Optimum food consumption can save natural resources

Habte TY and Krawinkel M

International Nutrition, Institute of Human Nutrition, Justus-Liebig University Giessen, Germany

Corresponding author: Habte TY, PhD, International Nutrition, Wilhelmstrasse 20, 35392, Giessen, Germany, E-Mail: Tsige-Yohannes.Habte@ernaehrung.uni-giessen.de

Introduction

Adequate nutrition ensures the consumption of diverse food groups that supply all essential nutrients at the level that meets the requirements for growth, body maintenance, physical activities and health of all age and gender classes of people. Optimum nutrition, on the other hand, satisfies the daily nutrient requirement and controls excess and unhealthy food consumption. The lack of optimum nutrition leads to either nutrients deficiency or overweight and obesity with subsequent health and environmental problems. Excessive food consumption is preconditioned by unnecessary expansion and intensification of agriculture that leads to the imbalance of ecosystem services. This, in turn, negatively influences biodiversity, nutrient cycle, greenhouse gas emission, and fresh water and soil quality. Likewise, food inadequacy and nutrient deficiency hamper human physical and mental development and reduces sustainable productivity. It is, therefore, intended to show by implication how optimum nutrition could save natural resources.

Methods

The extent to which the environment is implicated by the development of excess weight can be elucidated on the bases of the concept of food energy partition, the conversion efficiency of excess food energy (GE) to fat, and that of GE to mass of food and land productivity in terms of kg(t)/ha (4).

Excess body weight of each gender and age class is specifically calculated as the difference between overweight or obese weight and reference or normal weight i.e (over/obese weight BMI x h^2 - normal BMI x h^2). The energy value of excess bodyweight is estimated based on the amount of fat deposited and its energy value. Total food energy (Gross energy) expended for excess weight is the product of the energy value of excess body weight by the inverse conversion efficiency of food energy to the energy deposited. Dividing the grand sum of food energy expended for excess weight and the energy used for its maintenance by the average energy density of cereal equivalent (2552kcal/kg), gives the amount of food (cereal equivalent) expended for the synthesis and maintenance of excess weight.

Land area that produce enough food for excess weight is derived from the relationships between the amount of food expended for excess weight and the average level of food production (cereal equivalent) per hectare.

The effects of under nutrition and nutrient deficiency on natural resources could only be exemplified by the influence on labor resources and the extra cost they inflict on the economy of some countries.

Results and discussion

Table 1, shows the total food energy cost for global overweight and obesity or in general for excess weight in 2015. Based on this, the global food expended for the development of global overweight and obese weight is calculated as 261.684 million tons.

Table 1. The global food energy (E) cost for overweight and obesity

Gender	Body status	Age	Excess wt. (EW)	Food energy (E) cost/given EW	Population in millions	Total E cost in million Mcal
Male	Overweight	<5 years	2,84	61,28	42,91	2629,47
		5 - <10years	3,88	83,72	41,45	3470,55
		10 - <15years	7,99	172,41	40,38	6962,19
		15 - ≤18years	9,95	214,70	31,89	6846,17
		>18years	8,8	189,89	660,73	125462,88
	Obese	<5 years	4,2	90,63	16,50	1495,64
		5 - <10years	8,71	187,94	15,94	2996,46
		10 - <15years	19,82	427,68	15,53	6642,43
		15 - ≤18years	24,87	536,64	12,26	6581,55
		>18years	24,47	528,01	244,71	129211,81
Female	Overweight	<5 years	2,87	61,93	43,38	2686,29
		5 - <10years	3,77	81,35	41,71	3392,83
		10 - <15years	8,13	175,43	40,53	7109,44
		15 - ≤18years	10,28	221,82	32,09	7118,04
		>18years	13,2	284,83	643,47	183278,16
	Obese	<5 years	4,64	100,12	21,69	2171,48
		5 - <10years	12,86	277,49	20,85	5786,67
		10 - <15years	24,71	533,19	20,26	10804,18
		15 - ≤18years	15,79	340,72	16,04	5466,56
		>18years	20,07	433,07	321,73	139333,02
Grand total					2324,06	659445,82

Habte TY and Krawinkel M (2015)

The global food energy cost for the maintenance of excess weight is estimated at 239.8 Million Gcal/year. This accounts for 95.07 million tons of food per year. Land area equivalent to 100.26 million hectares is used to produce enough food to meet the cost of global excess body weight whereas additional 36.43 million hectares/year is required to meet the requirement for maintenance. In total an average of 137 million hectare land has to be cultivated to cover the global cost of excess weight (4). The given land area, which is about 8 times the size of agricultural area in Germany, accounts for about 2.8% of global agricultural area (4 922 206 000 ha) (2).

The expansion of agricultural land in order to meet the excess food demand is followed by daunting clearance of natural vegetation and the destruction of ecosystems. Life on earth depends on the ecosystem services, which are responsible for basic functions (energy synthesis and cycle), production (food, fiber, biofuel ...) and regulatory services (air, climate, water, soil, pollination and pest control). Despite its crucial role in providing food, agriculture remains the largest driver of genetic erosion, species loss and conversion of natural habitats. Globally, over 4000 plant and animal species are threatened by agricultural intensification and expansion, and the number is still rising (3). It is estimated that the expansion of agriculture to meet global excess weight could contribute to the loss of about 152 species.

The conversion of natural habitats to cropland typically entails the replacement of systems rich in biodiversity to homogenous agricultural system. Since the 1900s, some 75 percent of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties. Today, 75 percent of the world's food is generated from only 12 plants and five animal species (1).

In conditions where species loss within intermediate projection fall between 21 and 40%, plant growth can reduce by 5 – 10% because of increasing exposure to ultra violate radiation and climate warming. Where species extinction reach 41 – 60%, ozone pollution, acid deposition on vegetation and nutrient pollution can seriously influence food availability (8)

The expansion of agriculture increases nitrogen and phosphorus fertilization. The resultant effect on the environment include increase of atmospheric pollutants (e.g. CH_4, NO_X, N_2O, tropospheric ozone), and CO_2 leading to climate change, soil and water acidification, shifts in species composition, loss of biodiversity and eutrophication in the coastal marine ecosystem (9). Nitrous oxide is the most potent greenhouse gas in trapping heat and contributing to global warming. It is also involved in the destruction of stratospheric ozone, the layer that protects the planet earth from harmful ultraviolet rays. Since the beginning of the 20^{th} century an increase in the concentration of nitrate in the range of three to tenfold has been recorded in some water systems close to intensive agricultural enterprises

(9). Leaching nitrogen and phosphate fertilizers to estuaries and other coastal marine environment can cause eutrophication resulting in the blooms of nuisance algae, toxic organisms, and anaerobic condition that are lethal to fish (7).

Steady increase in agricultural production not only to feed the increasing number of world population but also to meet the excess demand of the more than 2 billion overweight and obese people has not only bean the function of high yielding varieties, fertilization and pest control but also that of continuous supply of fresh water through irrigation. Excessive and uncontrolled drawing of irrigation water has led to water wastage, the decline of underground water and the scarcity of clean and fresh water. In arid and semiarid areas, uncontrolled irrigation is degrading farm areas due to increased salinization and water logging (7).

Trees and underlying vegetation provide organic substrates, maintain soil structure for air circulation and soil water holding capacity, and control soil erosion. Expansion and intensification of agricultural practices distract the vegetation as well as soil life and the ecosystem services, leading to the decline in soil organic matter. In agricultural areas of temperate zone, the soil carbon declined by 50% in the last 25 years, the loss in the tropics is dramatically higher (6). Consequently, the soil fertility, water holding capacity and carbon dioxide sink or organic matter concentration in the soil are declining.

Optimum nutrition can save 137 000 000 ha land from the changes of land use by cultivation. In turn, this can limit the loss of biodiversity, soil biology, soil erosion, nutrient depletion and greenhouse gas emission. Water volume of about 355 km^3 that might water the excess land area can remain safe. An estimated amount of nitrogen fertilizer equivalent to approximately 20 Mt/season usable to fertilize the excess area of land can remain undistributed. This controls the use of fossil oil for N-fertilizer production, subsequent gas emission, and the loss of nitrogen compounds to the atmosphere and hydrosphere, limiting climate change and eutrophication.

It has not been easy to identify and quantify the effects of undernutrition and nutrients deficiency on natural resources. However, body growth, strength, energy utilization, cognitive ability, motivation, immune system and health are negatively influenced, affecting seriously the productive performance of human resource. Child malnutrition has been associated with poor health, poor education performance and low productivity in adulthood. These effects have costed Egypt, Ethiopia and Uganda 1.9, 16.5 and 5.6% of their GDP, which are equivalent to 3.7, 4.7 and 0.9 billion USD/year respectively (5).

Conclusion

In general, optimum food consumption, which is characterized by the regulation of excessive food consumption, and the promotion of satisfactory macro- and micronutrient intake from diverse foodstuffs, contributes to the maintenance of natural resources. It limits the expansion and intensification of agriculture land and regulates ecosystem services. At the same time, it advances the productivity of human resources.

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