International Law, Agro-Ecological Integrity, and Sovereignty—Proposals for Reform

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Although modern agriculture presents profound problems that are potentially fatal to the human species, a dramatically different natural-systems agriculture is possible and now under development. International law will need to undergo major reforms in order to facilitate the transition to such a natural-systems agriculture. Two types of reforms are summarized here: (1) a Global Convention on Agro-Ecology and (2) a reorientation of sovereignty to create a layered, blended "thin sovereignty."

The very existence of the Federal Bar Association reflects a fundamental reality about the U.S. legal and political system: It involves a "layering" of sovereignty. While issues of relatively limited geographical consequence are handled primarily by state and local law and authorities, issues that have nationwide impact are handled predominantly by federal law and authorities.

In recent years I have concentrated my attention on issues having impacts that are global in character.[1] These include agriculture and the danger posed by what I refer to as "modern extractive agriculture." In this article, I wish to present a bare-bones explanation of one initiative that I consider especially crucial and timely in order to address problems with global agriculture. That initiative revolves around an innovative treaty system that would have three aims. The first aim is to acknowledge the need for worldwide reforms in agriculture, essentially replacing it with a new natural-systems agriculture I refer to as "agro-ecological husbandry." The second aim is to establish formal obligations on states to pursue agro-ecological reforms through national legislative, regulatory, educational, and research initiatives. Lastly, the third aim is to design a new multilateral institution capable of exercising "layered sovereignty" that represents the long-term interests of many stakeholders (both now and in the future) in ensuring global agro-ecological integrity.

Here, I summarize what the agricultural crisis is and how certain technological developments now make a shift to "natural-systems" agriculture feasible. Then I turn to my specific treaty proposals. In doing so, and with the kind permission of the editors of *The Federal Lawyer,* I take an "essay" approach with only the barest of citations to authority.[2] For me, this brief account reflects a larger work in progress, and I welcome any comments and criticisms that readers offer.

Modern Agriculture: Danger and Opportunity

Two propositions sit at the center of my work on international law and agro-ecological integrity. They are:

- Proposition No. 1: The form of extractive agriculture that humans have developed over about 10,000 years presents a cluster of problems, especially in its most modern form. These problems are ecological, economic, and social in character, and they are so substantial as to conclude that modern extractive agriculture has failed.
- Proposition No. 2: A fundamentally different form of food production and rural life—agro-ecological husbandry—is possible, and it is highly preferable to modern extractive agriculture, particularly in terms of producing grains and legumes that account for the largest portion of human caloric intake.

Failings of Modern Extractive Agriculture

Many observers have developed the details of Proposition No. 1 above. Some have emphasized ecological (environmental) factors, and indeed it is from those ecological factors that the term "extractive agriculture" is derived. After all, the form of agriculture developed in the Fertile Crescent many thousand years ago featured the *annual* planting of seeds in designated plots of land. This process was "extractive" to the degree that the integrity of the soil that the farmers used for such cultivated agriculture was compromised by (1) erosion or (2) fatigue (extracting the soil's nutrients without replacing them). Of course, erosion could be reduced by various prudent farming practices, and fatigue of the soil could be counterbalanced in part by using manure from livestock. Yet substantial erosion and fatigue still inevitably occurred.

The degree to which this traditional form of agriculture was "extractive" in character gradually *increased* with the development of more effective means of tilling the soil. Various styles of plow emerged over time, including the scratch plow used in Mesopotamia and the Rotherham plow developed in England in the 1730s. Such plows were pulled by draught animals, such as mules, oxen, or horses—or sometimes humans.

The 20th century brought the addition of a third form of extraction for agricultural purposes. Since just after World War II, great quantities of ammonia—a combination of hydrogen and nitrogen—have been used to create synthetic nitrogen fertilizers to boost crop yields. Indeed, roughly four-fifths of all ammonia produced around the world is devoted to use as agricultural fertilizer.

Then, in the 19th century, two developments suddenly changed agriculture in ways that made it drastically more extractive in character. The first was the creation and manufacture of the steel plow in the 1830s. The second was the development of gasoline-powered tractors around 1900. Both of these developments—the introduction of the steel plow and the introduction of the gasoline-powered tractor to pull that plow—made agriculture more extractive. In fact, the two developments led to what has been termed "the Great Plow-up" that, in turn and in combination with a severe drought, led to the 1930s Dust Bowl days in the Great Plains of America. The two together also contributed to humanity's feverish rush—now about a century and a half old—to extract petroleum and other fossil fuels from the Earth.

The 20th century brought the addition of a third form of extraction for agricultural purposes. Since just after World War II, great quantities of ammonia—a combination of hydrogen and nitrogen—have been used to create synthetic nitrogen fertilizers to boost crop yields. Indeed, roughly four-fifths of all ammonia produced around the world is devoted to use as agricultural fertilizer. In overall terms, nitrogen fertilizer now constitutes the largest single energy input into industrial agriculture. Production of the ammonia requires an intense energy source. In the United States, the source is mainly natural gas, which is of course another form of fossil carbon that is extracted from beneath the surface of the Earth. Hence, as modern agricultural production has come to rely more and more on ammonia for nitrogen fertilizer, the extraction of natural gas has risen accordingly. More recently yet, reliance on fossil-carbon deposits has increased further in order to produce various pesticides and herbicides.

These various factors justify the use of the term "extractive" in describing today's agriculture. Moreover, the features of the "modern extractive agriculture" I have summarized above form the foundation for ecological critiques of the entire system. The critiques usually emphasize one or more of the following issues:

- Modern extractive agriculture creates massive *soil erosion*, even with "low-till" or "no-till" farming techniques. For instance, although topsoil can be replenished at a rate of less than 1 inch in 200 years, current rates of soil erosion in the United States (even with aggressive soil-conservation efforts in some locations) run 12 times higher than soil formation rates. Soil loss problems in many regions elsewhere in the world are much worse.
- In addition to soil erosion, modern extractive agriculture also results in serious *soil degradation*—that is, in its fertility, its resilience, its organic matter, and other elements of its quality. Particularly troubling in this regard is the initiative of the past half-century to use massive amounts of synthetic chemical inputs that kill or injure countless microbes, worms, insects, and other participants in the soil's rich architecture of life.
- Moreover, modern extractive agriculture creates enormous dead zones and other forms of aquatic poisoning and contamination because nitrate, phosphorus, and other substances emitted from agricultural operations are transported downstream. Similarly, emissions of ammonia are transported downwind in the air, inducing species destruction and stress from acid rain. As a consequence, both *terrestrial and aquatic ecosystems* are degraded.
- Modern extractive agriculture creates substantial *habitat loss and degradation* more generally. This is true worldwide in all cropland settings. North America provides a potent illustration: At one time virtually all of the acres (nearly a billion) currently used for farming in the United States were relatively undisturbed wildlife habitat.
- The damage to habitats highlighted above has created an unprecedented reduction in *biodiversity.*
- Modern extractive agriculture substantially adds to an existential planetary threat by its direct and indirect contribution to *global climate change*. Roughly 13 percent of worldwide greenhouse gas emissions come directly from agricultural activities; much of these are nitrous oxide and methane, which are more potent than carbon dioxide in their climate impact.

In addition to these ecological concerns, modern extractive agriculture has come under attack for its economic unsustainability. Critics emphasize in particular the economic perspective of most farmers, including those who have been driven away from farming in the past two or three generations. However, even from the perspective of large U.S. agribusiness operators, the economics of farming depends on substantial subsidies (both direct through farm-bill

support and indirect through fossil-fuel subsidies)—without which it could not survive economically.

In this respect, critics have drawn special attention to U.S. government policies dating back to the 1940s. Those policies brought an unprecedented shift in the U.S. agricultural sector, characterized by enormous concentration, in two respects: (1) concentration of ownership in the hands of a small minority of the population and (2) concentration in the types of grains and other agricultural products. U.S. influence elsewhere in the world has brought these same types of concentration (especially the second type) to other countries. One result is that now 90 percent of the world's food comes from 30 crop species, even though about 7,000 crop species exist.

In addition to attracting these criticisms on ecological and economic grounds, modern extractive agriculture has drawn criticism also on grounds that, by linking agriculture with industry (and the fossil carbon on which industry depends), the modern system has done deep and lasting harm to society by transforming farming, rural life, and food production in ways that unwisely discard some values and efficiencies that for thousands of years have been central not only to our production of food but also to our role and identity within the ecosphere—such as the principles of restraint and of bioregionalism.

Agro-Ecological Husbandry

Proposition No. 2, as I stated it above, offers welcome relief in the face of these criticisms of modern extractive agriculture. Extensive field research, focusing on plant breeding and ecological studies, indicates that a different approach to grain production can be developed that would avoid the shortcomings of modern extractive agriculture. This new approach, which I refer to as agro-ecological husbandry,[3] starts from the assumption that nature's economy—and particularly the economy and architecture of the native grasslands that constitute the setting for a great deal of today's agricultural production—should provide the guidance for a "natural-systems" agriculture that focuses on perennials grown in polycultures, not annuals grown in monocultures.

The use of perennials grown in polycultures (mixtures of several species of perennial crop plants in the same field) addresses the ecological concerns that have been directed at modern extractive agriculture. For instance, perennial polycultures can:

- Dramatically reduce the use of agricultural fertilizer and chemical pesticides, thus minimizing both the draw on nonrenewable fossil-carbon deposits and the greenhouse-gas emissions that contribute to climate change.
- Reduce emissions of nitrous oxide in particular, which is much more potent as a greenhouse gas than carbon dioxide.
- Dramatically reduce the use of fossil-carbon fuels needed to power farm implements.
- Arrest the degradation that traditional agriculture causes to soil through erosion, damage to soil structure, and reduction in soil organic matter.
- Because of their diversity, better resist attacks by pests and pathogens.
- Sequester carbon, thus recapturing a significant amount of the carbon that was released from the soil in the past several decades and contributing to the resilience and stability of the climate.
- Reduce groundwater contamination of the sort that results from nitrate leaching in annual monocultures.
- Better maintain the health and fertility of a landscape more generally over longer periods of time—especially by preserving the microhabitats present in perennial polycultures.

Fortunately, agro-ecological husbandry—relying on perennial grains grown in polycultures and featuring the characteristics and benefits summarized above—is not a pipe dream. It has solid prospects for success. Although it is still outside the typical orbit of research institutions funded by agribusiness interests, it has gained wide acceptance in the scientific world. To date, substantial progress has been made (on relatively meager research funding thus far) in developing perennial varieties of intermediate wheatgrass (including the commercial marketing of a variety called Kernza®), rice (including five lines of perennial rice now used in China), sorghum, *silphium integrefolium*, sunflowers, and some other oilseeds. Researchers are also making progress in understanding the structure of polycultures.

A Global Convention on Agro-Ecology

Having offered above a nutshell account of both some key criticisms of modern extractive agriculture and the prospects for a new natural-systems form of agriculture based on perennials grown in polycultures, let me turn now to some issues of international law. They revolve around this question: *What sort of legal framework could be established that would facilitate a transformation of agriculture worldwide away from modern extractive agriculture and toward agro-ecological husbandry?*

Transitioning to a new form of agriculture would require numerous changes in substantive law at the *national* level. However, the problems of modern agriculture are global in character, and therefore *global* legal initiatives will be required to address them. The principal mechanism that international law offers for establishing global solutions through cooperative action is the negotiation, conclusion, and implementation of treaties.

A Global Convention on Agro-Ecology could serve as the legal vehicle by which the international community formalizes a commitment to address the principal problems of modern extractive agriculture. As I summarized above, these problems are inextricably associated with global climate change, soil degradation, water resources, biodiversity, food security, economic displacement, and more. While several of these topics have been the subject of earlier multilateral efforts, no treaty has addressed the particular crisis posed by the interaction of these issues against the backdrop of the two immediate crises of agricultural unsustainability and climate change.

What would be the key features of a treaty aimed at ensuring agro-ecological integrity by facilitating a reform of agriculture worldwide? They can be divided into three main parts: preamble, statement of principles, and obligations of contracting states.

Preamble

The preamble of the Global Convention on Agro-Ecology (Convention) could include clauses on these topics:

- *Key mileposts in the evolution of international environmental law*. The preamble could cite the *Trail Smelter* arbitral decision from the 1940s,[4] the 1972 Stockholm Declaration on the Human Environment, the various "MarPol" treaties on marine pollution, the Convention on Biological Diversity, the UN Frame-

work Convention on Climate Change, the Vienna Convention on protection of the Earth's ozone layer, and other developments contributing to international environmental law.[5]

- *Recent developments in agriculture*. These recitals would concentrate on certain aspects of agriculture-related environmental destruction generally and on some particular ills generated by the Green Revolution and the industrialization of agriculture around the world. This portion of the preamble could also identify important global institutions created to address these and other problems, including the Food and Agriculture Organization and International Fund for Agriculture Development, as well as numerous research institutions and the Consultative Group on International Agricultural Research—but acknowledge the inadequacy of these efforts to date.
- *The special horrors presented by global climate change and its relation to agriculture*. This portion of the preamble could refer to the two-way causal connection between modern extractive agriculture and climate change: Agriculture is one of the largest contributors to greenhouse gas emissions, and hence to climate change, and climate change poses one of the greatest threats to agriculture in coming years.
- *The almost equally immediate danger posed by species extinction*. This trend is traceable both to climate change and to modern extractive agriculture.
- *The inadequacy of attention given at the global level to issues of human population and consumption*. These issues warrant attention now because of the strains that a dramatically increasing global human population has already placed on the Earth's natural systems.

The recitals in the preamble to the convention would also announce certain general aims that the convention would be designed to achieve, which would then be elaborated in a set of principles adopted by the participating states.

Statement of Principles

The heart of the convention will be its statement of principles. They may be enumerated in three broad categories: those that focus on integration and cooperation, those that focus on a transition to a new form of agriculture, and those that focus on meeting special ecological challenges.

As for the first of these—principles focusing on integration and cooperation—the convention might include the following:

- *Principle 1: Reintegration of humans with the rest of the natural world*. This would emphasize the need for humans to recognize their shared ecological destiny with other species. The provision could draw from Principle 1(a) of the Earth Charter, which recognizes "that all beings are interdependent and every form of life has value regardless of its worth to human beings."[6]
- *Principle 2: Responsibility of humans to restore the Earth's ecological integrity*. This would recognize that, because of the special status and capacities of human beings, our reintegration with the rest of the natural world necessarily involves a duty of restoration.[7] That duty would be expressly identified in this principle as having the character of a trustee's duty. (I briefly address issues of trusts and trustees below.)
- *Principle 3: Precaution in human activities affecting the natural world*. This would unambiguously adopt the Precautionary Principle as it has developed in Europe[8] and as it has been reflected thus far in some international legal instruments,[9] including the Earth Charter.[10] It would emphasize the importance of a minimalist approach ("light touch") that humans should take in their relations with the natural world—reminiscent of the approach shown in some forms of indigenous agriculture showing an "agriculture of restraint."
- *Principle 4: Cooperation of humans with other humans*. Whereas principles 1, 2, and 3 would focus on the relationship of humans with the other elements of the physical and living environment of the Earth, principle 4 would concentrate on humans' relations among themselves. It would endorse a duty of cooperation going far beyond the rather shallow and indirect duty appearing in Article 56 of the Charter of the United Nations (U.N.).[11]

The second of the three categories of principles—that is, principles focusing on a transition to a new form of agriculture—might include the following:

- *Principle 5: Creation of a new form of agricultural life and production*. The convention would have as its *raison d'etre* the transformation of agriculture as it exists today—a transformation away from modern extractive agriculture and toward agro-ecological husbandry of the sort described briefly above.
- *Principle 6*: *Recognition of the main objectives of such a new form of agricultural life and production*. These objectives, reflecting key problems with modern extractive agriculture summarized above, are to overcome its ecological, economic, and social unsustainability.
- *Principle 7: Protection of "safeguard rights" of all people during the transition to a new form of agriculture*. This would assert that certain values, such as those involving basic civil and political rights, are to be considered inviolable, so that during the dramatic changes that are called for in principles 5 and 6, powerful interests will not be permitted to act with inhumanity toward anyone.[12]

The third of the three categories of principles to be announced in the Global Convention on Agro-Ecology would focus on meeting "special structural challenges." These relate in particular to: (1) climate change, which involves not only agriculture but also the structure of global energy production and use; (2) the structure of human presence on Earth (and humans' use of the Earth's resources); and (3) the structure of international relations, particularly under the Westphalian model of nation-state sovereignty. This portion of the convention might include the following:

- *Principle 8: Urgent necessity to address climate change issues, with special reference to agriculture*. Because global climate change is a triggering cause for undertaking a reform of global agriculture in a way that would sequester dramatically larger amounts of carbon, the convention could establish a set of targets regarding climate change, such as a target to avoid at all costs a "four-degree world" of the sort that the World Bank has warned against in dire terms.[13]
- *Principle 9*: *Urgent necessity also to address problems of pop-*

ulation, preservation, and food security. Because ecological problems play a central role in the need to reform agriculture, and because those ecological problems result in part from recent breathtaking increases in human populations, the convention should reflect a consensus that population growth must be seen as a problem to be addressed, not as a "given" to be accommodated. This principle would acknowledge that reality.

- *Principle 10*: *Restructuring global governance,*[14] *particularly as it relates to ecological and agricultural affairs.* This would expressly acknowledge that effective reform necessary to implement the provisions of the convention requires fundamental restructuring of the "international community" and how it is governed. It would recognize the legitimacy of some criticisms about today's global governance—for instance, complaints made against the global economic institutions (the International Monetary Fund, the World Bank, and others) regarding a "democracy deficit," criticisms of the U.N. for lacking effectiveness and, indeed, criticisms of international law in general for its apparent inability to prevent blatant disregard of some of its rules. This principle would anticipate the opening of a new chapter in international law involving a multilayered, transparent, and widely participatory system of governance as it relates to ecology and agriculture.

Obligations of Contracting States

The principal obligations of those states becoming parties to the Global Convention on Agro-Ecology would reflect the statement of principles described above. Specifically, participating states would commit themselves to implement those principles through legislation, regulation, education, and research.

For example, legislation and regulations to be promulgated by contracting states could:

- Define and adopt the Precautionary Principle.
- Set aside "nature reserves" for the preservation of endangered or threatened species and to restore biodiversity more generally.
- Prohibit agricultural practices (such as nitrate discharge) causing serious ecological damage.
- Adopt the "Polluter Pays Principle."[15]
- Reorient agricultural subsidies.
- Remove fossil-carbon subsidies.
- Facilitate land reform, particularly by using the "constructive trust" (or "public trust") doctrine to protect the interests of various participants in the ecosystems falling within the jurisdiction of the contracting states—a matter I will expand on briefly below.

In addition to such legislative and regulatory action, contracting states would commit under the convention to enhance broad public education aimed at implementing the principles that it announces. One purpose of such education should be to provide everyone with at least a basic grounding in food production and in earth sciences, so that people would understand the importance, both in their own eco-region and for the world as a whole, of climate cycles, energy flows, soil conservation, the "law of return," biodiversity, and the like.

Such an education would go beyond science. It would impart to the populace what Frederick Kirschenmann calls an "ecological conscience"[16] and a conception of the natural world as the subject of a trust. A trust (as a legal matter) involves an equitable obligation that legally binds a person (the trustee) who has legal title and control over certain property (the trust property) to manage that property *not* for his or her own direct benefit but rather for the benefit of a specified group of persons named as the beneficiaries of the trust.

Viewed from an ecological perspective, the concept of the trust could be used to characterize the humans alive today as trustees who bear a responsibility to protect the Earth (the "trust property") for the benefit of two main classes of beneficiaries: other (nonhuman) species that are alive today and all species that are to be our successors and inheritors here in the future.

Such proposals and legal doctrines are not new. In U.S. law, the so-called "public trust doctrine" asserts that "courts should imply restrictions when private development threatens to destroy public use."[17] For various reasons, the development of this "public trust doctrine" has not gathered much momentum thus far in the United States. However, in her 2014 book *Nature's Trust*, Mary Christina Wood urges a reliance on the "public trust" doctrine to create a new framework for ecological protection, not just in the United States but more generally in the world.[18]

Examples of equitable trusts—whether styled as "constructive trusts" or "public trusts"—also appear in international law. For instance, the International Trusteeship System established in 1945 as part of the U.N. reflected the main contours of an equitable trust.[19] Peter Sand has recently provided a comprehensive survey of the concept of public trusteeship as it has developed in international law—dating back to the late 1800s with the Pacific Fur Seal Arbitration.[20] Similarly, in a recent book examining sustainable development and international law, Elisabaeth Bürgi Bonanomi emphasized the continuing relevance of the legal framework for intergenerational equity that Edith Brown Weiss proposed in the late 1980s.[21] According to that framework, "[e]ach generation receives the natural and cultural legacy [of the world] in trust from previous generations and holds it in trust for future generations."[22]

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My reason for devoting the preceding several paragraphs to the concept of the trust—with special attention to its historical roots and its emergence thus far in international law—is to highlight a responsibility to be shouldered by contracting states to the Global Convention I am describing here: to take legal measures aimed at protecting the public interest in land, along with the interests of other species and components of the eco-regions under those states' jurisdiction. Mustering the broad public support required for the enactment of these legal measures must involve a comprehensive campaign to

provide all people with a new basic grounding in earth sciences and an "ecological conscience" of the sort I referred to above.

In addition to providing their people with this basic grounding, however, contracting states to the convention described above would commit to give special attention to agricultural research needed to achieve agro-ecological integrity in their territories. For those contracting states that lack the financial resources to fund such research adequately, the convention would offer the prospect of financial support from other contracting states.

In sum, principal commitments undertaken by those states that would become parties to the Global Convention on Agro-Ecology would be to facilitate the implementation of the convention's principles through legislation, regulation, education, and research.

Contracting states would also have a responsibility to report to, and cooperate with, other contracting states. Many modern multilateral treaties with reporting requirements take an "every country, every year" approach: Each party to the treaty is to issue a report each year evaluating and documenting its performance during the preceding year in meeting its commitments under the treaty. In many cases, such a reporting requirement will be accompanied by a requirement that consultations occur between the participating state and a body of experts responsible for studying and evaluating that state's report.

My point in explaining these notions of eco-zone clusters and eco-states is this: Transitioning from modern extractive agriculture to agro-ecological husbandry—and realizing thereby the advantages I have explained above—will almost surely require a restructuring, a sharing, and a "layering" of authority over global ecological protection and agricultural production. This could be the foundation for a new "thin sovereignty" concept.

For example, in the case of the international treaty commitments that states make as members of the International Monetary Fund (IMF), each state engages annually in consultations with IMF staff members whose role is to examine in depth that state's performance of its IMF charter obligations through the preceding year and to issue a public report with candid assessments and recommendations.[23]

What would be the body of experts reviewing reports issued each year by contracting states under the Global Convention on Agro-Ecology I am describing here? A new international organization—the Global Corporate Trust for Agro-Ecological Integrity—which is the subject a book project I currently have underway.[24] I will simply explain here that another important obligation of contracting states to the convention would be to participate in good faith in the establishment of that new organization.

Doing so will require fresh thinking about the character of international institutions because the Global Corporate Trust for Agro-Ecological Integrity would depart from the structural pattern used in creating such post-war institutions as the U.N., IMF, and World Bank. Unlike those institutions, the Global Corporate Trust for Agro-Ecological Integrity would have a diverse membership dominated by nonstate actors. Its establishment would therefore require states (in keeping with principle 10 of the convention, as noted above) to accept and endorse some fundamental changes to the concept of sovereignty as it has developed over the past four centuries. Because state sovereignty sits at the very center of modern public international law, I give it separate consideration in the last segment of this essay.

A Reorientation of Sovereignty

"Thick Sovereignty" and "Thin Sovereignty"

As I have described in detail elsewhere,[25] the traditional concept of sovereignty—what we might regard as "thick sovereignty"—emerged in the political setting of 16th- and 17th-century Europe. Based on the writings of such authorities as Hugo Grotius, Thomas Hobbes, Jean Bodin, and Francisco Suarez, that view of sovereignty placed legal foundations underneath the dramatic political changes occurring then, most notably the recognition (as in the Peace of Westphalia, 1648) of the nation-state as the fundamental political unit in Europe. While some observers have suggested persuasively that there has never been such a thing as a true "nationstate,"[26] the concept of sovereignty as it solidified over the course of the past four centuries rested on such an image, emphasizing the elements of territoriality (with exclusive authority in a particular territory being exercised by only one sovereign entity) and nationality (with territorial boundaries reflecting national identities).

With European colonization and conquest of much of the Earth's land territories at various times between the 17th and 20th centuries, this concept of sovereignty spread around the world. Therefore this "thick sovereignty" concept—resting on the assumption that within its own territorial boundaries, a state (acting through a centralized government) is nearly all-powerful in promulgating its own laws and managing its own affairs—animates most international relations today. The territorial nation-state is still regarded as the fundamental political unit in law and practice.

In very recent times, however, some exceptions to the "thick sovereignty" concept have reduced the autonomy exercised by states. One such exception appears in the emergence of international organizations. The history of such organizations is quite short, dating only from the late 19th century. The turning point in the rise of international organizations came with the end of World War II. Of the several new international organizations formed then, three of the most widely known are the U.N., IMF, and World Bank. All three of these are significant because they represent, either in their inception or in their evolution, partial surrenders of sovereignty by states to international organizations.[27]

The rise of those international organizations marks the beginning of a change in the concept of sovereignty. Such a change is hardly surprising. After all, the "thick sovereignty" concept that granted such a monopoly of legal and political autonomy to states reflects much more the realities of earlier centuries than it does the realities of today's world. As our world faces a crescendo of problems with global consequences—such as those brought on by modern extractive agriculture and climate change—it makes sense to design

a revised version of sovereignty that will better help address such global problems.

Accordingly, in my view, intense effort should be devoted now to the development of what I refer to as a layered or blended "thin sovereignty," one that is more appropriate to today's world. Given the essential significance of global ecological protection, and the role that agriculture must play in achieving that protection, such a "thin sovereignty" concept would most appropriately rest on a global political framework in which effective authority over ecological matters—having to do with humans' relationship with the natural world—is exercised not by the sorts of existing territorial "nation-states" that have dominated the global political scene for several centuries but rather by authorities organized by natural ecological features.

Many efforts have been made to map the world on the basis of eco-regions and biomes. These two terms—eco-regions and biomes—are widely used in classifying the world's enormous diversity of climates, soils, land cover, species distribution, and other environmental factors. The World Wildlife Fund classification system, for instance, includes 867 terrestrial eco-regions fitting within 14 terrestrial biomes. One such terrestrial biome comprises temperate grasslands, savannas, and shrublands; another comprises Mediterranean forests, woodlands, and scrub.

Based on these classifications, I use the term "eco-zone cluster" to denote the set of all those territories fitting within a particular biome category, so that all those portions of the Earth that fall within, say, the "temperate grasslands, savannas, and shrublands" biome would constitute an eco-zone cluster. Moving from an ecological to a legal perspective, I use the term "eco-state" to denote the political and legal manifestation of a biome. An eco-state would be a legal entity in roughly the same way that a territorial "state" is a legal entity in the system of international relations that has prevailed in the world for several centuries. An eco-state's jurisdiction would include the territory encompassed in its corresponding eco-zone cluster, such that all eco-zones (whether in North America, South America, or elsewhere in the world) in, say, the "temperate grasslands, savannas, and shrublands" eco-zone cluster would fall within the jurisdiction of a single eco-state. Hence the boundaries between the eco-zone clusters (falling within the categories of "biomes") are almost entirely different from the *political* boundaries that exist in the states that define today's world.

My point in explaining these notions of eco-zone clusters and eco-states is this: Transitioning from modern extractive agriculture to agro-ecological husbandry—and realizing thereby the advantages I have explained above—will almost surely require a restructuring, a sharing, and a "layering" of authority over global ecological protection and agricultural production. This could be the foundation for a new "thin sovereignty" concept.

There is, after all, a strong element of artificiality in the theory that within a certain territory, all matters of law and administration are subject to the control of a single authoritative entity. The real world of the early 21st century has countless examples of territories that are subject to shared or layered authority, with those layers of governmental regulation determined by *topic* rather than *location*. Consider the region of Trentino-Alto Adige in northern Italy. There, a special sharing (or layering) of authority allocates most legislative and administrative powers to the two largely self-governing provinces that make up the region—namely, Trentino and South Tyrol. Hence, even though the roughly 1 million people of the region are Italian citizens, and Trentino-Alto Adige is unmistakably part of Italy, the exercise of sovereign control cannot be said to be strictly territorial. Instead, it is "topical" (my term for it), in that sovereignty is allocated on the basis of topics or aspects of administration and operation.

The world is replete with other illustrations of the same reality. As I emphasized in the beginning of this essay, the United States presents an obvious illustration: Its federal-state composition involves extensive "layering" of legislative and administrative authority defined in constitutions and frequently erupting into disputes. Likewise, the European Union involves a layering or blending of sovereignty.

The world is replete with other illustrations of the same reality. As I emphasized in the beginning of this essay, the United States presents an obvious illustration: Its federal-state composition involves extensive "layering" of legislative and administrative authority defined in constitutions and frequently erupting into disputes. Likewise, the European Union involves a layering or blending of sovereignty. A conference conducted in Trento, Italy, in 2009 highlighted many other illustrations of layered or blended sovereignty, in which the allocation of administrative and other forms of control over certain territories has been made on the basis of the topics at issue—trade, currency, education, taxation, defense, and so forth.[28] Such illustrations appear in Catalonia (in its relations with Spain), in Quebec (Canada), in Aceh (Indonesia), in Sabah and Sarawak (Malaysia), in Wales (U.K.), and elsewhere in the world. In these and many other cases, sovereignty is not territorially exclusive and absolute but rather layered, blended, shared, or mixed.

In short, the international community is replete with diversity. It consists of many power centers, and we have legitimized some of them legally on largely antiquated grounds. Although the "thick sovereignty" concept pretends that this legal legitimization has been done on the basis of territoriality (with exclusive authority in a particular territory being exercised by only one sovereign entity) and on the basis of nationality (with territorial boundaries reflecting national identities), in fact both of those assertions are largely false in a world that is characterized by multiple layers of authority and by massive relocations and interbreeding of peoples.

From a legal perspective, then, a central challenge of our day is to design some form of "thin sovereignty" that more accurately reflects the political reality of the world and that will change the character and theory of sovereignty in ways that can provide protection for the ecosphere, with special attention to agriculture.

Practical Challenges

How likely is it that legal reforms will be made along the lines I have

suggested above—that is, either in establishing a Global Convention on Agro-Ecology or in designing and implementing a revised concept of sovereignty? More broadly still, how likely is it that the modern extractive form of agriculture can be phased out and replaced with what I referred to above as agro-ecological husbandry?

On the one hand, we can expect that all such efforts at reform—in law or in agriculture—would face resistance on many fronts. On the other hand, if global ecological circumstances deteriorate quickly in coming decades, as seems likely, the reforms I have suggested here might soon seem too timid, not too bold.

After all, agriculture was transformed in profound ways over the course of just a few decades, starting in the Green Revolution days of the 1940s, and this transformation came about as a consequence of conscious policy adopted and implemented by a relatively small cluster of leaders in politics and technology with a clear vision of achieving certain goals. Given this fact, it strikes me as absurd—I would say even juvenile and small-minded—to think that radical change cannot be brought to agriculture over the course of the coming half century.

The same holds true for international law and institutions: It would be naive and short-sighted to assume that a collaborative system of rules and policies cannot be built at the global level to support a shift from modern extractive agriculture to agro-ecological husbandry. After all, such systems have been built before on other subjects, including trade regulation, commercial transactions, foreign investment, cross-border finance, legal process, telecommunications, navigation, shipping, diplomatic relations, and much more.[29]

In sum, it is possible and indeed rather commonplace in the modern age for collective action to be taken at the global level—that is, by states as the key players on that stage—in establishing and implementing rules considered binding on, and mutually beneficial to, those states. What I consider crucial is that such rules should involve *restraint*.

In sum, it is possible and indeed rather commonplace in the modern age for collective action to be taken at the global level—that is, by states as the key players on that stage—in establishing and implementing rules considered binding on, and mutually beneficial to, those states. What I consider crucial is that such rules should involve *restraint*. A natural systems agriculture of the sort I have described above reflects an "agriculture of restraint," so as to remain prudently within operating limits of the ecosystem in which the farming occurs. The notion of *restraint* applies also in the context of international law: The natural jealousies and self-interest that states exhibit in their international relations will need to be tempered significantly to ensure that the human species stays within the natural limits that the ecosphere imposes. Expressed differently, there must in my view be a "sovereignty of restraint" that parallels an "agriculture of restraint."

How is such restraint—whether in the form of an agriculture of restraint or in the form of a sovereignty of restraint—to be achieved? From a scientific perspective, the answer can be found through continued research, such as the efforts to develop an agro-ecological husbandry concentrating on perennial grains grown in polycultures. From a legal perspective, the answer lies in persistent efforts to design and negotiate new rules that serve the mutual long-term benefit of the negotiating parties and the full array of constituencies and interests that they are supposed to represent. ⊙

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Endnotes

[1]*See, e.g.*, John W. Head, Global Legal Regimes to Protect the World's Grasslands (2012) [hereinafter Grasslands]; John W. Head, International Law and Agro-Ecological Husbandry (forthcoming 2016) [hereinafter Agro-Ecological Husbandry]; John W. Head, Kate Marples, and John Simpson, *Mediterranean Agriculture, Ecology, and Law: Creating a New Non-State Actor to Counteract Agro-Ecological Collapse in the Mediterranean Basin*, 24 Mediterranean Studies (forthcoming 2016).

[2]For citations to authority supporting the assertions made in the following paragraphs, *see* Grasslands, *supra* n. 1 and Agro-Ecological Husbandry, *supra* n. 1.

[3]For an explanation of the concept of "husbandry" in this context, and of agro-ecological husbandry more generally, *see* Grasslands, *supra* n. 1, at 209-215.

[4]The arbitral panel's decision in this case involving transborder pollution from Canada to the United States is regarded as an important first legal statement of liability for environmental harm by one state to another. For the text of the decision, *see* legal.un.org/riaa/cases/vol_III/1905-1982.pdf.

[5]All of the treaties and declarations mentioned here are easily found online or in printed resources relating to international environmental law.

[6]*See* "The Earth Charter 2000," as reprinted in The Earth Charter: A Framework for Global Governance 257-261 (Klaus Bosselmann & J. Ronald Engel, eds., 2010) [hereinafter Earth Charter]. In a similar vein, the Preamble of the Earth Charter also asserts that "we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny." *Id*. at 257.

[7]As expressed in the Earth Charter, humans have a duty to "[p]rotect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life." *Id*. at 258 (Principle 5).

[8]For details, *see, e.g.,* Kenneth Foster, Paolo Vecchla, & Michael Repacholi, *Science and the Precautionary Principle,* 288 Science, issue 5468, 979-81 (May 2000); Robert V. Percival, *Who's Afraid of*

the Precautionary Principle?, 23 Pace Environmental Law Review 21 (2006); Noga Morag-Levine, *Is Precautionary Regulation a Civil Law Instrument? Lessons from the History of the Alkali Act*, 23 Journal of Environmental Law 1 (2011).

[9]The Precautionary Principle has been incorporated into international law in several ways. An early reference to it appeared in the World Charter for Nature in 1982, adopted by the U.N. General Assembly (asserting in Article II, part 11(b) that "[a]ctivities which are likely to pose a significant risk to nature shall be preceded by an exhaustive examination; their proponents shall demonstrate that expected benefits outweigh potential damage to nature, and where potential adverse effects are not fully understood, the activities should not proceed"), G.A. Res. 37/7, U.N. GAOR, 37th Sess., Supp. No. 51, at 17, U.N. Doc. A/37/51 (1982); 22 ILM 455 (1983). The Precautionary Principle was expressly endorsed five years later in the Montreal Protocol on ozone-layer protection, in 1992 in the Rio Declaration on Environment and Development (Principle 15), and also in 1992 in the U.N. Convention on the Protection and Use of Transboundary Watercourses and Lakes and two regional treaties on marine-environment protection. A more recent appearance of the Precautionary Principle in international law was in Article II of the Fifth International Conference on the Protection of the North Sea, the so-called Bergen Declaration, in 2002.

[10]*See, e.g.,* Earth Charter, *supra* n. 6, at 259 (announcing the requirement in Principle 7 to "apply a precautionary approach" that would "[p]lace the burden of proof on those who argue that a proposed activity will not cause significant harm").

[11]Article 56 of the U.N. Charter asserts that member states "pledge themselves to take joint and separate action in co-operation with the [U.N.] Organization for the achievement of the purposes set forth in Article 55." Article 55, in turn, provides that the U.N. itself "shall promote" such things as higher standards of living, social progress, solutions to international economic and health problems, and universal respect for human rights and fundamental freedoms.

[12]The Earth Charter includes similar principles. Earth Charter, *supra* n. 6, at 259-260 (Principles 10, 11, 12, and 13).

[13]*See* The World Bank, *Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided* (2012). First released in 2012, this World Bank publication has now become a series, *available at* www.worldbank.org/en/topic/climatechange/publication/turn-down-the-heat.

[14]I use the term "governance" as a label for the entire body of mechanisms by which international relations lurch forward. In my view, "global governance" does not connote the existence or desirability of a singular "world government" of any kind. In asserting that there should be a "restructuring of global governance" relating to ecological and agricultural affairs, this Principle 10 is urging changes that will make the mechanics for protecting the Earth against modern extractive agriculture less messy, less inefficient, and less unjust—for the benefit of all living and nonliving members of the ecospheric community, not just for humans.

[15]The "Polluter Pays Principle" was adopted by Principle 17 of the Stockholm Declaration, and it provides that all environmental costs of a product or activity be internalized, so that, as one resource expresses it, "the actor who might cause pollution or environmental harm bears the costs of avoiding the harm, cleaning up the mess and compensating for any injuries." Earth Charter, *supra* n. 6, at 10.

[16]Frederick L. Kirschenmann, Cultivating an Ecological Conscience: Essays from a Farmer Philosopher 187 (2010).

[17]George Cameron Coggins, Charles F. Wilkinson, & John D. Leshy, Federal Public Land and Resources Law 338 (4th ed. 2001).

[18]*See generally* Mary Christina Wood, Nature's Trust: Environmental Law for a New Ecological Age (2014).

[19]For details about the Trusteeship System, *see* the U.N. website at www.un.org/en/decolonization/its.html. For U.N. Charter provisions establishing and governing the International Trusteeship System, including the operation of the Trusteeship Council, *see* U.N. Charter, arts. 75-91.

[20]*See* Peter H. Sand, *The Concept of Public Trusteeship in the Transboundary Governance of Biodiversity, in* Transboundary Governance of Biodiversity ch. 3 (Louis J. Kotzé & Thilo Marauhn, eds., 2014). Sand lists several illustrations. *See id*. at 61.

[21]Elisabeth Bürgi Bonanomi, Sustainable Development in International Law Making and Trade: International Food Governance and Trade in Agriculture 125-127 (2015).

[22]*Id*. at 126, (quoting Edith Brown Weiss, In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity (1989)).

[23]Such consultations take place under the provisions of Article IV of the IMF Charter. *See* John W. Head, Losing the Global Development War: A Contemporary Critique of the IMF, the World Bank, and the WTO 112, 115, 229, 268 (2008).

[24]*See* John W. Head, A Global Corporate Trust for Agro-Ecological Integrity: Managing a New Agriculture in a World of Eco-States (forthcoming).

[25]John W. Head, *Supranational Law: How the Move Toward Multilateral Solutions Is Changing the Character of "International" Law*, 16 Kan. L. Rev. 605 (1993).

[26]*See generally* H. Patrick Glenn, The Cosmopolitan State (2013).

[27]In the case of the IMF, for instance, member states surrendered authority over the values of their currencies; in the case of the U.N., member states surrendered the legal right to use unilateral aggressive armed force.

[28]*See* Regional Self-Government, Cultural Identity and Multinational Integration: Comparative Experiences for Tibet (Roberto Toniatti & Jens Woelk, eds.) (forthcoming 2016).

[29]Some of the main contours of these rules and procedures can be found by conducting an electronic search for the General Agreement on Tariffs and Trade, the charter of the World Trade Organization, the Convention on Contracts for the International Sale of Goods, the New York Convention (governing international commercial arbitration), the Agreement on Trade-Related Investment Measures, the Convention on Stand-By Credits, the Hague-Visby Rules, the International Convention on the Settlement of Investment Disputes, the Hague Convention on the Taking of Evidence Abroad, the OECD Anti-Bribery Convention, the Vienna Convention on Diplomatic Relations, and scores of other treaties to which most states in the world are parties.