

# Mediterranean diets: are they environmentally responsible?<sup>1,2</sup>

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**ABSTRACT** Dietary recommendations made to promote health seldom, if ever, take account of environmental implications of producing recommended foods. This paper considers several aspects of the traditional Mediterranean diet in relation to global sustainability. Plant-centered diets, such as those consumed around the Mediterranean Sea during the 1950s and 1960s, would be environmentally beneficial because they imply need for a much smaller population of domestic animals and, consequently, lowered demand on soil, water, and energy resources. Although fish consumption is high in some Mediterranean diets, fish should not be used to replace animal flesh because all of the world's major fisheries are currently overexploited. As for the appropriateness of Mediterranean fresh fruit and vegetables (which would need to be imported into non-Mediterranean regions), locally producible substitutes should be used wherever possible to reduce the environmental costs of transporting food great distances. Research is needed to examine the environmental consequences of certain exports such as olive oil. *Am J Clin Nutr* 1995;61(suppl):1383S-9S.

**KEY WORDS** Sustainable diets, Mediterranean diet, animal foods, seafood, local foods, olive oil

## INTRODUCTION

Although discussions of food and nutrition often give minimal attention to foods per se, the actual production of food—agriculture—is usually ignored entirely as if availability of substances fundamental to the nutritional well-being of populations could be taken for granted. This neglect reflects the broader fact that although nutrition has often been defined as the link between agriculture and health, nutritionists have consistently ignored the agriculture-nutrition link and, instead, have focused almost exclusively on the nutrition-health relation (1). What follows is an attempt to enlarge that focus by examining whether the Mediterranean diet is a globally sustainable diet.

## WHAT IS THE MEDITERRANEAN DIET?

What is meant by the term “Mediterranean diet?” The term is generally understood to refer not to a single dietary prescription, but to a variety of plant-centered food patterns that evolved over many hundreds of years around the Mediterranean Sea and that shared in common the use of certain foods: pastas, coarse breads, olive oil, beans, nuts and seeds, fish,

wine, and climatically tender fruit and vegetables available fresh throughout the year. Given such a definition, it is evident that a true Mediterranean diet can only be produced in a region with a Mediterranean climate, although modern transportation and food preservation methods would permit such a diet to be consumed anywhere in the world throughout the year, wherever populations are wealthy enough to afford fresh imported foods.

From a nutritional standpoint, however, the term Mediterranean diet could designate equally well a more general approach to dietary patterns that allows for substitution of nutritionally similar foods producible in regions without a Mediterranean climate. Dried fruit, winter squashes, root vegetables, and sprouts could be substituted in northern winters for fresh fruit and tender vegetables, and safflower, sunflower, or nut oils might replace olive oil. Livestock producers in the Midwest could conceivably breed their birds and animals to once again contain some  $\omega$ -3 fatty acids, which are present in wild game (2), so that fish consumption would be unnecessary. In this paper I use the term Mediterranean diet to refer to such a general pattern of eating, although I will later consider the environmental implications of the narrower definition.

## WHAT IS A SUSTAINABLE DIET?

The notion that nutritionists ought to attend to the relation between dietary choices and environmental sustainability was first introduced in the nutrition literature in an article by Gussow and Clancy (3) titled “Dietary Guidelines for Sustainability,” which appeared in the *Journal of Nutrition Education*. The authors suggested that food choices “might regularly be made not merely in terms of their nutritional impact on the individual but in terms of their impact on the long-term stability of the food system.” The term “sustainable diets” made clear the “scientific basis for considering the resource costs of dietary recommendations” because the term was akin to “sustainable agriculture,” which was even then coming into widespread use. The authors defined a sustainable agriculture as “one that uses human and natural resources to produce food and fiber in a manner that is conservative, that is, in a manner that is not

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wasteful of such finite resources as top soil, water, and fossil energy."

In subsequent years, the definition of "sustainable" has expanded to include considerations of economic viability and social justice (4). The Non-Governmental Organization Sustainable Agriculture Treaty, prepared for the 1992 Earth Summit in Rio de Janeiro, defined agriculture as sustainable "when it is ecologically sound, economically viable, socially just, culturally appropriate and based on a holistic scientific approach" (5).

Gussow and Clancy's goal was to encourage nutritionists to teach consumers how to choose diets that might be healthier for the environment as well as for themselves (3). Consequently, they did not directly compare the sustainability of various diets but instead explained how nutrition educators might include environmental concerns in lessons built around the *Dietary Guidelines for Americans* (6). The admonition to eat a variety of foods, for example, was used to emphasize the need to maintain biological diversity, and the recommendation to avoid too much fat and cholesterol was used to emphasize the energy wastefulness of much animal food production. Because the US dietary guidelines emphasize reducing consumption of high-fat animal products and choosing a variety of whole grains, fruit, and vegetables, they are generally consistent with Mediterranean dietary patterns.

In the most general sense, then, the Mediterranean diet, like any diet that satisfies the dietary guidelines, is likely to be more sustainable than the average American diet, for all the reasons Gussow and Clancy present. But in asking whether the Mediterranean diet is sustainable we presumably mean something more, something on the order of: If this diet were widely adopted, would its effects on the planet be beneficial? And this question leads initially to an impasse, because there has not been sufficient interest in either the nutrition or agriculture community to stimulate serious research designed to provide an answer.

## WHICH DIETS ARE SUSTAINABLE?

Discussions of the meaning of agricultural sustainability, together with investigations of how particular crops can be produced sustainably under various climate and soil regimes, are now going on around the country. (*The Journal of Alternative Agriculture*, where much of this work is reported, is now in its ninth year of publication.) Recently, the University of California's Sustainable Agriculture Research and Education Program published innovative research that examined two new dairy technologies for their effect not merely on production, but also on the environment and on farmers' income and quality of life (7).

Little attention, however, has been given to questions that probe beyond agricultural sustainability to ask what sorts of food systems would be sustainable and what sorts of diets would be environmentally rational in various bioregions. As long ago as 1977, Lappé and Collins (8) published a volume asserting that at that time almost every country had the capacity to feed itself without overburdening the planet. In the same year, a British science journalist, arguing that famine was caused by overproduction of the wrong foods, examined the nutritional value of the "rational" diet that could be produced

by a self-reliant nation (9). Calling attention to "great cuisines" that evolved to "exploit the products of modest agriculture to advantage," the same author subsequently published a lesson cum cookbook to illustrate his point (10).

Since the energy crisis of the 1970s it has generally been assumed that local diets would be the most energy efficient, for the reason that the energy expended in transporting foods required to be kept cold from field to table is often considerably more than the energy provided by the foods. For example, the Pimentels (11) estimated that  $\approx 7540$  kJ ( $\approx 1800$  kcal) are expended in the truck transport of a 210-kJ (50-kcal) head of lettuce from California to New York, a ratio of 36:1. Several studies have considered various aspects of the feasibility of dependence on more local diets (12–17). There are, of course, major difficulties in the way of assessing the environmental costs of specific diets, not the least of which is the fact that the necessary inputs to and sustainability of different agricultural practices will vary depending on local soil type, water availability, climatic conditions, and many other variables. Sustainability is dependent on local characteristics (18).

There is, however, a scale on which it is possible to consider the sustainability of different diets—namely in relation to the differential effect these have on the total carrying capacity of the earth. The term "carrying capacity" refers in biology to "the number of plants, animals or people that an area's resources can support indefinitely, that is, without impoverishing the environment" (19). Where do humans now stand in relation to the earth's carrying capacity? The researcher who has been most attentive to this question in recent decades is Lester Brown, whose Worldwatch Institute has since 1984 issued yearly updates on humanity's impact on the planet (20). Some of Brown's predictions of impending doom have been judged, like those of Malthus, to be premature (21), but as the environmental crisis has grown more severe, the warnings have gained both urgency and credibility. "In country after country," he wrote in 1993, "demands for crops and for the products of grasslands, forests and fisheries are exceeding the sustainable yield of these systems... Every country is practicing the environmental equivalent of deficit financing" (22). In the most recent *State of the World* volume, Brown's warning is unmodulated:

As the nineties unfold, the world is facing a day of reckoning. Many knew that this time would eventually come, that at some point the cumulative effects of environmental degradation and the limits of the earth's natural systems would start to restrict economic expansion. But no one knew exactly when or how these effects would show up. Now we can see that they are slowing growth in food production—the most basic of economic activities and the one on which all others depend. (23, p 177)

In another chapter of the same volume, Postel (24) writes flatly that humans have "surpassed the planet's carrying capacity." This conclusion should not come as a surprise, because a carefully crafted analysis of US carrying capacity in the mid-1980s warned that even in this well-endowed country, a dwindling energy supply "means that industrial agriculture cannot continue indefinitely to support the current U.S. population... with our current diets and at our current standard of living" (19).

But the news from Worldwatch is worse: after decades of "unprecedented expansion in both land-based and oceanic food

supplies." per capita food production is actually declining globally rather than continuing to increase (24). "If current trends in resource use continue," Postel (24) writes, "and if world population grows as projected, by 2010 per capita availability of range land will drop by 22% and the fish catch by 10%," thus limiting two vital protein sources (23). Pimentel and his colleagues have published calculations showing that the planet could sustain a total population of 3 billion persons (compared with the current  $\geq 5.6$  billion). They estimate the sustainable US population, using fewer resources more efficiently to produce a relatively high standard of living, as 200 million, compared with the current 258 million (25).

That such grim predictions fall on largely disinterested or disbelieving ears is evident from the level of attention they receive. The Worldwatch Institute announcement that the world may have reached its biological limits was a 5-cm column, inside page story in the *New York Times* (26). But whether or not the warnings of Worldwatch and other more conservative commentators (27, 28) are accepted, there is little doubt that plans for future food consumption must take global sustainability into account. It is unnecessary to believe that humans have already outstripped the earth's ability to feed us to justify examining dietary choices in terms of their relative effects on the planet. The understanding that there is a limit to the earth's carrying capacity means that different dietary patterns can be assessed for their relative efficiency in utilizing land, water, and energy to produce enough total energy, protein, and micronutrients for the global population. It is in such a context that the Mediterranean diet must be considered.

Speaking in such relative terms then, the most ecologically beneficial aspect of the traditional Mediterranean diet is its emphasis on putting plant rather than animal foods at the center of the plate. The intake of red meat and poultry in Crete in the 1960s—one classic Mediterranean diet—was reported to have been 35 g/d, <13 kg/y (29), whereas the present intake of red meat and poultry in the United States is almost six times that much (30). Thus, the widespread adoption of the Mediterranean diet would result in a marked decline in the population of domestic animals in the United States and elsewhere.

Although representatives of the animal food industries dispute the extent of environmental damage produced by various intensive and extensive animal-raising systems, it is clear that the earth can no more sustain continually growing numbers of livestock than it can sustain continually growing numbers of humans (31). In a recent article considering the ecological rationality of vegetarianism, I concluded that the presence of both plants and animals in sustainable natural systems argues not for vegetarianism but for a much lower intake of animal products and a return to integrated systems of plant and animal production (32).

Intensive animal raising of the kind the United States originated is putting an unsustainable burden on world resources. **Table 1**, derived from the latest *State of the World* report, shows grain consumption per capita in 1990 for 15 countries (23). The disparities in this list reflect, at least in part, the effect of the meat-intensive diets of countries at the top of the list. Although 38% of the world's total grain production is fed to livestock, the proportion consumed by birds and animals in the developed world ranges from 48% in Japan to a high of 70% in the United States (33). The environmental costs of intensive grain production include the loss of  $\approx 2.27$  kg (5 lbs) "prime

**TABLE 1**Grain consumption per capita in selected countries, 1990<sup>a</sup>

Country	Grain consumption $\text{kg} \cdot \text{person}^{-1} \cdot \text{y}^{-1}$
Canada	974
United States	860
Soviet Union	843
Australia	503
France	465
Turkey	419
Mexico	309
Japan	297
China	292
Brazil	277
India	186
Bangladesh	176
Kenya	145
Tanzania	145
Haiti	100
World Average	323

<sup>a</sup> Modified from reference 23.

dirt" for every 454 g (1 lb) meat, poultry, eggs, and milk produced; immense amounts of water (1628 L/454 g pork); and energy (15 times more than fresh fruit and vegetables per kilogram product served). If the US diet were adopted around the world it would require "more grain than the world can grow and more energy, water and land than the world can supply" (34).

Nor will turning animals out to graze solve the problem. There are simply too many animals on the land. In the Global Assessment of Soil Degradation it was calculated that just since 1950 overgrazing has degraded  $\approx 680$  million hectares of the >3.4 billion hectares of pasture and rangeland around the globe, thus reducing the soil's productivity (23). If livestock are to live in balance with the environment again, Durning and Brough (33) conclude that "First World consumers will have to eat less meat, while Third World citizens will need to keep their meat consumption low." Keeping meat consumption from increasing in the Third World may be more difficult than lowering consumption in the First World because, as Rask (35) has shown, countries that move from very low to higher income levels show a five- to sevenfold increase in food demand, measured in cereal equivalents, "primarily through increased demand for livestock products."

There is less waste involved in dairying—Rask uses a grain conversion factor of 1.2 for milk compared with 11.7 for beef (35)—but once again, sustainability of production depends on whether dairy cattle are part of a system that uses resources rationally. Irrigated pasture and alfalfa, both largely for dairy herds, are two of the heaviest users of California's costly, but subsidized, irrigation water (36). So the sparing use of animal products in the Mediterranean diet is consistent with a much smaller global population of livestock. Thus, changing to the plant-centered Mediterranean diet should prove environmentally beneficial.

## SHOULD WE EAT MORE FISH?

Current dietary recommendations state that a more desirable dietary pattern can be achieved by substituting fish for at least

some of the animal flesh currently consumed in the United States (37). Because the Mediterranean is a sea, the traditional diets of this region do include seafood. The reported consumption of seafood in Crete has ranged from 24.3 g/d (170 g per capita per week) in 1948 (38) to  $\geq 35$  g/d in 1988 (39). In 1959, consumption was reported to be 18 g/d in Crete compared with 60 g/d in Corfu (29). Much higher consumption has been reported in Spain and Portugal, which also follow a traditional Mediterranean pattern. In the United States, per capita fish consumption has increased from 15 g/d (12 lbs/y) in 1909 to a record  $\geq 20$  g/d (16.2 lbs/y) in 1987; it has since declined to 18.4 g/d (14.8 lbs/y) in 1992 (40).

Would it be ecologically wise to encourage North Americans to increase their consumption of fish even as they decrease their consumption of land animals? It is impossible to compare the production "efficiency" of ocean fish with that of livestock, simply because the inputs for fish are in the hands of nature and hence unmeasurable. It is possible, however, to examine the present productivity of the world's seas to judge whether they can support a higher level of seafood consumption by the developed world. Such examination reveals that the seafood situation may be the most vivid illustration available of ecological constraints on dietary recommendations.

At the very time nutritionists have been urging increased seafood consumption for the public, the ability of the world's oceans to produce food is generally agreed to have reached (and perhaps even exceeded) its maximum. In a study in 1971 sponsored by the Food and Agriculture Organization (FAO) it was estimated that the marine environment could "sustainably yield about 100 million tons of fish per year" (41), a level essentially reached in 1989, after which the yield declined (42). FAO reported that "most traditional marine fish stocks have reached full exploitation; that is, an intensified fishing effort is unlikely to produce an increase in catch, and the use of any new fishing methods that did increase the catch would cause over fishing and therefore a further decline in fish populations" (42, p 179). Indeed, the most recent data show that all of the 17 major ocean fishing areas have now reached or exceeded their maximum productivity (41).

As the fish catch has declined, so has its quality. As fish stocks collapse, "fishers have managed to keep the marine fish catch climbing . . . by abandoning fished-out stocks and pursuing new species," often lower-value fish considered less desirable to eat. Concern about the total collapse of fish stocks has become serious enough that confrontations are occurring between countries battling over the same fisheries, and several countries have voluntarily suspended fishing or have planned to reduce the size of their fishing fleets (41, 43).

But it is not fishers alone who have contributed to the declining productivity of the oceans. The pollution of rivers that discharge into the oceans and the concentration of population and development along the world's coastlines have resulted in contamination or total loss of coastal wetlands, where 90% of the world's marine fish catch reproduces. The World Bank estimated that 95% of Italy's historic wetlands had already been lost by 1972, a loss that raises serious questions about the sustainability of the Mediterranean diet where it originated (42). The construction of dams also has decreased or destroyed fisheries at the mouths of dammed rivers. Other threats to oceanic productivity come from the atmosphere. In the Antarctic Ocean, where a 50% thinning of the stratospheric

ozone layer has increased ultraviolet radiation, "University of California researchers found that the increased levels of ultraviolet light caused a minimum 6- to 12% reduction in phytoplankton productivity in areas under the hole," a reduction that could "threaten the foundation of the marine food web" (41).

Reaching the limit of ocean productivity as world populations have continued to grow means that per capita fish availability has actually declined slightly from 18 to 17.8 kg/y even as prices have escalated (44). Equally distributed, the present fish catch would give the present world population  $\approx 49$  g fish/d, more than 2.5 times the current US intake. But because the global population will continue to grow, and the total fish catch is unlikely to increase, a decline in the amount of seafood available per capita seems inevitable, as does a continuing price increase.

Although fish farming is often suggested as a replacement for fish capture, in many places it is actually contributing to the decline of ocean fishing. Twenty percent of the world's shrimp is produced by Asian and South American shrimp farmers who, in clearing extensive tracts of mangroves for holding ponds, according to Weber (41), "destroy the natural nurseries for wild shrimp and thereby reduce stocks for offshore shrimp fishers." Moreover, in a practice Weber describes as "decimating," fishers in some countries sweep the oceans clean with trawl nets, and then grind the catch into a mash for farm-raised fish. Aquaculture is inevitably unsustainable if the animals in question are living in cages and grown on imported food instead of living in self-maintaining food chains (45). Although many traditional self-maintaining systems exist around the world for production of shellfish, creating sustainable systems for large-scale production rather than capture of most seafood will require the application to ocean aquaculture of the kind of careful ecological design that has grown out of research pioneered by the New Alchemy Institute (46).

Should available seafood be used to improve the diets of the rich? We already eat three times as much fish as do people in developing countries; although seafood is the primary source of protein for many developing populations, it contributes  $< 7\%$  of the animal protein in the North American diet (41). Even if per capita availability did not decline, the demand by the rich for increasing amounts of imported seafood would seriously compromise the well-being of other humans more dependent on the oceans for even minimally adequate nutrition. Therefore, substituting fish for meat to make the typical flesh-centered diet more Mediterranean is clearly less ethically and environmentally desirable than directly confronting the need to adopt a plant-centered eating pattern in which flesh of all kinds plays a minor role.

One other notable feature of Mediterranean diets is worthy of consideration because it raises important questions about environmentally responsible eating: the relatively high use of olive oil. As suggested earlier, a broader definition of a Mediterranean diet might substitute safflower, sunflower, nut, or other plant oils for olive oil derived from trees that grow only in mild climates. To judge whether such a substitution is worth undertaking from an environmental perspective, one needs to ask about the overall environmental consequences of the present global trade in foods.

## IS FOOD TRADE BENEFICIAL?

Current interest in the Mediterranean diet has been accompanied by concern among nutritionists that these healthy traditional diets are being displaced by diets that accompany "progress" in the countries where they originated. The negative nutritional effects of progress are not new. In the 19th century—and in some cases much earlier—the exploding populations of Europe spread across the globe in search of space and riches. Commandeering much of the best cropland of countries whose people were poor and less "developed," the conquerors arranged to have the land planted in crops such as sugar or trees (coffee, cocoa, coconut, cashew, and so on), whose products Europeans wanted (47). As geographer Georg Borgstrom pointed out, one-fourth of Europe's population went overseas between 1850 and 1950 and, in the process, acquired double the amount of cropland they had available at home.

In this manner, Europeans managed to eliminate hunger among their own burgeoning populations in the 19th and 20th centuries, with effects on the nutrition of the conquered that were seldom beneficial. As Borgstrom (47) wrote, "Western man commissioned the entire globe for his well-being with little concern until the 1950s for the legitimate needs of the other three-fourths of the world's people." What he called "the great land grab" also had serious ecological consequences: "For one crucial century in the sequence of history, technology and economics created the unique opportunity to unfold their tricks without taking biology seriously into account" (47). Thus, international trade in food tended to discourage self-reliance, and to increase dependence on imported foods, thereby creating a distorted, veiled, and confused picture of regional carrying capacity, and displacing dependence onto overseas soils.

Although many poor nations have recently experienced the sorts of population explosions that scattered Europeans across the globe between the mid-19th and mid-20th centuries, the richer nations to which these new wanderers are trying to emigrate now resist their coming and there are no "new" continents for them to settle. Moreover, the lands on which these refugees once grew their own food are increasingly utilized by multinational corporations to produce tropical products, out-of-season produce, or other luxury foods to be sent to those of us who already have enough to eat (48–53). Those in developing countries who produce food for local consumption are thus increasingly pushed onto less productive or more fragile lands with negative consequences for their crops, their nutritional status, and the environment (54–60).

Meanwhile, rapid long-distance transport, canning, and refrigeration currently make available to the affluent a seasonless, regionless diet. In the United States, the average food travels 2000 km before it is consumed; as noted earlier, more petrochemical energy is used in production, processing, and transport than is captured by photosynthesis in the growing of the raw materials (61). Clearly, such a system is not sustainable. Indeed, the United Nations Development Programme (UNDP) recently suggested that it might be to the advantage of developing countries to avoid this high-energy agriculture, given the "... excesses and ecological damage of the conventional high-external-input agriculture all around the globe. ... [Indeed]. UNDP has decided to promote a new kind of agricultural development in the future which will focus on people:

their education and technical training, employment and income, improved health, and promising future in a life-supporting sustainable environment" (62). In short, UNDP wishes to promote sustainable food systems.

The fact that the current price of oil is low obscures the irrationality of turning what should be an energy-capturing system (agriculture) into an energy-consuming one (63). If all the costs of ensuring cheap fuels were factored in, we would have to count military adventures such as the Gulf War as part of the true cost of dependence on energy-intensive imported food. Cheap fuel especially distorts the price of foods such as fresh fruit and vegetables that require extra energy to be kept cool during transport. So this exploration of food trade leads to the general conclusion that a Mediterranean-type diet that makes use of seasonal local produce has a clear environmental advantage over a dietary pattern that uses imported out-of-season Mediterranean fruit and vegetables.

Some food trade is not only energy intensive, but inefficient. The economist Daly (64) pointed out that "more than one-half of all international trade involves the simultaneous import and export of essentially the same goods." For example, "Americans import Danish sugar cookies, and Danes import American sugar cookies. Exchanging recipes would surely be more efficient" (64). Yet the "recipe" for olive oil is not so easily exchanged. When examining diets from an environmental perspective, it is important to ask whether such products need to be sent around the world.

Because we lack specific information about oils and sustainability, it is useful to consider Jeavons' (65) conclusions about the land costs of producing oil. Making use of intensive growing methods pioneered at the Santa Cruz campus of the University of California, Jeavons began by investigating the maximum possible yield per acre that could be obtained for various crops, and then attempted to determine the least possible area on which a minimally adequate diet could be produced. The various publications from his organization Ecology Action reflect his more recent concerns. Some recent titles are: *Learning to Grow All Your Own Food: A One-Bed Model for Compost, Diet and Income Crops* (66), *One Basic Kenyan Diet* (67), and *One Basic Mexican Diet* (68). In developing their models, Jeavons' group calculates the amount of land that is needed to grow compost crops to maintain the soil's fertility without robbing resources from elsewhere to keep the cropland productive. Although they have calculated that a nutritionally adequate diet made up largely of root crops can be produced on 305 m<sup>2</sup> of land (69), maintaining the fertility of that land turns out to require another 305 m<sup>2</sup>.

Although diets produced by such methods might seem absurdly restricted, they have allowed Jeavons and his colleagues to clarify the production implications of dietary changes. Using the metaphor of a circle containing 305 m<sup>2</sup>, Jeavons calculated that growing 2 level tablespoons sunflower oil (30 mL) to add to foods grown in that circle would double the amount of land needed to produce the diet and to keep the soil fertile (personal communication, 1994). Comparable figures for olive oil are not available. But Jeavons' work makes it evident that the total environmental effects of importing olive oil depend to some extent on the relative efficiency with which oils are produced by olive trees, nut trees, and by such nonarboreal sources as peanuts, sunflowers, and corn.

## CONCLUSION

Although research permitting a detailed comparison of the ecological consequences of one diet over another has yet to be published, existing research suggests that the plant-centeredness of the Mediterranean Diet gives it a decided advantage over the present American diet with its much higher proportion of animal products. To be most ecologically responsible in non-Mediterranean climates, however, the traditional Mediterranean pattern would require several modifications. First, fruit and vegetables should be consumed fresh when available in the region where they are grown. Thus, in northern climates, warm-season varieties would be consumed in their dried, canned, or otherwise preserved forms in winter, along with squashes, stored root crops, and stored fruit of that season. Second, given the many sources of fat in the American diet, it is highly unlikely that US fat consumption will decrease to a point that would justify an increase from any source, regardless of the assumed health benefit. Finally, oil, from whatever source, is an ecologically "expensive" commodity. A good deal more information will be needed to determine whether there are environmentally cheaper substitutes that would be as esthetically acceptable as olive oil. ☞

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