

Tragedy of the Global Commons: Soil, Water, and Air

by Rattan Lal

The Prasna Upanishad, an ancient Sanskrit scripture, states “Kshiti, jal, pawak, gagan, smeera; panch tatva yah adham sharira,” or the human body is comprised of soil, water, heat, ether, and air. The importance of the quality of soil, water, and air for the welfare of the biosphere in general and of humans in particular has been recognized for millennia. Yet, these three vital components of the environment have been taken for granted; misused, abused, and exploited for short-term material gains; and often ignored and left to fend for themselves. The degradation and abuse of these common resources raises several questions:

- Why are these basic truisms (e.g., Prasna Upanishad), so fundamental and vital to human welfare and recognized for millennia by most ancient cultures and civilizations, forgotten and ignored?
- Why was the desertification (dust bowl)-related poverty and economic collapse in the U.S. serious in the 1930s but not so since the World War II and during the later half of the 20th century?
- Why were poverty and environmental degradation serious issues in Iceland until the 1950s but followed by an era of prosperity and land stewardship?
- Why are agriculture and the economy thriving in Israel despite the harsh arid environments normally prone to desertification and the poverty trap?
- Why did the Aral Sea and Lake Chad suffer a catastrophic demise since 1960s?
- Why did the once highly productive and profitable agriculture of Rhodesia/Zimbabwe collapse since the 1980s?

- Why has it been difficult to break the vicious cycle of soil degradation–poverty–more degradation in sub-Saharan Africa?
- Why has nutrient mining at 20 to 40 kg⁻¹ ha⁻¹ yr⁻¹ of NPK been perpetuated at the continental scale since the 1950s in sub-Saharan Africa with the attendant decline in soil productivity and increase in hunger and malnutrition?

Perhaps the answer to these and similar questions for other ecoregions lies in: (a) governance, political will, and visionary leadership; (b) public awareness about land stewardship and land ethics; (c) use of modern technology; and (d) attitude towards management of the global commons. Garret Hardin, in his 1968 essay, *The Tragedy of the Commons*, reinforced what the Greek philosopher Aristotle (384–322 BC) wrote “What is common to the greatest number gets the least amount of care. Men pay most attention to what is their own: they care less of what is common.”

Addressing Problems Associated with the ‘Tragedy’

The tragedy of the environmental commons has exacerbated the problems of: (a) contamination of the oceans and rivers, (b) pollution of the atmosphere, (c) mining of soil carbon for plant nutrients (NPK, etc.) leading to emission of CO₂, (d) over-exploitation and poisoning of the groundwater, and (e) deforestation of the world’s pristine forests including those in North America and Europe.

The good news is that we now recognize that mismanaging the commons causes serious problems—deforestation causes flooding and landslides, fossil fuel combustion causes global warming, acid rain kills trees, and mining soil fertility causes hunger, malnutrition, and social/politi-

cal instability. The bad news is that we do not yet recognize the need for using our collective wisdom and cutting-edge science to address the problems of the global commons. It is logical that we invest in common resources (e.g., soil, water, and air) to restore and improve them and to enhance their ecosystem services for present and the future generations. Institutional arrangements, nationally and internationally, are needed to identify policies based on mutual coercion. Institutional interventions can address the problem of soil degradation, global warming, hypoxia of coastal ecosystems, decline in biodiversity, and extinction of endangered species including some soils (e.g., peat).



Assessing the Value of Ecosystem Services

As a famous Latin proverb goes, “Ex nihilo nihil fit”—from nothing comes nothing. Indeed, there is a price attached to every solution. Any strategy to address these commons reflects the value that our carbon civilization places on the benefits yielded by a given technological advance and the harm that we associate with the hazards foreseen. Such benefits and hazards must be objectively assessed, not just in monetary value but, more importantly, in terms of their ecological footprints. We must pay for all ecosystem services provided by world soils (e.g., water harvesting, water purification, biodiversity, mitigation of climate change, denaturing of pollutants, and disposal of waste—nuclear, urban, and industrial). The abuser/polluter must be required to pay even more.

“What is common to the greatest number gets the least amount of care.”

—Aristotle

It is about time that we move away from the empty rhetoric and develop global action plan(s). We must develop and respect the “Land Ethic.” As Aldo Leopold stated, “There is as yet no ethic dealing with man’s relationships to land and the animals and plants which grow upon it. Land, like Odysseus’ slave girls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations.”

Using Modern Technology to Solve Modern Problems

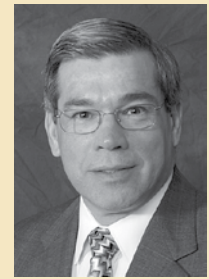
The importance of using modern and innovative technologies cannot be overemphasized. In the context of improving agriculture in sub-Saharan Africa, it is important to refer to the Law of Marginality. It states that *marginal soils cultivated with marginal inputs produce marginal yields, support marginal living, and create a marginal environment prone to physical, social, and economic instability.* With the world population expected to increase from 6.6 billion in 2007 to 8 billion by 2020, there is no choice but to use cutting-edge science including nanotechnology, biotechnology, information technology, and knowledge management to address issues of soil quality restoration, water purification, soil fertility enhancement, and climate change. It is about time that we make an objective assessment of the overreliance on traditional knowledge, which was decisively beneficial when the population was small and the societal expectations were low. At present, we have to build upon the traditional knowledge and must use the modern technology to address the modern issues of the 21st century. As Francis Bacon once stated, “He who will not apply modern remedies must expect new evils.”

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ASA President’s Message

Agronomists and Global Change

by Jerry Hatfield



Over the past few months, we have had a series of articles in *CSA News* about global change and its potential impact. There is a need for agronomists to become involved in this issue from more than a policy debate but to provide information to producers to help them cope with the types of change that will be occurring. This last week, I had the pleasure of meeting with 20 producers in northwest Iowa about their concerns in crop production, environmental quality, and weather variation. One of the first comments they made was how can research help them cope with all of the variation they are experiencing within and among years. This question is often asked by producers and consultants—they want to know how they can understand the changes that are occurring and what signals they should be observing to guide their decisions. What they really want to know is how they can manage their farming systems to decrease the risk due to weather and how agronomists can help them discover optimum management strategies.

There are no simple answers to any of these questions; however, I believe there are some underlying factors that we need to be aware of as we begin to address these issues. First, the climate models show that precipitation will become more variable. Since most of our agricultural systems depend on precipitation, either directly or indirectly, this variation is going to create some real challenges in being able to offer an exact solution at a specific location. However, water management in agriculture will become one of the critical building blocks, and water conservation will be key to helping cope with this variation. We are in a warming trend right now, and extremely warm temperatures will be detrimental to grain production because of the problems on pollination and grain set in many of our crops. The temperature variation in the early spring may impact growth and flowering of spring crops because of the potential for cold periods after relatively warm periods. Since our crops grow and develop as a result of the interactions of a number of environmental variables, we need to be aware that these changing conditions will not only impact crops but also weeds, insects, and diseases. These interactions of all of the environmental variables on the soil, plant, and pest populations will stretch our current knowledge base.

My challenge to agronomists is to become aware of these changes and begin to understand the potential impact on agriculture. These challenges are not limited to the United States but are occurring throughout the world, and this presents an opportunity to begin to share with our international colleagues. The issue of climate change is not a problem we can ignore, but one to which we need to apply our best thinking and provide potential solutions. There are a large number of producers and consultants who want answers and our best effort on this problem. This is an effort that will require agronomists to reach out to other disciplines and form alliances to address this complex problem. Are we ready for this challenge?

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