Review: Harvesting the Biosphere: What We Have Taken from Nature
By Vaclav Smil

Reviewed by Enzo Ferrara
Istituto Nazionale di Ricerca Metrologica and Istituto di Ricerche Interdisciplinari sulla Sostenibilità,Torino, Italy

Smil, Vaclav. *Harvesting the biosphere. What we have taken from nature.* Cambridge, MA: MIT Press, 2012. 312pp. ISBN 9780262018562. US$29.00, cloth. 16 b&w illus.

Compared to the 4.6 billion years of Earth history, the human species has become the supreme organism on the planet in a brief time since its appearance. *Homo habilis* emerged 2.5 million years ago, *Homo sapiens* 200,000 years ago. This last group, shifted from hunting-and-gathering to settled existence only 10,000 years ago. Afterward, our genus' capacities for expansion grew steadily. With the birth of the first civilizations, human population began to exact ever-increasing demands on resources, until reaching the unsustainable consumption intensity of the present-day.

In *Harvesting the Biosphere,* Vaclav Smil tries a quantitative reconstruction of these long-term trends that, although uncertain in dimensions, capture the relentless exploitation made by humans of the biosphere: the Earth's skinny layer including the mass of any living organism.

Drawing on scientific literature, Smil provides a global perspective from prehistory of all possible uses of biomass, including energy, food, and raw materials. He offers an account of the previous and present features of the biosphere focusing on human-caused environmental change. The writing is informative. Photosynthesis by autotrophic organisms remains the fundamental energy conversion on Earth, also sustaining heterotrophic life (zoomass). Even if 75% of standing phytomass is in tropical forests, the most massive organisms on Earth are the giant sequoias of North America attaining 3,000 tons and 3,000 years lifespan. Compared to phytomass, heterotrophic mass is much more diversified; it is dominated by tissues of unicellular organisms and–as Darwin guessed–earthworms are among its most conspicuous contributors. On the contrary, the aggregate zoomass of highly reputed top predators, like wild felids and sharks, is only a small fraction of their respective ecosystems.

At the end of the nineteenth century, the amount of phytomass used annually by humans took off; Smil quantifies that mass as amounting worldwide to about 0.4 Giga tons (Gt) of dry matter. Then, denser planting, optimum nutrient supply and applications of pesticides boosted cereal yields, which by 1950 doubled, and by 1975 doubled again. At the beginning of the twenty-first century, yields were about 2.7 Gt, half of which was fed to animals producing meat, milk, and eggs.

To direct attention to the rates of biomass decline (or rise) at different times of human development, Smil expresses the level of harvests as a share of the biosphere's productivity using the concept of "human appropriation of the global net primary production," which, according to various estimates, actually spans from 10% to 55% of all terrestrial photosynthesis.
Focusing on technique, Smil observes that energy use in the earliest civilizations was limited to burning wood and crop residues; even in the Roman Empire, the average annual energy consumption accounted for 10 Giga Joule (GJ) per capita. By 1800, it reached 50 GJ in Great Britain. In 1900, the average U.S. energy supply surpassed 130 GJ and today the largest EU countries are at about 170 GJ, while the U.S. and Canadian supplies are twice that rate.

Most of the quantifications presented by the author derive from computations whose reliability depends on national and global transactions historically accounted for. Maybe there is no need of such accuracy in quantifying the harvest of the biosphere. Qualitative assessments already show how it has been suffering for human gains: the total stock as well as biodiversity and productivity of phytomass have all significantly declined. Smil hopes, however, that a better definition of the biosphere limits could be helpful in keeping the level of global harvest within acceptable limits. Otherwise–he concludes–unrealistic expectations still aimed at increasing the extent of present-

day consumption will only guarantee undesirable outcomes on a global scale, challenging the very foundations of civilization's well being.

Enzo Ferrara <e.ferrara@inrim.it>, Istituto Nazionale di Ricerca Metrologica and Istituto di Ricerche Interdisciplinari sulla Sostenibilità, Strada delle Cacce 91, 10135 – Torino, Italy.

Electronic Green Journal, Issue 36, Fall 2013, ISSN:1076-7975