

AGRICULTURE AND THE LAW: CAN THE LEGAL PROFESSION POWER THE NEXT GREEN REVOLUTION?

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I. INTRODUCTION

It is a familiar set of statistics: By the year 2050, we will need to feed over another 2 billion people on the planet.³ Sub-Saharan Africa and South Asia will

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3. *World Population Projected to Reach 9.6 Billion by 2050*, UN DEP'T ECON. & SOC. AFFAIRS (June 13, 2013), <https://www.un.org/development/desa/en/news/population/un-report-world-population-projected-to-reach-9-6-billion-by-2050.html>.

be responsible for 90 percent of the population increase.⁴ This increasingly urbanized populace will consume roughly 70 percent more food than today.⁵

Moreover, agricultural productivity, as it is currently distributed around the world, does not align with demand. For many reasons (e.g., farm-to-market efficiency, cultural acceptability, and geopolitical factors), food should continue to be produced locally. Approximately 85 percent of the world's food is consumed either within 100 miles of where it is grown, within the national borders, or within the same eco-regional zone.⁶ At the same time, agricultural productivity today is lowest in the regions where our population is likely to grow the most.

A strong agricultural economy is the key to a peaceful society. Without a reliable supply of safe, affordable food, the future will be one of famine, disease, and disorder on a global scale. Former U.S. Senator Tom Daschle has characterized food security as one of the defining challenges facing mankind in the twenty-first century.⁷ For the world's farmers, this means essentially doubling agricultural productivity, without increasing the amount of arable land on the planet, while dealing with the increasing impact of global climate change.

II. HOW ARE WE GOING TO MEET THE CHALLENGE?

Farmers, ranchers, scientists, agronomists, engineers, educators, government officials, philanthropists, and others around the world are hard at work every day on solutions. We have seen the introduction of new technologies in the areas of pest management, irrigation, cultivation, and water management that have already increased productivity for farmers of all sizes in virtually all crop production.

In addition, the application of digital and satellite technology to farming is changing the way growers around the world decide what and when to plant, how to manage their fields, and when to harvest and market their crop. Even in highly developed farming operations, the use of this information can improve yields and reduce seed, fertilizer, and chemical inputs by fifteen15 percent.⁸

4. See *Urbanization in Africa*, AFRICAN DEV. BANK GROUP (Dec. 13, 2012), <http://www.afdb.org/en/blogs/afdb-championing-inclusive-growth-across-africa/post/urbanization-in-africa-10143/>.

5. FOOD & AGRIC. ORG. OF THE UN, *HOW TO FEED THE WORLD 2050* at 2 (2009).

6. ETC GROUP, *ISSUE # 102, WHO WILL FEED US? QUESTIONS FOR THE FOOD AND CLIMATE CRISES 1* (2009), http://www.etcgroup.org/files/ETC_Who_Will_Feed_Us.pdf.

7. See Tom Daschle & Dan Glickman, *On Food Security, Who Leads?*, ASPEN J. IDEAS (May/June 2015), <http://aspens.us/journal/editions/mayjune-2015/food-security-who-leads>.

8. Lyndsey Gilpin, *How Big Data is Going to Help Feed Nine Billion People by 2050*, TECHREPUBLIC, <http://www.techrepublic.com/article/how-big-data-is-going-to-help-feed-9-billion-people-by-2050/> (last visited Aug. 21, 2016).

It is encouraging that many of these technologies are ‘scale-neutral,’ in that they offer benefits to small and large farms alike. Biotechnology in all of its forms (not limited to transgenic seed products), drought and disease resistant crop varieties, agronomic practices that enable reduced tillage and more efficient use of water and fertilizer, and technologies that better protect harvested crops from disease and spoilage are all good things for farmers regardless of the size of their operations. This can be seen by the increase in production of grains on approximately the same amount of land. In 2005, 2043.4 million metric tons (MMT) of grains were produced on 300.42 million (MM) hectares.⁹ However in 2015, 2509.9 MMT of grains were produced on 322.22 MM hectares.¹⁰ This is an 18 percent increase in production on only about a 6 percent increase in land area.

Clearly, it is in many ways the best of times for agriculture. At the same time, there are daunting challenges ahead, highlighted by the fact that the benefits of modern agriculture are not evenly distributed around the world. The disparity is apparent in the global production of corn (maize), the largest grain crop by weight produced in the world.¹¹ Today, farmers around the world produce around 38,105 million bushels or 988 million metric tons of corn,¹² on approximately 179 MM hectares—an average yield of about six MT per hectare (MT/Ha).¹³

More specifically, U.S. farmers now produce an average of over 160 bushels of corn per acre (10 MT/Ha).¹⁴ In Sub-Saharan Africa, on the other hand, maize farmers average some fifteen to thirty bushels per acre (1 MT/Ha).¹⁵ Maize yields in South Asia are better (around 3-5 MT/Ha in many areas) but still far short of the potential.¹⁶ This ‘productivity gap’ is not new, and its significance in feeding the future population has been the focus of significant public and private investment for more than four decades. The first Green Revolution during the 1940s and 1950s brought improved varieties of wheat and new agronomic practices to many

9. See FOREIGN AGRIC. SERV., USDA, WAP 01-07, WORLD AGRICULTURE PRODUCTION, at tbl.01, 04 (2007), <http://usda.mannlib.cornell.edu/usda/fas/worldag-production//2000s/2007/worldag-production-01-01-2007.pdf> [hereinafter WAP 01-07].

10. See FOREIGN AGRIC. SERV., USDA, WAP 6-16, WORLD AGRICULTURE PRODUCTION, at tbl.01, 03 (2016), <http://usda.mannlib.cornell.edu/usda/fas/worldag-production//2010s/2016/worldag-production-06-10-2016.pdf> [hereinafter WAP 6-16].

11. *Id.* at tbl.04

12. *World Corn Production 2015-2016*, NAT’L CORN GROWERS ASS’N (Jan. 12, 2016), <http://www.worldofcorn.com/#world-corn-production>; *Conversion Factors*, U.S. GRAINS COUNCIL, <http://www.grains.org/buyingselling/conversion-factors> (last visited Aug. 19, 2016).

13. FOREIGN AGRIC. SERV., USDA, WAP 7-16, WORLD AGRICULTURE PRODUCTION, at tbl.04 (2016), <http://apps.fas.usda.gov/psdonline/circulars/production.pdf>.

14. *Id.*

15. *Id.*

16. *Id.*

parts of the developing world.¹⁷ A new Green Revolution will be needed to solve the current productivity gap and sustainably feed 9 billion people in the future.

Clearly, if the world's average corn yields could be increased to the levels of the U.S., we would be well on the way toward doubling agricultural productivity. Viewed this way, the challenge may not be so much about finding new solutions as it is about adapting existing solutions to new geographies. Agricultural technologies and practices already exist that would raise yields in the developing world to levels comparable to the developed; most simply need to be adapted to local climates, agronomic conditions, and cultures.

Within the developed world, where agriculture is at its most productive, the challenges are different, with agriculture beginning to expand its focus from productivity to sustainability. Historically, U.S. farmers have been free to decide how best to conduct their operations, but as society's understanding of the environmental impacts of modern society in general and of agriculture, in particular, has increased, agricultural practices have come under heightened scrutiny by a variety of newly-interested stakeholders: federal, state, and local governments and a wide range of non-governmental organizations (NGO's), as well as consumers.

Going forward, it will not be enough for growers in places like the Corn Belt to continue to be the world's most productive—they will also need to find new, more sustainable ways to do it.

III. WHAT LEGAL ISSUES MUST BE ADDRESSED IN DEVELOPING MARKETS?

Farmers in South Asia and Sub-Saharan Africa face a variety of economic, political, and cultural challenges. However, there exists at least four common factors for developing agricultural markets that must be addressed in order for agricultural productivity to increase: (1) land ownership rights; (2) legal system structure; (3) access to technology and information; (4) access to markets, both for farm inputs and outputs.

A. *Land Ownership Rights*

Land ownership creates the fundamental incentives necessary for farmers to invest in and preserve their farming operations. By way of background, two

17. Dr. Norman Borlaug, a native Iowan, is said to be the father of the "Green Revolution," which is the name given to this time period of improved crop management and introduction of new varieties in Mexico, and later Asia and Latin America. *About Dr. Norman Borlaug*, WORLD FOOD PRIZE, http://www.worldfoodprize.org/en/dr_norman_e_borlaug/about_norman_borlaug/ (last visited Aug. 19, 2016).

concepts must first be defined. Land tenure is a system of land ownership that refers to the person who holds the land and often is used to describe the relationship between landlord and tenant.¹⁸ Accompanying this is the concept of land registration where the holder of the land registers their ownership right with a government department or agency.¹⁹ However, in many countries, land ownership rights are limited or difficult to enforce. The first barriers to landownership rights are the land registration systems in many parts of the developing world. While nearly all of the countries in Sub-Saharan Africa have the legal framework to register land rights, only about 10 percent of occupied rural land is registered.²⁰

Two common reasons are cited to support this statistic. First, it has historically been the case that the dominant customary land tenure system provided enough security to incentivize members of the community to invest in their land and as such it was not necessary to invest in actual land registration programs.²¹ Second, in countries where independence was newly claimed, documenting of land rights often required surveying and mapping.²² This was seen as a feasible cost for high value land found in the urban areas but was considered to be too high of an expense in rural areas where land values drop significantly. One hybrid model is “communal registration,” where registered land is held in common amongst a number of community members, and the allocation and management of individual plots is left to community organizations, rather than individual members.²³ This model allows for the elimination of costly overhead during the registration process.²⁴ This communal holding of land allows for covering larger areas quickly during the registration process and thus enables the government to focus on issues of how to resolve community conflicts.²⁵ Communities, such as those in Angola, the Democratic Republic of Congo, Ghana, Mozambique, Tanzania, and Zambia, with large areas of communal land are often targets for foreign investment and land grabs due to the historically unregistered nature of this land.²⁶

Further, communal registration can also have the effect of maintaining

18. See Rural Dev. Div., Food & Agric. Org. U.N. [FAO], *Land Tenure and Rural Development*, at 7, ISBN 92-5-104846-0 (2002), <ftp://ftp.fao.org/docrep/fao/005/y4307E/y4307E00.pdf>.

19. See generally FRANK F.K. BYAMUGISHA, *SECURING AFRICA’S LAND FOR SHARED PROSPERITY* (The World Bank, ed. 2013).

20. *Id.* at 55.

21. *Id.* at 28-29.

22. *Id.* at 29.

23. *Id.* at 55.

24. *Id.*

25. *Id.*

26. *Id.* at 34.

cultural practices and prejudices that do not contribute to greater agricultural productivity. For example, in many parts of the world 70 percent of the farmers are women, but landownership rights are still limited to men.²⁷ There is progress being made on this front, and ‘enlightened’ communal registration can actually be a force for positive change. Countries such as Ethiopia and Rwanda have set the standard for implementation of programs which elevate women’s landownership rights to the same level as men and include provisions that establish inheritance rights as well.²⁸ These legal provisions are often accompanied by educational programs that increase the productivity of women farmers²⁹ Additional issues of land grabs, land vulnerability, insufficient land administration, corruption, as well as low capacity and high demand for legal professionals are continuing barriers to landownership rights.³⁰ These issues result in a general lack of reliable, accessible, government-sanctioned administrative structures that allow individuals to document and transfer land efficiently.³¹ As the administration of registration is a costly, lengthy, and understaffed process, land remains unregistered and is then vulnerable to land grabs by investors who are subject to a weak level of governance, causing violations of local agro-investment principles and dispossession of local communities. Such a situation indicates a need for stronger legal systems to facilitate the registration of land so that land ownership rights may be preserved and enforced.

B. Legal System Structure

Additionally, the rule of law itself is unreliable in many of these countries, making it difficult to enter into the kinds of input supply and marketing agreements that farmers in developed markets may take for granted. For example, in Kenya, the land laws require the use of alternative dispute resolution “as far as possible”³² and encourages the settling of land disputes “through recognized local community initiatives,”³³ leading to resolution (or lack thereof) outside the legal system, which undoubtedly yields unpredictable results.³⁴ Further, the severity of disputes based on land borders and the sale of goods varies widely—from simple arguments between neighbors to wars fought over land borders to pursuing tribal arbitration rather than judgment from a court.³⁵ In the event that such disputes are sought to

27. *See id.* at 89.

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

32. *Id.* at 23 (citing CONSTITUTION (2009) (Kenya)).

33. *Id.* at 23 (citing CONSTITUTION (2010) (Kenya)).

34. *Id.*

35. *See id.* at 98.

be settled in in a justice or court system, there are issues of accessibility, functionality, trustworthiness, and understanding.³⁶ For residents of rural communities, the location of the courts in urban areas present issues of physical access.³⁷ Access to the court system to enforce existing statutory rights can be an additional challenge, as courts are understaffed and under-resourced.³⁸ For many, solving the conflict without legal assistance is timelier than attempting legal resolution as the courts in Sub-Saharan Africa experience a number of backlogs, which are only compounded by undertrained judges.³⁹ There is also a concern of corruption in the legal system and a general level of societal suspicion of pursuing formal legal remedies.⁴⁰ It is possible that this corruption and suspicion continues due to a lack of understanding regarding legal processes and options available to those who wish to protect their rights.

C. Access to Agricultural Technology and Agronomic Information

Further compounding the lack of reliable land ownership structures and access to functional legal systems, farmers in developing markets often do not have access to some of the modern technologies that farmers in the developed world have used for years, including improved seed, fertilizer, and mechanization.⁴¹ The initial challenge is that the regulation and deployment of technology varies widely across the developing world, from the lack of a functioning, science-based regulatory system in many countries, to the accompanying absence of an enforceable scheme of intellectual property rights and protection. For example, genetically modified (Roundup Ready) soybeans, which are planted on over 90 percent of the U.S. soybean acres,⁴² are rarely found outside the U.S. and Brazil, despite their value. The regulatory processes for approving this technology and the intellectual property protection structures that would protect it, are not in place in many developing countries and thus, those technologies are not deployed to farmers. An additional barrier to access is the absence of agronomic support farmers need in order to understand and properly deploy modern agricultural

36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.* at 99-101.

40. *Id.* at 98 – 99.

41. Idah Sithole-Niang, Board Chair, African Agric. Tech. Found. (AATF), Presentation at Workshop on Promoting Agricultural Biotechnology for Sustainable Development in Africa: AATF – Facilitating Access to Agricultural Technology for Smallholder Farmers in Africa (Feb. 25-26, 2014).

42. See *Recent Trends in GE Adoption*, USDA: ECON. RES. SERV., <http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx>.

technologies. Thus, there is a need for educational services to provide not only technology information but information on the legal issues surrounding the application of such technology, including stewardship of technologies such as insect resistance. The absence of sound agronomic advice leaves many farmers in the developing world unable to take full advantage of the potential of their land. Organizations such as the African Agricultural Technology Foundation, however, are beginning to fund research projects that are directed at the specific technology needs of Sub-Saharan Africa and act as a liaison between scientists and farmers so that technology may be implemented within rural communities.⁴³ Specific projects that center on improvements to indigenous crops and the regulatory systems to protect such improvements may increase acceptance by tribal groups and a spark a movement toward implementation of technology.⁴⁴ Further projects supported by USAID, private industry, and academia may seek to fill the gap in educational services provided to farmers in developing countries.⁴⁵

D. Access to Markets

Finally, as roughly 80% of farmers in Asia and Sub-Saharan Africa are ‘smallholders’ with fewer than ten Ha’s (twenty-five acres) of land, there are number of unique challenges associated with the size of these farms.⁴⁶ For instance, as 75% of the world’s food is supplied by only twelve plants⁴⁷ and five animal species, the potential of market fluctuations disproportionately impacts smallholders, versus large-scale farms that have the capital to absorb such shocks.⁴⁸ Moreover, smallholder farmers most likely lack the economic power to negotiate favorable pricing on inputs, finance the cost of those inputs until harvest, and store their harvest until the optimal time to market that harvest.

Smallholders, however, may enjoy unique opportunities. Specialty crops are defined as “fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture).”⁴⁹ These crops are used for food, medicinal

43. Sithole-Niang, *supra* note 41.

44. *Id.*

45. *Id.*

46. FOOD & AGRIC. ORG. U.N. [FAO], SMALLHOLDERS AND FAMILY FARMERS, 1 (2012), http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf.

47. Common plants that make this list include: plantains, yams, sorghum, sweet potatoes, soybeans, cassava, potatoes, rice, wheat and corn. Eric Goldschein, *The 10 Most Important Crops in the World*, BUS. INSIDER (Sept. 20, 2011 8: 26 PM), <http://www.businessinsider.com/10-crops-that-feed-the-world-2011-9?op=1>.

48. *Smallholders and Family Farmers*, *supra* note 46, at 1 (stating animals listed often include cattle, pigs, sheep, goats, and chickens).

49. *What is a Specialty Crop?*, USDA: AGRIC. MARKETING SERV.,

purposes, and/or aesthetic gratification.⁵⁰ There is increasing global demand for specialty crops as the developed world public explores new and unique sources for everything from fair trade-sourced coffee beans, to ancient grains such as quinoa, to herbal remedies used in homeopathic medicines. This global demand is creating a variety of potential high-value export markets for smallholders in addition to their more traditional local food markets.

A common solution to both the challenges and the opportunities faced by smallholders in the developing world is the formation of agricultural cooperatives: collectively-owned legal entities that allow smallholders to enjoy many of the benefits of larger operations: mechanization, bargaining power with input providers and output purchasers, warehousing, marketing capabilities, and agronomic support. This is a solution that throughout the 20th century in the United States proved critical in raising the bargaining power of individual farmers and helping them affordably access key inputs, equipment, and services.⁵¹ In developing countries, though, cooperatives may struggle to achieve broad acceptance without a clear legal framework providing for such entities.⁵²

IV. WHAT ARE THE LEGAL ISSUES FACING FARMERS IN THE DEVELOPED WORLD?

It is tempting to focus solely on the relatively low productivity levels of

<http://www.ams.usda.gov/services/grants/scbgp/specialty-crop> (last visited Aug. 19, 2016).

50. *Id.*

51. *See About Co-ops*, NAT'L COUNCIL OF FARMERS COOPS., <http://ncfc.org/about-co-ops/> (last visited Aug. 19, 2016).

52. *Id.* The author further notes that for example, in Africa, as countries within the continent began to liberalize, many markets followed no rules, leaving rural communities crying for government support. In recent years, such support has increased, but the regulatory systems are not exhaustive and there is a continuing need for a regulatory system which is appropriate but allows for freedom of action amongst the cooperative members. The need for leaders within the cooperative who are entrepreneurial and seek to have a member driven and owned cooperative is real. For many cooperatives, there is a lack of incentives to attract such qualified leadership which strains the transparency, accountability, and member participation of the cooperative. Further there are challenges amongst the membership as there are more members who are riding on the coattails of the genuine members to receive the benefits of market access. Further the attracting of such genuine members is lacking, as is the member education and training. These members expect a high rate of return for the membership but this is challenged by market competition and lack of incentives for participating in a high value share ownership of the cooperative.

In order for these challenges to be met, the legal framework for cooperatives must be reviewed with guidance from the members so that the response to the needs of the membership can be achieved. Additionally, the government controls in place require adjustment and reduction so that resources can be utilized by the membership. Lessons should be taken from the addressing of these issues so that the next generation of cooperatives can be established and sustained within the developing world.

farmers in the developing world, but there are also significant challenges facing farmers in the developed world in the 21st century. Even if one (incorrectly, in our view) assumed that the most advanced farmers needed only to maintain current levels of productivity while the rest of the world catches up, there are a number of daunting challenges ahead. While the legal system in the United States is well established for supporting agriculture in a broad sense, there are aspects of the legal system that should be reexamined as agriculture continues to evolve. Succession planning in light of generational changes in rural America; science-based regulatory frameworks, as consumers demand additional food labeling; and land-use rights, as they intersect with a growing understanding of the environmental impact of agriculture, all represent areas of the law ripe for fresh thinking.

A. *Generational Change is Underway in U.S. Agriculture*

The average age of farmers in the United States today is fifty-eight years old.⁵³ Since 2010, there has been an increase of 30 percent in farmers over the age of seventy, and a 20 percent decrease in farmers under the age of twenty-five.⁵⁴ Not surprisingly, the demographics of legal practitioners in rural areas reflects this same dynamic. The average age in 2005 of the over 1 million attorneys in the United States was forty-nine years, while the average age of those practicing in rural areas was closer to retirement age.⁵⁵ These statistics are accompanied by the fact that there are only 2 percent of small law practices in rural areas.⁵⁶ With an aging population of both farmers and attorneys, there are several issues affecting both groups individually and jointly, starting with the fact that in Iowa alone, nearly 60 percent of farm ground is expected to change hands in the next twenty years.⁵⁷ Land ownership is going to change, whether by inheritance, tenancy, or purchase. Clearly, there is a corresponding need for attorneys with an understanding of the formal and informal legal aspects of succession planning, lease agreements, and purchase of title to property.

53. NAT'L AGRIC. STAT. SERV., USDA, ACH 12-3, FARM DEMOGRAPHICS: U.S. FARMERS BY GENDER, AGE, RACE, ETHNICITY, AND MORE 2 (2014), https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farm_Demographics/Highlights_Farm_Demographics.pdf.

54. *Id.* at 3.

55. Lorelei Laird, *In rural America, There are Job Opportunities and a Need for Lawyers*, ABA J. (Oct. 1, 2014 5:40 AM), http://www.abajournal.com/magazine/article/too_many_lawyers_not_here_in_rural_america_lawyers_are_few_and_far_between.

56. *Id.*

57. Donnelle Eller, *An Estimated \$150 Billion in Iowa Farmland Could Change Hands over Next Two Decades*, DES MOINES REG. (Jan. 24, 2014 12: 31 PM), <http://blogs.desmoinesregister.com/dmr/index.php/2014/01/24/an-estimated-150-billion-in-iowa-farmland-could-change-hands-over-next-two-decades>.

The next generation of farmers is being cultivated and supported in many substantive ways. Programs such as the Beginning Farmer and Rancher Development Program of National Institute for Food and Agriculture within the USDA are directed at providing tools and education to those interested in farming or just getting started as a beginning farmer.⁵⁸ Resources available through this program include learning how to plan, manage, market, and expand farms as well as finding financial support and opportunities.⁵⁹ On the legal side, the Iowa State Bar Association has developed a Rural Practice Committee aimed at placing current law students with attorneys with the hope that they remain after graduation.⁶⁰

It is not uncommon that lease agreements or purchase agreements are oral contracts that are sealed by a handshake between neighbors. In Iowa, oral leases are still enforceable but not for a term exceeding one year.⁶¹ However, farm leases automatically renew unless there is a notice of termination served by September 1, prior to the end of the lease year and must fix the termination of the lease on the following March 1.⁶² The nuances of farm leasing and the parties involved are complicated and must be understood by new attorneys as they enter the so-called “rural practice.”

Under the American Bar Association’s Model Rules of Professional Conduct, attorneys who are solo practitioners are encouraged to prepare a plan that designates another competent attorney to “review client files, notify each client . . . and determine if there is a need for immediate protective action” in the event of the solo practitioner’s death or disability.⁶³ As rural attorneys age, the body of agriculture-specific knowledge they’ve accumulated over their careers is at risk of being lost.

These challenges, of course, represent potential opportunities in rural communities, particularly in a time when the markets for attorneys in urban areas

58. *Beginning Farmers and Ranchers Development Program (BFRDP)*, USDA: NAT’L INST. FOOD & AGRIC., <https://nifa.usda.gov/program/beginning-farmer-and-rancher-development-program-bfrdp> (last visited Aug. 19, 2016).

59. *Getting Started*, USDA: NEW FARMERS, <https://newfarmers.usda.gov/new-farmers> (last visited Aug. 19, 2016).

60. *ISBA Rural Practice Committee*, IOWA ST. B. ASS’N, <http://www.iowabar.org/group/RuralPractice> (last visited Aug. 19, 2016).

61. EXTENSION & OUTREACH, IOWA STATE UNIV., FILE C2-06, LEASE TERMINATION AND OTHER LEGAL CONSIDERATIONS FOR LEASE CONTRACTS 1 (2014), <https://www.extension.iastate.edu/agdm/wholefarm/pdf/c2-06.pdf>.

62. *Id.*

63. MODEL RULES OF PROF’L CONDUCT r. 1.3 cmt. 5 (AM. BAR ASS’N 1983).

are more saturated.⁶⁴ Prospective law students and new lawyers alike need to be made aware of the opportunities associated with the generational change in farming outlined above. Just as important, those lawyers and law students who take advantage of these opportunities should have the same kinds of resources available to them that their farmer clients have to ensure their success.

B. Access to Technology and Information

The rise in alternative energy and the demand for renewable fuels will also influence agriculture as new technologies will be developed to maximize the value of energy crops. For instance, corn stover can be used to produce cellulosic ethanol that can be incorporated into gasoline.⁶⁵ As the efficiency of cellulosic ethanol production increases, the demand for corn stover as well as other cellulose-rich crops such as miscanthus and jatropha will most likely increase. Breeders will develop new varieties that optimize the balance of grain and stover in corn and maximize the production of cellulose in non-grain crops. New cultivation and harvesting technologies that enable interseeding of cellulose-rich crops could certainly follow. All of these developments will likely be accompanied by new regulatory schemes and intellectual property rights that will impact the ability of farmers to deploy them at a reasonable cost.

C. Access to Markets

Farmers in the U.S. depend on access to specific markets for their crops. Most U.S. farm acres are devoted to commodity grain production, both for domestic and export consumption; however, fruit and vegetables, as well as specialty crops such as sugar beets and organic food represent increasingly important markets for U.S. farm profitability. But the ability of farmers to sell into any market, whether commodity grains for export or organic fruits and vegetables for domestic consumption, depends on clear, science-based regulatory frameworks that enable farmers and consumers alike to get the value of the crops they produce and purchase.

Existing regulatory frameworks around the world are under significant stress with the introduction of new biotech traits and new combinations of existing traits.

64. See generally AM. BAR. ASS'N, ABA NATIONAL LAWYER POPULATION SURVEY (2015), http://www.americanbar.org/content/dam/aba/administrative/market_research/national-lawyer-population-by-state-2005-2015.authcheckdam.pdf (noting that the number of licensed attorneys in the United States has increased 17.7% in the past ten years).

65. See *DuPont Cellulosic Ethanol Facility*, CULTIVATION CORRIDOR, <http://www.cultivationcorridor.org/dupont-cellulosic-ethanol-facility/> (last visited Aug. 19, 2016).

Internationally, developers of new seed-delivered technologies face a patchwork quilt of restrictions on the import of grain derived from those seeds. Even when a new seed trait is approved for cultivation and consumption in the U.S., it must be approved for import in the key export markets for U.S. grain.⁶⁶ Those approvals are rarely issued in a coordinated fashion, leaving seed companies, growers, and grain processors in potentially untenable positions.⁶⁷ Lawyers in the U.S. and abroad need to work closely with regulators and other stakeholders to create a more synchronous set of regulations that depend on consistent application of scientific principles, while respecting each country's sovereignty, so that U.S. growers can have consistent access to key export markets.

Domestically, organic farmers enjoy a significant premium for crops that can be marketed as "organic" or "non-GMO." The definition and implementation of those terms in modern agriculture, however, are a challenge. The USDA has a definition of "organic" that focuses on the process of production of the labeled product, not the content.⁶⁸ The term "non-GMO" conveys a degree of comfort to certain consumers, but that comfort is not founded on any scientific data.⁶⁹ Arriving at a scientifically accurate approach to helping consumers make informed choices about the food they consume is an ongoing challenge being taken up by the USDA. In response to the recent Vermont law mandating labeling of foods containing GMO products, Secretary of Agriculture Tom Vilsack has invited those in the food industry, consumer groups, and other stakeholders to meet with the purpose of developing a compromise and solution to the labeling issues surrounding GMOs.⁷⁰ Whatever the outcome of those efforts, it will be up to lawyers to ensure that these diverse stakeholders' interests are all reflected in the resulting regulatory framework.

66. See *Grain Marketing and Export Approvals*, PIONEER, <https://www.pioneer.com/home/site/us/products/stewardship/grain-marketing/> (last visited Aug. 19, 2016).

67. See e.g., the recent Syngenta class action suit, which arose out of the commercialization of Syngenta's insect control trait in corn, VIP-Terra, before it was approved for import into China.

68. *Organic Labeling*, USDA: AGRIC. MARKETING SERV., <http://www.ams.usda.gov/rules-regulations/organic/labeling> (last visited Aug. 19, 2016).

69. *Can GMOs Be Used in Organic Products?*, USDA: AGRIC. MARKETING SERV., <http://www.ams.usda.gov/publications/content/can-gmos-be-used-organic-products> (last visited Aug. 19, 2016).

70. Christopher Doering, *Vilsack Calls Opposing Sides of GMO Labeling Debate to the Table*, DES MOINES REG. (Dec. 19, 2015 4:19 PM), <http://www.desmoinesregister.com/story/money/agriculture/2015/12/18/vilsack-calls-opposing-sides-gmo-labeling-debate-table/77500910/>.

D. Sustainability Needs and Implementation

Climate change and the accompanying new and unpredictable weather patterns are producing new challenges for farmers in the prime crop-growing parts of the Northern Hemisphere. Specifically the increased presence of greenhouse gases in the atmosphere creates radiative forcing effects that lead to an increase in the earth's temperature.⁷¹ Such an increase in temperature can lengthen growing seasons and change planting schedules and even cropping patterns.⁷² Temperature increase can also reduce yields, as new, warmer weather plant diseases, weeds, and insects begin to thrive in traditional row-crop climates.⁷³ Further, the application of additional fertilizers, herbicides, and pesticides in the pursuit of maximized yields can, over time, exacerbate changing atmospheric conditions.⁷⁴ Agriculture is now widely regarded as one of the largest non-point sources for atmospheric and water pollution.⁷⁵

Not surprisingly, sustainability is becoming a key factor in U.S. farmers' ongoing freedom to operate. As water becomes a scarcer resource, as environmental impacts of inputs such as nitrogen fertilizer become better understood and as pests continue to evolve, the pressure is increasing on agriculture to not only continue to produce at current levels, but to do so with a reduced environmental footprint. The USDA and EPA advocate for a number of "best management practices," such as increased use of cover crops, reduced fertilizer application, implementation of buffer strips, contour and no-till plowing, and better manure management strategies.⁷⁶ However, as we have seen in recent developments, external stakeholders are beginning to resort to the court system to

71. See *Climate Forcings and Global Warming*, NASA, <http://earthobservatory.nasa.gov/Features/EnergyBalance/page7.php> (last visited Aug. 19, 2016).

72. See *How Will Global Warming Change Earth?*, NASA, <http://earthobservatory.nasa.gov/Features/GlobalWarming/page6.php> (last visited Aug. 19, 2016).

73. See *Sources of Greenhouse Gas Emissions*, EPA, <http://www3.epa.gov/climatechange/ghgemissions/sources/agriculture.html> (last visited Aug. 19, 2016).

74. *Id.*; see also *Nonpoint Source: Agriculture*, EPA, <http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/nonpoint-source-agriculture> (last visited Aug. 19, 2016).

75. See WERNER EUGSTER & NINA BUCHMANN, INST. OF AGRIC. SCIS., ETH, GREENHOUSES GAS EMISSIONS FROM AGRICULTURAL SOILS—A GLOBAL PERSPECTIVE 7 (2011), http://www.fibl.org/fileadmin/documents/de/news/2012/calas/5_CaLas2011_Eugster-Buchmann.pdf; *Polluted Runoff: Nonpoint Source Pollution*, EPA, <http://water.epa.gov/polwaste/nps/agriculture.cfm> (Aug. 19, 2016).

76. See generally A. Asseng et al., *Rising Temperatures Reduce Global Wheat Production*, 5 NAT. CLIMATE CHANGE 143 (2014), <http://www.nature.com/nclimate/journal/v5/n2/full/nclimate2470.html>.

compel changes in farm practices. The lawsuit recently filed in the U.S. District Court by the Board of Water Trustees for the City of Des Moines, asserting a citizen enforcement action under the Clean Water Act against three counties for their nitrate pollution discharge into the Raccoon River and failure to obtain a National Pollution Discharge Elimination System Permit, serves as an example of non-traditional entities intervening in agricultural decisions in the name of sustainability.⁷⁷ Further, the proposed legislation of the Safe and Accurate Food Labeling Act of 2015 reflects an increased public demand for agricultural products to be produced with sustainable and transparent practices.⁷⁸ This level of involvement in agricultural practices by such non-traditional groups certainly highlights the need for attorneys who understand the complex interactions between agriculture and the environment and those who are willing to moderate and mediate the discussion between stakeholders with diverse interests.

V. CONCLUSION

Each of the challenges outlined above represents a specific set of issues that must be addressed in the law, regardless of whether the country is developing or developed. For example:

1. There must be legal structures in place that provide for clear rights regarding land ownership, transfer, and inheritance. These rights must be available and enforceable without regard to gender, class, or political affiliation.
2. Farmers and others involved in agriculture need to be able to rely on the rule of law in entering into and enforcing contracts relevant to their operations.
3. The development of new technologies and the deployment of those technologies in the markets where they are needed most across global agricultural system, requires a strong system for protection of intellectual property, rather than a patchwork quilt of IP rights in agricultural markets around the world.
4. In a world of global markets for agricultural commodities, new technologies are subject to approval in countries where they will be cultivated, but also where the products of those technologies will be imported. A science-based regulatory system that is robust,

77. *See generally* Complaint at 1, Bd. of Water Works v. Sac Cnty. Bd. of Supervisors, No. 5: 15-cv-04020-MWB (N.D. Iowa 2015).

78. Safe and Accurate Food Labeling Act of 2015, H.R. 1599, 114th Cong. (1st Sess. 2015).

predictable, and transparent to all stakeholders is essential to this process.

5. In countries where they do not already exist, legal structures need to be developed that enable farmers to form agricultural cooperatives for input financing and purchasing, warehousing and marketing their crops.
6. Regulation of farming practices must balance the needs of farmers to make the best agronomic decisions for their operations with the demands of broader society for environmental sensitivity.

Lawyers are uniquely qualified to develop the legal structures outlined above, to educate society and their clients about their legal rights and responsibilities under these structures, and ultimately, to ensure access to these rights for all. Lawyers can (and must) help develop the law, educate the public, and seek enforcement of legal rights in a variety of practice areas, including private practice firms, in-house legal departments, and government agencies, as well as in non-practicing roles as legislators, regulators, and businesspeople.

Law schools in the U.S. are an essential part of this process. Law schools must continue to develop curricula that address the entire spectrum of legal issues that will be faced by U.S. farmers in the next half-century. In addition, lawyers and potential lawyers around the world look to their colleagues in the U.S. to understand what kinds of legal structures they need to advocate for in order to help farmers in their own countries become more productive. U.S. law schools must continue to expand their offerings to students and practicing lawyers from around the world, including: regular ag-related seminars and CLE's; conferences on domestic and international legal issues; and exchange programs for faculty and students from around the world.

All lawyers in ag-law practices, lawyers working in government or agriculture business-related roles, and the faculty and staff of law schools with ag-law and related curricula have opportunities to be a part of driving the agenda outlined in this paper. Indeed, the challenge is so great, and the consequences of failure are so catastrophic, there is little choice whether to participate. If we are successful, however, the legal profession will be the driver of the next Green Revolution.