

GOOD FOOD, HEALTH, AND SUSTAINABILITY: AN INTRODUCTION FOR HEALTH PROFESSIONALS

Global Challenges — Local Opportunities

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LEARNING OBJECTIVES

This article provides an introduction into sustainability and health, with a focus on food. When health professionals integrate concepts of sustainability into life and work, cobenefits can be leveraged, as health-promoting services then also serve a greater cause — that of environmental protection, social justice, and economic viability. Regarding food, this may begin by simply considering the decision-making process when purchasing food. However, the process does not stop there, as considerations surrounding a more sustainable lifestyle in general, and adjusting eating patterns specifically, can be eye opening, while getting involved in the local food movement is life changing. The four environmental hotspots, meat, fish, biodiversity, and waste, will be discussed to raise awareness and build knowledge in health professionals. Resources and examples are given to help mobilize learners to take action.

Key Words:

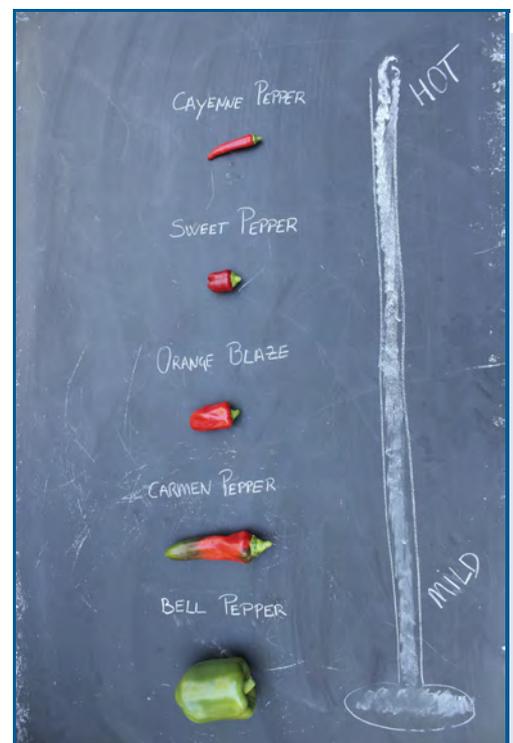
Food, Healthy Lifestyles, Sustainability, Farmers' Markets, Urban Farms

INTRODUCTION AND GLOBAL PERSPECTIVE

The earth is warming rapidly because of increased greenhouse gas (GhG) emissions, whereas the rising air and ocean temperatures in the Arctic and Antarctica are responsible for the increasing ice loss, resulting in sea level rise. This process often is characterized as earth's energy imbalance, and climate scientists are calling on all of us to help reduce

GhG emissions to protect young people, future generations, and nature (25,28).

Climate-related extremes, such as heat waves, droughts, wildfires, or storms, have already increased across the past decades and show disruption of infrastructures such as food production and water supply with risk to human well-being and even ecosystem stability (28). Furthermore, there will be considerable inequity to those affected, especially from lower socioeconomic status, and geographical regions most exposed (coastal regions and developing nations) are likely the most vulnerable (28).



Recognizing the rise in population growth, current trends in hunger and malnutrition in the developing world, and food insecurity and obesity in developed nations, it is clear that climate change probably is the biggest global health threat of the 21st century (7).

As health professionals, we are concerned about the enormous economic cost of the current trends in obesity and related chronic diseases. Is earth’s energy imbalance associated with the energy imbalance of its people? From a health professional’s point of view, we must recognize this crossroad. Although we act interdisciplinarily within our fields, we need to consider the bigger picture — the link between the health of the people and the planet. Where is the connection between the food we eat, our health, and sustainability?

WHAT IS SUSTAINABILITY?

Most commonly, sustainability is defined as “meeting the needs of the present generation without compromising the ability of future generations to meet their needs (42). Sustainable development and resilience are two terms often used to describe more contemporary and dynamic phenomena that may imply a paradigm shift or adaptation to a new situation (see Table 1 for definitions). Sustainable development often also is expressed by the three Es that stand for Environment, Economy, and Equity. Theoretically, these key fields all are important to consider when addressing sustainability; however, there exists considerable debate how this is achievable on a global level (32).

How would you define sustainability and what does it mean in an applied sense, especially related to the health professions and on a local rather than a global level?

A good entry point may be this example. Visualize a community that incorporates easy access to services, such as city parks and open space for leisure and sports surrounded by walkable neighborhoods, including businesses and grocery stores, schools with school gardens, a hospital, food bank and pantry, an urban farm, post office, and a year-round farmer’s

market. Ideally, this community also uses alternative energy such as solar and wind.

This community meets the three Es:

- **Environment:** through establishment of various ecosystems, enhancing biodiversity and natural beauty in an urban setting.
- **Equity:** through access to physical activity, healthy and secure food, and a social network.
- **Economy:** through local businesses and promoting to keep dollars in the community.

From this example, we quickly connect the dots and see that such a sustainably developed community also facilitates health-promoting behaviors. Unfortunately today, such environments still are rare and inaccessible or not affordable to everyone. A further issue is that the connection between sustainability and health is not clear and, thus, these topics are tackled separately — locally, city planners may work with ecologists but forget about the health professional who focuses on the built environment inviting citizens to walk, run, and bike. Likewise, health promotion initiatives often fail to include sustainability. For example, health and fitness events, held in the city, may fail to address local food sourcing or waste and recycling. In schools, sustainability is only sparsely integrated, if at all, and health sciences students, including nutrition students, often lag behind those in environmental sciences in knowledge and skill pertaining to sustainable food systems. Finally, in sport nutrition, performance-based menus often lack the integration of sustainable choices, considerations of local farms, or discussions surrounding meat as a choice. In these examples, important links are missed and so are the leveraging opportunities of health and sustainability, had these two fields been integrated.

When we look at our food system, it becomes apparent how we literally have distanced ourselves, our families, students, clients, and patients from good food grown close to us, thereby losing the story of where food comes from, food traditions and

TABLE 1: Sustainability Definitions

	Definition	Reference
Sustainability and sustainable development	Meeting the needs of the present generation without compromising the ability of future generations to meet their needs.	(43)
	A dynamic process, sustainable development often is described as the development of a new normative horizon that implies a paradigm shift from a development based on inequity and overexploitation of natural resources and environmental services (such as a biodiverse ecosystem) to one that requires new forms of responsibility, solidarity, and accountability.	(43)
	Aims at improving the life quality of all people of the world without increasing the usage of natural resources above the carrying capacity of the Earth.	(9)
Resilience	The capacity of social, economic, and environmental systems to cope with a hazardous event or climate trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while maintaining the capacity for adaptation, learning, and transformation.	(28)

Good Food, Healthy Lifestyles, Sustainability

Photos courtesy of Nanna Meyer, PhD, RD, FACSM.



culture, farming and gardening, a biodiverse ecosystem with crop varieties unique to the area, and sharing pleasures of cooking and eating together. Wendell Berry said it correctly that “Eating is an agricultural act” (5) and, thus, without local food production, “eaters” become ever more alienated from agriculture, losing an important connection to land, people, animals, and an intact health-promoting ecosystem. Likewise, we must realize that obesity cannot be viewed simply as a health sector issue but must be related back to agriculture and the food we grow and eat today (27,41).

Recently, the Food and Agriculture Organization of the United Nations defined a sustainable diet as follows: “A diet with low environmental impacts, which contributes to food and nutrition security and to healthy life for present and future generations. A sustainable food system is protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, while optimizing natural and human resources”(17).

Currently, there are few countries that have adopted sustainable food principles into governmental nutrition recommendations. Some of the best examples are the Mediterranean diet (2), the Health Council of the Netherlands (26), and the New Nordic Diet (37).

ENVIRONMENTAL IMPACT OF FOOD

Although many factors contribute to GhG emissions (*e.g.*, transportation, industries), the current food system accounts for 10% to 14% of global emissions. When deforestation is added, the numbers creep up to nearly 30% (44). Depending on the country, livestock production is estimated to account for up to 51% of global GhG emissions (18). Thus, industrialized agriculture, while highly efficient, now contributes heavily to Earth’s energy imbalance.

Agriculture contributes to GhG emissions through preproduction (*e.g.*, fertilizer, pesticide, herbicide manufacture, energy use in feed production), production (direct emissions of agriculture, including carbon dioxide (CO₂), methane (CH₄),

and nitrous oxide (N₂O) and indirect from deforestation), and postproduction (processing, transport, refrigeration, cooking, waste); however, the total impact varies by region and country. Direct emissions from soil (N₂O), enteric fermentation and manure (CH₄), biomass burning, and rice production (CH₄) and indirect from deforestation are the most burdensome (44). GhGs also differ in global-warming potential. For example, warming potential for CH₄ is 72 times greater when quantified over the next 20-year time span than that of CO₂ (28). Thus, short-term strategies, including those of a sustainable diet and waste recovery, targeting CH₄, are gaining more in-depth attention as a low-hanging fruit.

Considering the projected population growth to 9 billion people by 2045, global food demands are expected to rise an additional 60% (16). Logically, this will result in higher food production and greater emissions for decades to come. Besides emissions, further environmental impacts of intensive agriculture include land and water use, loss of biodiversity, and pollution of waterways.

ENVIRONMENTAL HOTSPOTS

There are at least four environmental hotspots related to our food system that burden planet Earth, and these are discussed below. Taking action related to these four hotspots appears no longer a choice but a necessity. How we tackle these hotspots is entirely up to us (at least for now), especially if we want to safeguard long-term ecological sustainability, satisfy basic human needs, and promote cross-generational equity, good health, and longevity.



Hotspot 1: Meat

The largest environmental impact from the industrialized food system stems from meat, which accounts for about 20% of global GhG emissions and requires high water inputs. Livestock-based food production also can contribute to displacing biodiversity because of land clearing (12). The most polluting part of livestock production is its feed (*e.g.*, corn), which is accompanied by expanding needs for more land using large inputs of fossil fuel. Meat production's impact on the environment is well documented (6,10,41), and scientists also are addressing animal and human welfare (8,9), antibiotic use (29), and water pollution from runoffs (38) and leaching fertilizer (40).

Recent research has examined livestock production and its effects on GhG emissions, water, and land use (12). Compared with plant staples (potatoes, rice, wheat), U.S. beef production requires 160 times more land and 8 times more irrigation water for feed while emitting 11 times more GhG and 19 times more N₂O compared with nonbeef categories. Although pork, poultry, eggs, and dairy fare better, they too require substantially more land and water, with greater emissions than plant staples. Although dairy products need less input and emit less than beef, dairy is not necessarily cleaner than nonbeef animal sources. When feed is converted to food (kcal) and protein (g), 35 to 45 kcal are needed to produce 1 kcal of beef (compared with 2 kcal input for 1 kcal of plant protein). Per gram of protein, GhG emissions are 250 times greater for ruminants compared with plant protein from legumes. As expected, eggs, dairy, poultry, and pork exceed GhG emissions compared with plant protein from legumes, but they all have much lower emissions than ruminants (41).

Two questions arise. Is eating from the nonbeef category a better choice? Yes and No. Eating poultry, pork, eggs, or dairy leads to lower emissions and a decrease in land use than eating beef. However, industrial production of poultry or pork similarly questions animal welfare, water pollution, and health impacts on animal and people (*e.g.*, antibiotics) and, thus, simply switching to these protein options without considering overall quantity and production method, while not replacing protein calories with nutrient-dense alternatives, such as fruit, vegetables, grains, or legumes, will not be a straightforward solution.

Furthermore, is sustainable meat production, such as grass-fed beef (and dairy), a better choice? Certainly, pasture-fed meat (and dairy) production may well be part of an intact ecosystem or in areas where crop production is limited because of topographical issues. Furthermore, such production systems also promote a better-quality product and reduce food insecurity (11). However, GhG emissions and land use are still of concern, especially if the aim was to meet current and projected meat demands using sustainable production.

Considering the rise in meat consumption patterns across the world, including the United States and European countries, with

a per capita intake often exceeding 200 lbs per year (13), and many Asian countries increasing meat consumption, the first approach should be to eat less meat (and other animal products). According to a recent study, cutting meat, dairy, and egg intake by 50% would achieve a 40% reduction in N₂O emissions, a 25% to 40% reduction in GhG, and a 23% per capita reduction in cropland use that could be cultivated for food rather than feed (45). In addition, reducing intake also would benefit health, especially cardiovascular health and diabetes (20,45,41), promote weight loss (4), and reduce all-cause morbidity and mortality (39,41). Lower meat consumption would still enable athletes and active individuals to meet their protein needs, especially if meat calories were replaced by a plant-based equivalent (*e.g.*, beans, grains, nuts).

For solutions to eating less meat and associated tricks to keeping balance on the plate and resources, see Tables 2 and 3.

Hotspot 2: Fish

Environmental impacts of dietary choices vary across food groups and changes are needed across multiple sectors. In the past 50 years, fish consumption per capita nearly doubled (20). Two thirds of the world's fish consumption occurs in Asia, with the highest consumption in China. Similar to China, in Europe, the United States, and Australia, fish consumption exceeds 44 lbs per capita per year and nearly 50% of this fish supply comes from aquacultures. Despite the fact that sustainable practices in aquacultures are rising, there still are considerable issues related to traditional nonrecirculating aquacultures, including high GhG emissions and adverse health effects (41). Currently, the supply of sustainably farmed or wild caught fish is inadequate to meet consumer demand without leaving deep environmental marks (19).

Water contamination (eutrophication) from industries, including agriculture, and overfishing practices, with consequential marine stock exploitation, have put seafood resources and fishing livelihoods at risk and question the viability of marine life worldwide. Of available fish stock today, 80% are fully exploited or overexploited, requiring careful management (19). Major environmental groups are calling on consumers to eat less fish and purchase fish caught using sustainable practices (these also reduce GhG) while awaiting cleaner technologies of aquacultures to meet rising demands of fish. Further disruption of ocean ecosystems is inevitable, considering rising levels of CO₂, which will lead to further loss of marine zones and biodiversity and eventually irreversible changes in commercially available fish stock (19).

Eating less fish, fish lower on the food chain (*e.g.*, smaller fish), and choosing from consumer guides such as the World Seafood Watch may be the only way to save our oceans. The developed world consumes a lot more fish than those who depend on it for protein (*e.g.*, coastal regions). Per capita fish

TABLE 2: Problems, Solutions, and Resources for a Sustainable Diet Along the Four Hotspots (Meat and Dairy, Fish, Biodiversity, Waste)

Hotspots	Problems	Solutions for Eaters*	Resources
Meat	GhG, N ₂ O	Eat less meat. Make smaller portions.	Sustainable Table (http://www.sustainabletable.org)
	High water use	Choose pasture-fed meat and protein from nonbeef options.	Cowspiracy Movie (www.cowspiracy.com)
	High land use		Environmental Working Group (www.ewg.org) (http://www.ewg.org/meateatersguide/)
	Animal and human welfare	Be an advocate for humane treatment of animals.	Non-GMO Project (http://www.nongmoproject.org/learn-more/)
	Obesity		Meatless Monday (http://www.meatlessmonday.com)
	Diabetes	Associated with better health, lower risk of morbidity and all cause mortality.	Vegetarian Resource Group (http://www.vrg.org)
Cancer Mortality		Lowers risk of CVD, cancer.	Healthy People, Healthy Planet, WWF (http://livewellforlife.eu)
		Increases longevity.	NPR story on meat (http://www.npr.org/blogs/thesalt/2012/06/27/155527365/visualizing-a-nation-of-meat-eaters) Forks Over Knives (www.forksoverknife.com)
Fish	GhG	Eat less fish. Make smaller portions	Monterey Bay Aquarium Seafood Watch (http://www.montereybayaquarium.org/conservation/research/seafood-watch)
	Overfishing	Choose sustainably caught or farmed fish.	Marine Conservation Society (http://www.mcsuk.org) and (http://www.fishonline.org)
	Eutrophication	Be an advocate for marine conservation.	Marine Stewardship Council (http://www.msc.org)
	Ocean acidification	Consider where you live and from where fish is imported.	2014 State of World Fisheries and Aquaculture (SOFIA, http://www.fao.org/fishery/sofia/en)
	Removing important nutrient source of those who depend on it.	Health impact?	
	Possibly reduced omega-3 intakes	Identify plant sources of omega-3.	
Biodiversity	Loss of biodiversity	Learn about plant and animal biodiversity, seasonality of food.	Food and Agriculture Organization, Sustainable Diets (http://www.fao.org/food/sustainable-diets-and-biodiversity/en/)
	Soil quality and nutrients	Visit a local farm. Volunteer at a farm.	Slow Food Biodiversity (http://www.slowfoodfoundation.com/en/258/biodiversity#.VAU3Ll48uzA)
	Pollinators and insects	Learn about gardening, farming, and permaculture from your University Extension Services or online.	Farmer's Market Directory (www.localharvest.org)
	Crop and animal varieties	Grow something!	Eat the Seasons (http://www.eattheseasons.com)
	Loss of culture and knowledge	Cook and eat together.	Edible Communities (www.ediblecommunities.com)
	Micronutrient deficiencies	Improved health, decreased morbidity, mortality risk	Examples of Extension Services (http://www.ext.colostate.edu and http://extension.oregonstate.edu) Permaculture Principles (http://permacultureprinciples.com)
Waste	30% to 40% of food wasted	Only buy what you can and will eat.	Food and Agriculture Organization Food Waste Initiative 2014 (http://www.fao.org/save-food/savefood/en/)
	Loss of resources (e.g., water, energy)	Bike to grocery store.	Contact extension services (see above)
	Adds to GhG	Rethink, Reduce, Reuse, Recycle!	Environmental Protection Agency (http://www2.epa.gov/recycle)
	Adds to food insecurity and hunger	Learn about composting.	Find your local food rescue like this one! (http://www.coloradospringsfoodrescue.org) 2nd Harvest Food Bank (www.no-hunger.org)

GhG, greenhouse gas; GMO, genetically modified organism; CVD, cardiovascular disease.

*See reference (39) for more information on sustainable food production.

TABLE 3: Pathways to a Sustainable Diet for Health Professionals

- 1 Download a seasonal calendar, the Dirty Dozen list, and GMO-free shopping guides*
- 2 Find *Grow or Eat Local* labels in your grocery stores.
- 3 Identify a local farmer's market* or neighborhood coop.
- 4 Identify a Community-Supported Agriculture (CSA) Farm in your area.*
- 5 Source sustainably raised meat, dairy, and eggs and incorporate meatless days, learning to create balanced vegetarian meals.
- 6 Make meat the side dish and add more fruit, veggies, grains, and legumes.
- 7 Download a suitable seafood guide/app to make sustainable fish choices.*
- 8 At your work place, integrate sustainable food options (*e.g.*, seasonal and local fruit, local yogurt, sandwiches with local goat cheese, and hard-boiled eggs) and source local or organic snack foods such as granola bars, granolas, dried fruit; make smoothies with locally sourced ingredients.
- 9 If you live where water is scarce, grow food where you water.
- 10 Start a compost bin and recycle/reuse what you can.*

*Use Table 2 for resources and suggested readings to build your knowledge. GMO, genetically modified organism. See reference (22) for further guidelines.

consumption in Sub-Saharan Africa has not changed in the last three decades (19) most likely caused by increased exports to meet the demand of the developed world. Fish has become the food of the rich, whereas various organizational and national nutrition guidelines continue to push for multiple servings of fish per week, despite the issue of dwindling supply. There is no better example to illustrate the disconnect between health and sustainability than with the case of fish.

How much fish is really needed for health and does a sustainable option exist in the absence of reducing overall intake? Research shows that 250 mg of omega-3 fatty acids is needed to favor cardiovascular health (34). This amount of fish oil is found in one serving of oily fish. Thus, eating more than one serving of fish per week may not be needed. With the current state of marine ecosystems, consumers are asked not to eat more fish (26). In addition, using guides for sustainable fish is valuable and replacing fish with alternative sources of essential fatty acids also may offer some benefit. Recent data point to wild plants, berries, seeds, and nuts (1).

For solutions to eating less fish and resources, see Tables 2 and 3.

Hotspot 3: Biodiversity

Of edible plant varieties, 75% have been lost irreversibly in the last century (14). Today, 60% of our energy (kcal) is supplied by the world's main crops: wheat, rice, and corn. It is estimated that, of the 10,000 plant species once supplying the nutrients of our diets, 75% of what we eat today is generated from 12 plants and 5 animal species. *Loss of biodiversity* means loss of diet quality, which increases the risk of micronutrient deficiencies, as limited plant varieties no longer provide the nutritional profile (27,46). The industrialized food system has altered nutritional diversity while it added unwanted chemicals (3). Thus, to understand food's contribution to dietary variety, how, when, and where it was grown need to be considered. Relying

on a few crops to meet the nutrient needs of people is short sighted because dietary variety has long been recognized to boost human health (17).

Biodiversity provides the building blocks of a working ecosystem and contributes to local livelihoods. One of the best examples of a fragile food system is the example of the Irish Potato Famine in 1845 that led to starvation and deaths because only one variety of potatoes was planted. This potato was affected by a fungus and resulted in crop loss for years. Loss of biodiversity may mean reduced pest resistance, food insecurity, and hunger, as well as loss of cultural diversity. Ultimately, human health depends on biodiversity and should be viewed as its foundation and, thus, conservation, while a global priority (17), should link to the local community (*e.g.*, reawakening the biodiversity of a regional and local food system).

There are many factors responsible for biodiversity loss. One of the biggest threats is the conversion of natural habitats, rich in animal and plant life, to uniform monocultures. Monocultures (*e.g.*, wheat, corn, soy, rice) are typical in today's industrialized agriculture and especially found in intensive



Pictured here from left to right: Heather Richardson, Brittany Bove, Mitch Whitmore, Sugar Todd, and Daisy the Farmer of Copper Moose Farm, Park City.

"Honestly, local food simply tastes better."
Mitch Whitmore

"I really liked the community the farm share opened me to. I've met some really great people."
Sugar Todd

"It was so much fun learning new things all of the time and different ways to cook!"
Heather Richardson

"Prior to having the opportunity with Copper Moose, I had never stepped foot on a farm and it was such a great learning experience. Getting to see how the food I'm eating is planted, how it grows, and how it is harvested, right to my plate, was amazing. It opened my eyes to a whole new world that I greatly appreciate and because of that opportunity, it has changed the way I see food every single day."
Brittany Bove

TABLE 4: Case Studies Linking Health and Performance With Sustainability

Case Study	Description	Additional Information
Healthy Campus Initiative	<p>Transition of University of Colorado's (UCCS) food environment to a self-operated sustainable food system. Emphasis is on student employment, a menu in line with a sustainable diet (13), including plant-based menus and education to link health with sustainability. Besides servicing campus with fresh, seasonal, and locally grown and humanely raised food, the focus is on the link between a sustainable food system in Dining and Food Services, campus garden and greenhouse, and academic programs and the greater Colorado local food shift.</p> <p>To accomplish a transition in institutional food service, all stakeholders must be involved. Although the transition is slow, each step forward is meaningful. Barriers include cost, education of food service staff and "eaters," state and institutionalized procurement rules and regulation. Cost associated with sustainable food procurement should be integrated into retail and menu plan pricing. From consumer surveys at UCCS, students are willing to pay between 5% and 10% more for better food.</p>	<p>This program is in its second year. Please visit the following sites for updates on progress:</p> <p>https://www.facebook.com/uccsfood http://www.uccs.edu/~dining/services/</p> <p>Currently, we use one Healthy Campus Nutritionist (50%) and two Healthy Campus Graduate Students 10 hours per week.</p>
Flying Carrot Food Literacy Project	<p>Mission: The Flying Carrot is an innovative mobile project that fosters food awareness and empowers individuals to improve the well-being of themselves, the community, and the planet by providing creative hands-on experiences, building cooking skills, and improving access to local, seasonal, and sustainable food.</p> <p>The project focuses on food and sustainability literacy through taste education while accomplishing reduced food waste from local farmers, distributing CSA shares to residents. Sustainability and health constructs are integrated into environmental, social, and economic areas as introduced in "The duality of health and sustainability" (23) framework with taste education and conversation, beautiful recipes, educational cards, handouts, posters, and books.</p>	<p>Information available at https://www.facebook.com/pages/The-Flying-Carrot/349091708570998 http://vimeo.com/85737800</p> <p>The project is established at the Colorado Farm and Art Market (CFAM) and also is integrated into UCCS's Healthy Campus Initiative. http://www.farmandartmarket.com/vendors/</p> <p>The project is supported by the Pikes Peak Community Foundation (PPCF) and includes a small school bus, small gas and food budget, and one graduate assistantship with lots of volunteers. http://www.ppcf.org</p>
Reshaping America's Health Professionals	<p>A week-long intensive course, for undergraduate and graduate students, and transdisciplinary departments, focuses on food, culture, community, and health and introduces the concept of sustainability. The course contains lectures, panel discussions, and field trips visiting various farms, gardens, community restaurants, and schools. After the course, students do service learning at various sites. Students travel through a personal journey during the course and begin to see the holistic connection among topics of sustainability and health.</p>	<p>Course listed here: http://catalog.uccs.edu/preview_course_nopop.php?catoid=8&coid=31286</p> <p>This course is required for sport nutrition graduate students. Students from outside of UCCS can take this course under extended studies. An online version also is underway.</p>
Sustainability in Sport Nutrition	<p>When health professionals teach about nutrition, sustainability concepts will add a new dimension, even in elite sport. We transformed how Olympic athletes receive education with hands-on experiences using workshops, visiting farms, and cooking and eating together. Athletes pick up weekly bags at a neighborhood store or local farm, thereby acquiring knowledge and skill in local food, enabling a new connection between sustainability, health, and performance.</p>	<p>See more here: http://www.sltrib.com/sltrib/entertainment2/56960388-223/athletes-csa-fresh-olympic.html.csp</p> <p>Norwegian initiative: http://athletesforfarming.com http://www.eatwellguide.org/i.php?pd=Home</p>

For more information on any of these case studies, contact Nanna Meyer (nmeyer2@uccs.edu).

farming systems. This production usually occurs with large areas of land use and heavy inputs. In the United States, less than 1% of agricultural land is cultivated using certified organic methods and, thus, the majority of U.S. farmland grows crops using conventional means (43). Intense farming systems use agrochemicals, which affect pollinators necessary to maintain an intact ecosystem and to supply food to people. The recent

declines in bee populations have affected pollination greatly (17), especially in pollinator-dependent crops, ultimately leading to a decline in yields (21). Conventional farming systems also are characterized by reduced soil quality (nutrient density) and biodiversity, greater erosion leading to increased N₂O emissions, and leaching of synthetic fertilizers into waterways, causing pollution and loss of further ecosystems

(40). Thus, biodiversity needs to become valued, conserved, restored, and carefully used so that ecosystem services can be provided more sustainably to both the planet and its people (17). For solutions to this problem and resources, see Tables 2 and 3.

Hotspot 4: Waste

Americans waste up to 40% of their food, equal to about 220 lbs of food per capita per year (35). This compares with a 30% food waste in Europe. In developing countries, food waste is much less and mostly pertains to preconsumer loss (e.g., lack of cold storage). In developed nations, food waste mainly occurs through postconsumer losses. Of these losses, 50% to 60% occur in households. Data show the greatest losses occur in fresh produce and fish, followed by grains, meat, and milk (15).

Reasons for food waste in developed countries include:

- food is cheap
- lack of value and connection
- bulk buying at reduced price
- lack of planning
- expiration dates

Considering the costly inputs for food production, it seems that there would be enough food for everyone if waste was reduced, distribution was improved, and access was increased, even in the presence of a growing population (30). Food waste, as it turns into garbage (not compost), represents the second highest waste source in U.S. landfills and accounts for 23% of U.S. CH₄ emissions (35). Minimizing food waste going to landfill is considered one of the lowest-hanging fruit to decrease GhG emissions. In addition, if this waste instead is redirected to feed the many millions of hungry and food-insecure people or it is recycled in compost and reused in agriculture, both planet and people will profit. While waste is of global scale, solutions often originate at the local level. Food rescue groups, waste recovery restaurants, and community composting programs are only a few examples that contribute to sustainable solutions, and many strategies start at home. For solutions to this problem and resources, see Tables 2 and 3.

Applications for the Health Professional

Health and an active life with good food are more than the absence of disease. Through a better socioecological understanding of health promotion and sustainability (23,31), health professionals are able to offer their clients and patients a refreshed look at their lifestyles in the context of daily choices, and here with focus on food. Bringing health and sustainability together enables both and constrains neither (31,33). To understand these two concepts, their relationships for fostering a healthy and sustainable future, is key (36). Most importantly, by addressing both, like integrating sustainable food options into a worksite wellness program or an elite sports team, reducing the amount of bottled

beverages at a gym, or considering fad diets using an ecological perspective, their cobenefits can be leveraged with the result of being healthier in a more sustainable world. In addition, enhancing such changes through education (e.g., newsletters, guides for sustainable shopping, recipes) with tastings brings the message home while social media supports its mobility and continuity, and these strategies deepen the meaning, which ultimately propagate beyond the gym. For becoming health professionals, including dietitians, curricula should be modified and include sustainability in the context of health. However, to accomplish this paradigm shift, creativity and a vision for the future, including innovative programs that teach people about food and the link to agriculture, are needed. It will require that practitioners reflect on their own values, political views, and an openness to change in response (24).

Table 3 shows simple steps toward sustainable dietary choices and Table 4 provides various case examples that illustrate the integration of these concepts in the practical setting of health and fitness professionals.

SUMMARY

The industrialized food system accounts for up to 30% of global GhG emissions and contributes to loss of land and biodiversity, an overexploited marine ecosystem, and high amounts of food waste. Whereas many production pathways must become more sustainable, “engaged eaters” also can make an impact on the four environmental hotspots — meat, fish, biodiversity, and waste — that have a significant effect on the three Es of sustainability, environment, economy, and equity.

Integrating sustainability into the health professions, while presenting challenges at first, promises opportunities for innovative educational approaches and community engagement. Besides making better choices for home and family, health professionals may address sustainability in various other areas, including their gym’s refueling bar, product purchasing, or special events. Providing students in the health professions experiential and service learning opportunities linked to a sustainable food system gives rise to new connections, including a revitalized curriculum that is integrative, ecological, ethical, creative, reflective, and beautiful (24).

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BRIDGING THE GAP

The industrialized food system accounts for up to 30% of global greenhouse gas emissions and impacts on soil and food quality, food safety, terrestrial and aquatic biodiversity and ecosystems, and human health. Paradoxically, 30% to 40% of food is wasted. Food insecurity, along with obesity and chronic disease, in the face of population growth and climate change, is creating great challenges to both agriculture and health sectors. Although these issues are global in scale and overwhelmingly challenging to solve, health professionals need to learn about concepts of sustainability, including related issues of our food system, and tackle health-promoting services by integrating such concepts on the local level. Although full of difficult questions to answer and barriers to overcome, addressing a sustainable diet in the context of good health awakens a socioecological understanding of eating and this gives rise to new opportunities.

Recommended Readings

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