwide. Since that time, related research, practice,

¹ Community Food Security Coalition's North American Urban Agriculture Committee 2003. Community Food Security Coalition, <http://foodsecurity.org>.

and policy development have blossomed, although an acceptance of urban agriculture proved faster originally in the global South than in the North.²

More recently, urban gardening and farming are experiencing a renaissance in North America. Significant amounts of food are cultivated by entrepreneurial producers, community gardeners, backyard gardeners, and even food banks, in vacant lots, parks, greenhouses, roof tops, balconies, window sills, ponds, rivers, and estuaries.³ The potential to expand urban production is enormous. One third of the 2 million farms in the United States alone are located within metropolitan areas, and produce 35% of U.S. vegetables, fruit, livestock, poultry, and fish.⁴

I. Community Health: Nutrition and Food Security

Small well-tended plots of land can yield surprising amounts of produce. In a 130-day temperate growing season, a 10x10 meter plot can provide most of a household's total yearly vegetable needs, including much of the household's nutritional requirements for vitamins A, C, and B complex and iron.⁵ In many parts of the world, urban food produce augments urban food supplies particularly, but not only, of fruits and vegetables.⁶ Urban spaces that produce significant amounts of food include: parks, utility rights-of-way, bodies of water, roof tops, walls and fences, balconies, basements and courtyards.⁷ Urban area food production can operate at a for-profit farm scale, producing high quality fresh foods (including protein-rich production) on relatively small amounts of space that include aquaculture, hydroponics, and greenhouses.⁸

Dietary Knowledge and Practice

Practical experience with fresh food – growing, harvesting, identifying varieties in stores and farm stands, understanding seasonality, cooking, and preserving – positively impacts dietary habits. An allegiance to homegrown and farm-purchased foods develops when we develop the skills to transform fresh, raw food into cooked, savory food.⁹ This is also an opportune time for clinical and extension interventions to promote healthy forms of cooking (e.g., low salt and fat).¹⁰

Evidence is building that when gardeners and small-scale farmers “save food dollars” by producing their own food, their overall food consumption patterns and dietary knowledge improve.¹¹ Gardeners generally believe that what they grow is good for them and so they tend to eat it.¹² A number of studies show that the fruit and vegetable intake, as measured in terms

² United Nations World Health Organization, WHO 2001; Bakker et al. 2000; United Nations, FAO 2000; Maxwell et al. 1998; Smit 1996; Smit et al. 1996.

³ Brown and Carter 2003.

⁴ Kaufman and Bailkey 2000; Smit et al. 1996; Sommers and Smit, 1994.

⁵ Patel 1996; Sommers and Smit 1994.

⁶ (UNFAO), <http://www.fao.org/urbanag/default.asp>; Smit, et al. 1996; Bellows 1996; Bellows and Hamm 2003.

⁷ Dunnett and Kingsbury 2004; Pilcher 2002.

⁸ Resh 2001; Koc 1999; Smit et al. 1996; Olson 1994; Nicholls 1990.

⁹ Wells and Gradwell 2001; Ohri-Vachaspati and Warrix 1999.

¹⁰ Martinez-Salgado et al. 1993; Ohri-Vachaspati and Warrix 1999.

¹¹ Pothukuchi and Bickes 2001; Pranis 2003.

¹² Armstrong-A 2000; Lackey & Associates 1998; Patel 1996.

of recommended servings per day, is higher among gardeners than among non-gardeners in the same study,¹³ or among gardeners versus the average U.S. consumer¹⁴. In a 1991 study, gardeners ate more vegetables more frequently and they consumed less sweet foods and soft drinks as compared to a non-gardener control group.¹⁵

Research shows that new gardeners increase vegetable more than fruit consumption.¹⁶ This may be because vegetables are relatively easy to grow, benefiting the U.S. diet that particularly lacks leafy green and yellow vegetables.¹⁷ Fruits generally take more room and time to grow than do vegetables. Berries, however, can be somewhat simpler to introduce than orchard crops, thus providing the fruit sub-group identified as most underrepresented in the U.S. diet.¹⁸ “Truck farming” traditionally exists in peri-urban environments and specializes in those under-consumed foods, the leafy greens, yellow vegetables, and berries. Farms on the urban fringe are threatened by development. The potential loss of the farms and their capacity to supply the nutritional needs of concentrated urban populations should be of concern to health practitioners.

Land and water livestock provide existing and potential protein resources for urban area populations. The production of pasture and free range poultry is increasing within daily delivery of urban centers and mobile poultry processing plants are becoming more common. Urban production, processing, and distribution of micro- and small-scale livestock – including goat, sheep, and rabbit -- is increasing rapidly. Farm fish was the most rapidly growing industry in the world during the 1990s and much of that growth was in and near cities.¹⁹

Nutrition education through gardening enjoys documented success in changing dietary practice among seniors.²⁰ Public sector advocates of nutritional health encourage: a) day care workers to introduce gardening to boost young children’s dietary habits²¹; and b) community groups to start community gardening projects for over all health planning and self-care²².

Home gardening and nutrition education has been shown to boost micro-nutrient intake in many countries and can be considered as additional intervention models applicable to the North American region. Studies describe nutrition education programs that include home gardening components to balance diets and variously boost serum retinol, vitamin A, iron, and iodine in rural South Africa²³, India²⁴, Bangladesh²⁵, Indonesia²⁶, Mexico²⁷, and The Philippines²⁸.

¹³ Armstrong-A 2000; Lackey & Associates 1998; Pothukuchi and Bickes 2001.

¹⁴ Giordano et al. 1998.

¹⁵ Blair et al. 1991. Cf. Lineberger and Zajicek 2000; Pothukuchi and Bickes 2001.

¹⁶ Lineberger and Zajicek 2000.

¹⁷ McNamara 1999.

¹⁸ Kantor 1998; Peters et al. 2002; O’Brien 1995.

¹⁹ Kilgannon 2004.

²⁰ Hackman and Wagner 1990.

²¹ Texas Dept. of Human Resources 1981; Frederick and Holzer 1980.

²² United States Office of Consumer Affairs, Consumer Information Division, 1980.

²³ Faber et al. 2002.

²⁴ Vijayaraghavan 2002.

²⁵ Ahmed 1999.

²⁶ de Pee et al. 1998.

²⁷ Martinez-Salgado et al. 1993.

²⁸ Anonomous-A. 1993.

Saving Food Dollars

Fruits and vegetables are low calorie and “nutrient dense” foods. Limited income households, however, tend to focus their buying power on bulk foods that fill them up.²⁹ Community and residential gardening, as well as small-scale farming, save household food dollars. They promote nutrition and free cash for non-garden foods and other items³⁰. Studies report that every \$1 invested in a community garden plot yields approximately \$6 worth of vegetables.³¹ An average urban garden in 1991 produced about \$160 worth of produce.³² A 1996 study claims that 1,900 gardens in community lots on 30 acres in Newark produced approximately \$915,000 of food value in one year and almost \$4 million over 5 years.³³

Emergency food providers typically have relatively greater access to breads, cereals, and canned goods and suffer a chronic shortage of fresh fruits and vegetables and of proteins (fish, fowl, and meat; fresh, frozen, and canned).³⁴ Through garden donation projects like Plant-a-Row, urban food production saves food bank resources required to obtain needed food and further, provides precisely those foods rarely donated by retailers, restaurants, processors, and other suppliers.³⁵

Fresh and Local

Numerous studies show that gardeners and those who buy directly from local farmers identify wanting *fresh* produce as an important reason why they grow their own food and purchase locally grown products.³⁶ This is partly a function of taste, which some name as the most important lever to increase fruit and vegetable consumption.³⁷ The full-sensory experience of eating fresh-picked produce and/or the activity of producing vegetables appears to enhance fruit and vegetable consumption among some ethnic groups.³⁸ Studies that report relationships between freshness and health are beginning to appear in the literature. For example, it has been shown that a 5-10 day transportation and storage lag between production and consumption leads to losses of 30-50% in some nutritional constituents.³⁹

Gardeners report that they increase their fresh produce consumption because the same foods they grow are not (equally) accessible to them for many different reasons: the retail price is too high; local stores offer inadequate selections of produce; the food they grow and prefer has an ethnic or regional character that is not available at local stores.⁴⁰ When farmers and consumers meet face-to-face they learn about each other’s needs, for example, the desire for vegetables not commonly available. Direct marketing improves the producer-consumer relationship and maximizes opportunities and interest in increased consumption of fresh fruit and vegetables.

²⁹ Lin et al. 2005; Drewnowski and Spencer 2004; Levine et al. 2003; Morgan et al. 1985; Peterkin and Hama 1983.

³⁰ Kaufman and Bailkey 2000; Herbach 1998; Lackey & Associates 1998; Sommers and Smit 1994.

³¹ Hynes 1996.

³² Blair et al. 1991.

³³ Patel 1996.

³⁴ Poppendieck 1999.

³⁵ Wilson 2001.

³⁶ Armstrong-A 2000; Giordano et al. 1998; Hanna 1999; Lackey & Associates 1998; Patel 1996; Patel 1991; Ramirez 1995; Salvidar-Tanaka 2002.

³⁷ Morris et al. 2001.

³⁸ Devine et al. 1999.

³⁹ Shewfelt, RL 1990a, 1990b; Klein 1987.

⁴⁰ Salvidar-Tanaka 2002; Hanna 1999; Hynes 1996; Feenstra et al. 1999; Ramirez 1995.

Community Food Security

Urban agriculture contributes to community food security.⁴¹ Times of war and conflict render tenuous our dependence on distant food sources, especially in this post-9/11 world.⁴² A local agri-food system provides a relatively secure and more locally controlled source of food. Better interaction between local consumers and farmers increases awareness of local food options. Enhanced communication also augments knowledge and commitment to healthy, sustainable, and secure food products and practices.⁴³

Urban gardening contributes to local food security. Gardeners report that sharing food with friends, families, neighbors, and/or needy members of their community in need is one of the important reasons that they grow produce.⁴⁴ This generosity has been organized into programs that maximize contributions to soup kitchens and pantries, for example, through the “plant-a-row” project that encourages gardeners to set aside a specific space for donations.⁴⁵

Strategies to buy locally have surged.⁴⁶ States and regions have instituted “buy local” policies.⁴⁷ Community supported agriculture (CSA) has linked buyer collectives with local farmers; some CSAs strive to make opportunities available to low-income groups.⁴⁸ Local farmers are in such demand that many large and small towns now compete to have farmers participate in their farmers markets.⁴⁹ Low income group access to fresh and local produce is increasingly addressed.⁵⁰ U.S. federal programs encourage direct marketing of fresh produce through farm stands and farmers markets. Many of these programs also incorporate voucher and electronic benefits transfer (EBT) redemption programs⁵¹ at the markets to augment fruit and vegetable consumption in vulnerable population groups -- seniors, low-income, and single parent families. Through donations and gleaning opportunities, urban area farmers contribute to urban food banks and emergency food assistance programs.⁵²

II. Community Health: Lifelong Active Lifestyles and Personal Wellness

Urban agriculture benefits both individuals and neighborhoods, and thus contributes to overall community health.⁵³ The benefits of food production transcend the physical, mental and emotional health of the individual to leave lasting change on others and on the physical and

⁴¹ Koc et al. 1999; Bellows and Hamm 2003; Hamm and Bellows 2003; Mann 2001.

⁴² Wilkins 2004; United States Food and Drug Administration 2003, <http://www.cfsan.fda.gov/~dms/fssrep.html>.

⁴³ Cohen et al. 2004.

⁴⁴ Saldivar-Tanaka 2003; Von Hassell 2002; Hanna 1999; Giordano and Tam 1998; Patel 1996; Hynes 1996.

⁴⁵ “Plant-a-Row” Project; <http://www.gardenwriters.org/par/>.

⁴⁶ Hinrichs and Lyson (eds., Forthcoming).

⁴⁷ Barham 2003, <http://www.state.nj.us/jerseyfresh/>.

⁴⁸ Hunger Action Network of New York State 2005, 2004.

⁴⁹ Knox and Feenstra 2004 (working draft); Gradwell, et al. [no date].

⁵⁰ Fisher 1999.

⁵¹ United States Department of Agriculture (USDA) 2004; USDA Food Stamp Program, <http://www.fns.usda.gov/wic/>; USDA, Women, Infants, and Children (WIC) <http://www.fns.usda.gov/wic/FMNP/FMNPfaqs.htm>; and USDA, EBT Farmers' Market Demonstration Project http://www.fns.usda.gov/fsp/eft/eft_farmers_marketstatus.htm.

⁵² Hoisington et al. 2001; Lazarus 2000.

⁵³ See early review of health benefits of urban agriculture in a special issue of *Urban Agriculture Magazine*. 2001.

social space of the community.⁵⁴ Gardening is a lifetime activity, and its health advantages span generations of gardeners. It is associated with satisfying labor, physical and mental relaxation, socializing, and a means to produce food and beauty. Used well, gardening can be a key element in successful health intervention programs because it addresses simultaneously the physical, mental, spiritual, and social health of individuals and their communities.⁵⁵

For many, farming is a labor of love as well as a source of income. In recognition of the financial potential of farming, a number of programs now exist to expand opportunities to new farmers – many of whom are based in peri-urban environments – who have difficulty with start up costs. These programs promote community wellness: clean, open space landscapes, access to local fresh foods, and healthy local economies with local economic multiplier effects. Some programs specifically target immigrant communities, many of whose members come to North America with extensive farming knowledge and experience. These individuals often find great personal satisfaction in returning to farm operations and they typically grow crops and raise livestock wanted by their ethnic peers; foods that may otherwise be difficult to find.⁵⁶

Exercise

Gardening and food production is good exercise. Health professionals and others, however, often undervalue its exercise-related health benefits. Garden enthusiasts and farmers themselves rarely compartmentalize their labors as “exercise.” The “exercise” ranges from fine motor involvement when cutting flowers, to aerobic gross motor tasks such as turning compost piles.⁵⁷ Gardeners report that garden “activity” increases self-esteem, pride, confidence, personal satisfaction, and efficacy.⁵⁸

Research that addresses gardening generally unravels the holistic advantages of gardening from “exercise.” Many studies bundle walking, bicycling, taking the stairs, and gardening together as undervalued forms of exercise. When self-identified as exercise by research subjects or isolated by researchers, gardening has been connected to reducing risks of obesity (children and adults)⁵⁹, coronary heart disease (for women and for men, notably menopausal women and elderly males),⁶⁰ glycemic control and diabetes (adults, elderly men, Mexicans and Mexican-Americans)⁶¹, and occupational injuries (railway workers).⁶²

Gardening can expend little or intensive amounts of energy. Even moderate forms of garden exercise increase muscle strength and endurance in activity-reduced persons including pregnant

⁵⁴Shoemaker and Kiehl 2002; Littman 1996; Brogan and James 1980.

⁵⁵ Armstrong-B 2000; Herbach 1998; Hynes 1996.

⁵⁶ Growing New Farmers, <http://gnf.bigmindcatalyst.com/cgi/bmc.pl?page=pubpg1.html&node=1010>; World Hunger Year, Food Security Learning Center, <http://www.worldhungeryear.org/fslc/>; New England LAND LINK, <http://www.smallfarm.org/nell/nell.html>.

⁵⁷ Brown and Jameton 2000.

⁵⁸ Hanna and Oh 2000; Waliczek et al. 1996.

⁵⁹ Reynolds and Anderson 2004; Kien and Chiodo 2003.

⁶⁰ Beitz and Doren 2004; Reynolds and Anderson 2004; Lemaitre et al. 1999; Pols et al. 1997; Grimes et al. 1996; Haines et al. 1992; Caspersen et al. 1991; Magnus et al. 1980; Magnus et al. 1979.

⁶¹ Wood 2004; Reynolds and Anderson 2004; Van Dam et al. 2002.

⁶² Chau et al. 2004.

women, cancer survivors, and those generally sedentary.⁶³ Gardening and nature-adventure education in after-school programs increased energy expenditures of 12 year olds by 60 percent.⁶⁴

Research shows that gardening is a preferred form of exercise across age, gender, and ethnicity.⁶⁵ Overall, older persons do more gardening than younger ones.⁶⁶ Research does not always capture gardening as exercise, because some gardeners perceive it as part of a day's leisure or labor activities and not a separate activity in the category of "exercise." In one study, men identified gardening as "exercise" more often than did women though women and men reported similar amounts of time gardening.⁶⁷ Many women may associate gardening with gendered household food-related chores rather than exercise.

The beneficial effects of outdoor activity and exposure to sunlight need more research. Sunlight could influence susceptibility to a number of chronic diseases. For example, sunlight deficiency may increase blood cholesterol. One study shows that gardening is associated with lower blood cholesterol during the summer growing season but not in the winter.⁶⁸

Mental Health

Working with plants and in the outdoors benefits the mental health, mental outlook, and personal wellness of individuals.⁶⁹ Cultivation activities trigger both illness prevention and healing responses. Health professionals use plants and gardening materials to help patients of diverse ages with mental illness improve social skills, self-esteem, and use of leisure time.⁷⁰ The field of horticulture therapy promotes plant-human relationships to induce relaxation and to reduce stress, fear and anger, blood pressure, and muscle tension.⁷¹ Given the literature on positive outcomes of plant-human relationships, the American Community Gardening Association has expressed surprise that more gardens have not been dedicated to mental health and rehabilitative intervention.⁷²

III. Community Health: Building Safe, Healthy, and Green Environments

Urban environments have the capacity to integrate our need to live in a balance of built and open spaces. Constructing green zones is important for a robust city as building housing, service infrastructure, and industrial and commercial spaces. Community and educational land dedicated to food production encourages participation in the vigor of a positive urban

⁶³ Evenson KR, et al. 2004; Irwin 2004; Rolland et al. 2004; Wannamethee and Shaper 2001; Wannamethee et al. 2000; Anonamous-B 1995.

⁶⁴ Kien and Chiodo 2003.

⁶⁵ Wood 2002; Crespo et al. 1996.

⁶⁶ Wood 2002; cf. Krems et al. 2004.

⁶⁷ Armstrong-A 2000.

⁶⁸ Grimes et al. 1996.

⁶⁹ Brown, VM et al. 2004; Matsuo and Relf 1995; THRIVE, Using Gardening to Change Lives, <http://www.thrive.org.uk/>.

⁷⁰ Brown, VM et al. 2004; Smith 1998; McGinnis 1989; McBey 1985.

⁷¹ Sempik et al. 2002; Matsuo and Relf 1995; Relf 1991; American Horticultural Therapy Association, <http://www.ahta.org/>.

⁷² American Community Gardening Association 1998.

environment. The practice of cultivation improves the urban physical environments as measured by air quality, range of bio-diversity, and soil quality.

Social Life in Urban Neighborhoods

Gardens and farms enhance the informal and the formal economies of social environment. The effort to develop and sustain urban food production inside cities builds social capital – trust, civic engagement, the development of community leaders, and the sharing of goods (“vegetable capital”), services, and information.⁷³ Bringing people together, building community, and improving neighborhoods are some of the reasons gardening empowers its participants.⁷⁴ Social engagement is positively correlated with personal attention to health care and wellness.⁷⁵ Food production teaches job skills and offers entrepreneurial opportunities.⁷⁶ Reports find that low-income communities particularly value the community building benefits of urban agriculture.⁷⁷ Innovative prison garden programs strive to improve personal health and mental outlook through pride in nurturing the life of a garden and understanding and connecting nutrition and bodily self-respect.⁷⁸

Urban community gardens and farms help overcome social, health, and environmental justice challenges.⁷⁹ Safe and pleasant neighborhoods promote active lifestyles and outdoor exercise that counteract the physical passivity associated with the obesity epidemic. Participating in beautifying a neighborhood builds a constructive, collective consciousness. The presence of vegetable gardens in inner-city neighborhoods is positively correlated with decreases in crime, trash dumping, juvenile delinquency, fires, violent deaths, and mental illness.⁸⁰ Gardens link different sectors of a city—youth, elders, and diverse race, ethnic, and socioeconomic groups.⁸¹ Gardeners, especially older ones, feel safe and have a purpose for leaving their households and engaging in a wider landscape; they literally and figuratively broaden their horizons.⁸² Adults feel more secure allowing young persons to move freely in safe, green, cared-for, and populated environments.

Urban Agriculture in Schools

Extensive and mounting evidence shows that school-based garden programs have significant health effects on young people. In these non-traditional learning labs, youth become familiar with good and healthy food, especially the fruits and vegetables critical to reducing obesity and chronic diseases. It is precisely these foods that are missing from our children’s usual diets. School garden programs teach a skill and a lifetime hobby that provides exercise, mental stimulation, and social interactions. Children receive practical entrees to biological and

⁷³ Hinrichs and Lyson (Forthcoming); Lyson 2004; Von Hassell 2002; Feenstra et al. 1999; McGuinn and Relf 2001; Oh 1999; Littman 1996; Lewis 1991.

⁷⁴ McGuinn and Relf 2001; Hanna 2000; Feenstra et al. 1999; Kuo et al. 1998a; Kuo et al. 1998b; Lewis 1991; Blair et al. 1991.

⁷⁵ Greenberg and Schneider 1996.

⁷⁶ Halweil 2005; Kaufman and Bailkey 2000; Feenstra et al. 1999; Francis et al. 1994.

⁷⁷ Armstrong-A 2000.

⁷⁸ Sneed 1998; Project on Human Development in Chicago Neighborhoods, <http://www.hms.harvard.edu/chase/projects/chicago/index.html>.

⁷⁹ Von Hassell 2002.

⁸⁰ Hurley 2004; Patel 2003; McKay 1998.

⁸¹ Predny and Relf 2000; Feenstra et al. 1999; The Food Project, <http://www.thefoodproject.org/>.

⁸² Milligan et al. 2004.

environmental sciences, math, geography, and social studies. Additionally, reports show that these advantages accrue to students that have trouble succeeding in school as well as those who excel.⁸³

Farm-to-school and farm-to-college programs establish market relationships with local farms to secure the freshest and in season fruits, vegetables, and other products for consumption in school and college cafeterias. These programs reflect a grassroots endeavor by parents, teachers, school health officials, students, farmers, and others. Their efforts counter a trend to offer students fast food and highly processed menus in schools –the very foods linked to the obesity epidemic. At the national, state, and municipal levels, the public sector is joining grassroots organizers to develop policy and pass legislation to enable and promote farm-to-school or farm-to-college programs.⁸⁴

A schoolyard garden can deliver produce to its school's cafeteria in order to provide an exceedingly dynamic linkage between nutrition, education, and learned behaviors. Such a program exists in the Berkeley, California school system and represents a progression *from* already functioning schoolyard gardens and a successful farm-to-school program *to* new curriculum development that benefits the health and education of its students.⁸⁵

Growing Urban Green Zones

Gardeners and farmers “create nature” and enjoy being “in nature” within urban built environments. They work hard to improve the physical environment of their neighborhoods and communities.⁸⁶ The beauty gardeners develop enhances their physical environment that in turn advances gardeners' psychosocial⁸⁷ as well as physical health. One study found that access to gardens, along with improved housing fixtures and dwelling type, location and adequacy of housing space was positively associated with how respondents self-assessed their health.⁸⁸

Urban area gardens and farms improve air quality. On the local level, plant foliage reduces carbon dioxide, ozone concentrations (heavy, low-lying gas), and lowers urban mass temperatures.⁸⁹ On a more macro scale, locally grown food reduces the present average of 1300

⁸³ French SA, Wechsler H. 2004; Kien & Chiodo. 2003; Pranis 2003; Morris et al. 2002; Morris et al. 2001; Morris et al. 2000; Pothukuchi and Bickes 2001; Lineberger and Zajicek 2000; Predny and Relf 2000; Bellows 2004; Texas Department of Human Resources 1981. Some school-based research and program reports, *of the many*, National Gardening Association, <http://www.nationalgardening.com/> and Kids Gardening Program, <http://www.kidsgardening.com/>; School Garden Research, KidsGardening.Com, <http://www.kidsgardening.com/Dig/DigDetail.taf?ID=124&Type=faq>; Edible School Yard Program, <http://www.csg.org/CSG/Policy/education/school+health/edible+school+yard.htm>.

⁸⁴ Brillinger et al. 2003; Farm-to-School Program, Community Food Security Coalition, http://foodsecurity.org/farm_to_school.html; Farm-to-College Program, Community Food Security Coalition, http://foodsecurity.org/farm_to_college.html.

⁸⁵ Edible School Yard Program, <http://www.csg.org/CSG/Policy/education/school+health/edible+school+yard.htm>.

⁸⁶ Armstrong-A 2000.

⁸⁷ Brogan and James 1980.

⁸⁸ Macintyre et al. 2003.

⁸⁹ Akbari et al. 1988; City of Toronto 1998; Heissler et al. 1995; Bernatzky 1983; EPA-NASA Urban Heat Island Project, http://www.ghcc.msfc.nasa.gov/uhipp/urban_uhipp.html.

miles that our food travels from “field to plate.” Growing (and buying) locally is fuel efficient, less polluting, and has a relevant and substantial impact on our health.⁹⁰

Urban gardens and farms increase urban bio-diversity. They attract beneficial soil microorganisms, insects, birds, reptiles, and animals. Gardens play a role in species preservation for birds and butterflies by providing food, resting spaces, and protection along migratory flight paths.⁹¹

Urban food production improves urban and urban fringe soils. Rooted plants stabilize the ground and reduce soil erosion. Cared-for soils absorb rainfall that then does not run over exposed, compacted dirt and pavement absorbing toxic debris and dumping it into storm drains. Urban compost systems can transform significant amounts of a city’s waste (organic waste from yards, parks, food establishments, etc.) for beneficial re-use.⁹²

IV. Community Health: Planning for Potential Health Risks

Heavy Metals

Many urban residents are challenged by soils containing toxic levels of heavy metals including lead, cadmium, mercury, nickel, and copper. The type of heavy metal depends on the source: paint, gas or oil, waste incineration, lead pipes, specific industries, etc. Dangers include direct absorption of toxics through ingestion (breathing and swallowing, the latter especially by children with their hands in their mouths) and indirect consumption through foods grown on the land that may have absorbed the toxics. Particularly in older cities, it is crucial to test soils for lead before growing food or even before allowing small children to enter and play in the garden spaces.

Appropriate gardening practices reduce risk. Strategies include: 1) improving soil stability through crop plantings and soil amendments like mulch, thereby reducing wind-born dust and the tracking of contaminated soils into residences by human feet and household pets; 2) emphasizing the cultivation of fruiting plants (including vegetables like peppers and eggplants) rather than green leafy vegetables and tubers because the latter absorb heavy metals about ten times faster than do fruiting plants; 3) adding compost and/or calcium to the soil to lower soil acidity and thus reducing the potential of metal “uptake” by plants; 4) growing ornamentals (for beauty, exercise, healthy cities) and not edibles; 5) using phytoremediation whereby highly absorptive plants are cultivated to “take up” heavy metals from the soils (This practice is, however, problematic in terms of disposal of contaminated plants). Raised beds, container gardens, and hydroponics additionally circumvent many contamination problems.⁹³

⁹⁰ Jules et al. 2005; Roberts 2005; Pirog and Benjamin 2003; Jones 2002.

⁹¹ Towle 1996; Biodiversity Science Assessment Team 1994; The BUGS Project, Biodiversity in Urban Gardens in Sheffield, <http://www.shef.ac.uk/uni/projects/bugs/>; Urban Biodiversity; Urban Ecology and Urban Sustainable Environment, <http://bch-cbd.naturalsciences.be/belgium/links/themes/urban.htm>.

⁹² Locke 2004; BioCycle 1999; San Francisco, Department of Environment, Composting Page, <http://temp.sfgov.org/sfenvironment/aboutus/recycling/compost.htm>; California, Food Scraps Management, <http://www.ciwmb.ca.gov/foodwaste/>.

⁹³ Hamel and Heckman 2003; Lock and Veenhuizen 2001; Litt et al. 2002; Xintaras 1992; Bellows 2000; Bellows 1999; Bellows 1996; US Dept. of Health and Human Services, Public Health Service, CDC 1991; Lepp 1981.

Air pollution

Polycyclic aromatic hydrocarbons (PAHs), a known carcinogen, have been found in urban soils. PAHs are residues from incomplete combustion. They may exist in gardens and other urban soils due to vehicle pollution from adjacent roads and railways, past wood or coal burning on or near the site, or the extensive use of creosote railroad ties as garden plot dividers during the 1970s & 80s. Little is known about them, but basic research has begun.⁹⁴

Other Potential Risks

Other potential risks associated with urban gardening and farming require common sense strategies. Standing water can attract bugs, including mosquitoes carrying diseases like West Nile virus. Gardens and farms that rely on water catchment systems need to take simple precautions like covering standing water or seeking access to public water mains. Use of incompletely composted animal manures can spread diseases, however proper composting is simple to learn and implement. Standard and common sense safety measures are necessary with the use of heavy or sharp garden tools, especially around small children. Proper ergonomic use of tools lessens the risk of muscle strain. Reducing exposure from direct sunlight (hats, sun block, less gardening in the middle of the day) protects from sunburn and vulnerability to skin cancer.

Recommendations for Health Professionals

Health professionals can increase the positive benefits of urban agriculture in many ways. Here are a few suggestions:

- Cultivate a *Healing Garden* on idle land at your health department, medical office, hospital, or long-term care facility. The garden will provide serenity, food, and education about the therapeutic and preventative benefits of specific vegetables and of gardening.
- Encourage patients/clients to grow their own vegetables at home, as a therapeutic means for enhancing nutrition, physical exercise, and relaxation.
- Encourage patients/clients to shop at farmers' markets and/or join a vegetable-box subscription (sometimes called a Community Supported Agriculture, CSA) program to increase their access to fresh vegetables and fruits, and to support local farmers.
- Introduce the subject of public health and urban agriculture to your professional association to exchange ideas and find out what your colleagues know about the subject.
- Work with local planners and policy makers to establish new community gardens, preserve open space and market structures that secure urban food production in and near urban areas.
- Encourage State health departments to adopt the option of WIC redemptions at farmers markets and CSAs.
- Encourage local farmers markets and CSAs to incorporate mechanisms and support to accept emergency food assistance including food stamp benefits through EBT, and WIC and Senior FMNP coupons.

⁹⁴ Agency for Toxic Substances and Disease Registry, <http://www.atsdr.cdc.gov/tfacts69.html>

- Provide financial support for community-based gardening projects such as youth garden initiatives and community gardening.
- Support the national 'farm to school' movement.
- Envision and help to plan and implement a local farms-to-hospital program.
- Support a "Garden at every school" program like the successful model in California.
- Support 'edible buildings', green building' and 'vertical agriculture' programs.
- Join the Community Food Security Coalition to partner with the broad swath of active and engaged food and nutrition practitioners dedicated to building strong, sustainable, local and regional food systems that ensure access to affordable, nutritious, and culturally appropriate food for all people at all times.

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