Wisdom in the earth: an examination of the history of intellectual property rights in plants and seeds

by

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DEDICATION

To my family for generous and tolerant support during this wonderful adventure and for all those who find their place in this world in the joy of learning.

TABLE OF CONTENTS

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I would like to thank the Iowa State University History Department faculty and staff. I first visited Iowa State University in 1978 as a prospective freshman. Those days were defined by excitement over a seemingly limitless future, which is a joy and privilege of youth. I returned to Iowa State University in 2005, after nearly twenty years in the practice of law. My second visit, this time as a prospective middle-aged graduate student, was defined by uncertainty and trepidation as I sat down to discuss my goals with a professor who was easily ten years my junior. The rigors of law school and graduate school are similar in many respects but they are taught and written in different tongues and with different objectives. A law school is a trade school and a law degree is vocational. My concerns about whether I really belonged in higher academia were short-lived, however, as the entire faculty proved to be both welcoming and encouraging in my desire to research and write a dissertation on a topic of legal and political history. In the years of class work and research since my return to school, I rediscovered the excitement of learning. To all of you, particularly my committee chair, Pamela Riney-Kehrberg, and Professor Charles Dobbs, I thank you for friendship, encouragement and guidance. My years at Iowa State gave me a new appreciation and a deep respect for the precision and expertise reflected in your work. I am honored to join your ranks and to have the privilege of calling you peers.

ABSTRACT

Economic influences played a dominant role in design and implementation of intellectual property laws and agriculture policy in America. These influences have helped shape the values and goals of people who created, administered and interpreted patent laws throughout the twentieth century, as well as those who promoted agriculture in America and later in the developing world. The historical motivations driving these two institutions help explain how and why plants entered the realm of intellectual property and why international aid organizations defined and measured progress in economic terms. Events that serve to illustrate these dynamics include the Plant Patent Act of 1930, the Plant Variety Protection Act of 1970, the Rockefeller Foundation's agricultural outreach program in Mexico and the Foundation's formation - in cooperation with the Word Bank, the Food and Agriculture Organization and the Ford Foundation - of the Consultative Group on International Agricultural Resources (CGIAR). Review of documents particular to these events reveals a consistent philosophy of progress through profit that informed debate over use of intellectual property rights in plants. As aid organizations such as the Rockefeller Foundation and CGIAR embraced modern agriculture as a tool to help the developing world, they inherited and sometimes perpetuated this economic philosophy. The biotechnology revolution of the 1980's enhanced the already valuable seed collections held by these institutions and forced them to reevaluate their traditional policy of free sharing and address if and how seeds should be protected and used to generate income and how profit from such activities should be allocated. The solutions to these difficult issues and the historical influences that shaped

them help drive the contemporary debate on topics such as GMO food, environmental safety and cultural preservation.

INTRODUCTION

Twenty-first century agriculture is rife with debate about the way the industrial world produces food. The debate swirls around diverse issues, which reflect genuine concerns for any rational and compassionate person but which offer no easy compromises. Environmental safety and human health are juxtaposed against the promise of abundant and nourishing food produced under varied and sometimes hostile conditions. The rights of small farmers to perpetuate their culture and traditions are juxtaposed against the opportunity for larger progressive farmers to usher in economic growth through more efficient and viable methods of food production. The morality of commercializing thousands of years of common labor and free sharing of natural resources is juxtaposed against the need to encourage entrepreneurs to invest money and years of research in the hope of producing a valuable new product. As is often the case when pragmatism meets idealism, advocates on both sides struggle to find a balance.[1]

Two common themes in this long running debate are money and power. As the science of agriculture becomes more complex and costly, the range of active participants (like the seeds they produce) becomes more narrow and uniform, resulting in

[1] Many books and articles touch on this topic ranging from technical scientific reviews to general interest news articles. For introductory works relating to genetics, the environment and food safety, see, e.g., Larry D. Kier and Jay S. Petrick, "Safety assessment considerations for food and feed derived from plants with genetic modifications that modulate endogenous gene expression and pathways," *Food and Chemical Toxology* 46, no. 8 (2008): 2591 – 2608; Tim Lang, "Food Control or Food Democracy: Re-engaging nutrition with society and the environment," *Public Health Nutrition* 8 (2005): 730-737; Nicole Dyer, "Techno Food: Genetically Modified Crops cook up a sizzling debate," *Science World*, Vol. 58, no. 6 (November 26, 2001): 16; Lisa Turner, "Weird Science," *Better Nutrition*, Vol. 63, no.6 (June 2001): 40. For a review of issues relating to indigenous cultures, modern farming and intellectual property, see, e.g., David A. Cleveland and Stephen C. Murray, "The World's Crop Genetic Resources and the Rights of Indigenous Farmers," *Current Anthropology*, Vol. 38, No. 4 (1997), 479 and Michael F. Brown, *Who Owns Native Culture*?, Cambridge: Harvard University Press (2003).

consolidation of assets critical to the world food supply.[2] Technology has continually funneled agriculture into a commercial and industrial model, aided by the availability of private economic rights, including intellectual property rights, in plants and seeds. The science of plant production has also necessitated greater attention to the global environment, from which comes the raw materials that serve as ingredients for modified and improved crops. The need to preserve and protect the very environmental diversity that modern agriculture threatens to condense and unify demands balance between the long and short- term goals of modern agriculture as well as the proper commitment and participation of private industry, governments, philanthropies, academia and human rights organizations.[3]

Advancements in biotechnology and genetic modification thrust these issues into a highly public spotlight in recent decades. Media coverage, sometimes sensational, has brought this issue to a broad public audience, much of which is confronting these issues for the first time. The historical perceptions of both intellectual property and agriculture are instructive in fully understanding, perhaps even predicting, the thought processes that will likely guide what is for many a case of first impression. These well-established perceptions pre-date the current debate by over two hundred years and carry with them a

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[2] According to ETC Group, a non-profit farm advocacy organization (f/k/a Rural Advancement Foundation International), the top 10 seed corporations accounted for 55% of the commercial seed market worldwide based on 2006 revenues (up from 37% in 1996), including 64% of the proprietary seed market, with almost half being concentrated in the top four companies – Monsanto (U.S.), Dupont (U.S.), Syngenta (Switzerland) and Groupe Limagrain (France). "World's Top Ten Seed Companies," ETC Group, April 30, 2007 http://www.etcgroup.org/en/node/615 (accessed December 13, 2010).

[3] An example of such efforts is the United Nations Conference on Environment and Development, also known as Earth Summit, which convened in Rio de Janeiro in 1992 and produced the International Convention on Biodiversity. The convention represented an effort to dedicate international resources to management and preservation of biological diversity that the signatories viewed as critical to human survival but that, unlike the ozone layer or the oceans, rested mostly within sovereign borders. See, Timothy Swanson, "Why Is There a Biodiversity Convention? The International Interest in Centralized Development Planning," *International Affairs*, vol. 75, no. 2 (April 1999). See also, Simone Bilderbeek, "Biodiversity as Political Game," *Politics and the Life Sciences*, vol. 12, no. 2 (August 1993).

long history of economic pragmatism as a central tenet in determining how we farm and how we view unique plants and seeds.

Patents and agriculture both pre-date the United States of America, the former by several hundred years and the latter by several thousand.[4] Machines, whether simple or complex, have been part agriculture ever since men and women used simple tools to break the earth for planting. Patents and plants, however, represent a far more recent paradigm. A patent is an economic tool used to encourage or entice new and useful information into the public domain in exchange for a legally enforceable claim of exclusivity for a number of years.[5] Patents, like the machines they protected, were a pragmatic invention designed to promote progress in a newly independent America. Agriculture, by contrast, was an art as well as a science and its primary input, the seed, was a self-replicating product of nature. Agriculture existed within a complex cultural dynamic of cooperation and sharing that encompassed both occupation and social standing. Agriculture gave pre-industrial America its economic teeth but it also represented something more than the value of a harvest. Americans viewed a man or woman born and bred on the farm as a national asset. For many people, patents represented America's economic progress while agriculture was its muse. This contrast in views helped to keep the two institutions at arms length in America for well over 150 years. Industrial machines dominated the patent books in the early years of the new American nation while invention and plants remained conceptually segregated until well

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[4] For a concise overview of patent laws, including examples of European patent laws that informed and guided patent policy in the United States, see, "Invention and the Patent System," Printed for the use of the Joint Economic Committee, Congress of the United States, 88th Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, 1964).

[5] The patent laws of the United States are found in Title 35 of the United States Code. See also, Roger E. Schechter and John R. Thomas, *Intellectual Property: The Law of Copyrights, Patents and Trademarks* (St. Paul: Thomson West, 2003), 283.

into the twentieth century. Patents focused on man-made machines and processes while agriculture focused on nature.[6] To be sure, farmers manipulated nature when they domesticated crops and animals. Both government and science, however, viewed such actions as guiding a natural process rather than building something from nothing through a creative process.[7] Farmers labored mightily but nature did the creating.

These distinctions did not go to the ultimate goal of promoting progress, however. The same machine of government that created patents as a tool for economic progress worked to promote similar results in agriculture as well. In the latter case, progress often meant promotion and expansion of knowledge to the end of more profitable farming. The government achieved this goal by giving away seeds and the knowledge they contained rather than 'buying' knowledge with exclusivity.[8] In that sense, patents and agriculture served the same purpose, achieved by different means. The assumptions about invention and nature changed the strategy but not the goal.

These long-held assumptions changed in the late nineteenth and early twentieth century as the art of plant breeding evolved from a natural process of seed selection based on appearance to a formalized process designed to produce specific traits that were both unique and valuable. Whether produced asexually by grafting or sexually by cross pollination, these new plant varieties offered entree into the world of patents on the

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[6] "Patent Injustice," *World's Work*, 61:40-3 (January, 1932), 40.

[7] The United States Supreme Court expressed this sentiment in the famous patent case in which Alexander Bell sought to defend his invention of the telephone. The court drew a clear distinction between a force of nature (electricity) and the use of that force within an invention (the telephone). See, *Dolbear v. American Bell Telephone Company*, 126 US 1, 532-33 (1887). Even after enactment of the first plant patent law the Court adhered to the general rule that phenomena of nature belonged freely to all mankind and that invention came only after application of the law of nature to a new and useful end. See, *Funk Brothers Seed Company v. Kalo Inoculant Company,* 333 U.S. 127 (1948).

[8] For an excellent summary of seed distribution programs within the federal government, see, Jack Ralph Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000* (Cambridge: Cambridge University Press, 1988).

grounds that human creativity and intervention had altered nature's process. Human intervention produced a better plant. This intervention was expensive and time consuming. Such efforts needed legally enforceable exclusivity that patent laws granted. The result was passage by Congress of the Plant Patent Act of 1930, which made asexually produced plants eligible for patent protection.[9]

The basic philosophies behind patent rights in plants became critical as the use of plant breeding expanded and became a key component of agricultural aid to the developing world. Directed breeding offered opportunity to establish plant varieties designed to thrive in specific parts of the world. Whether it was higher yields, resistance to drought or sturdier structure against the elements, custom bred plants could be introduced in specific parts of the world to improve local agriculture. American philanthropy joined with government-sponsored international aid to bring improved farming methods to the developing world.[10] The goals were many and varied. At its most basic, agricultural aid represented a humanitarian effort to feed a hungry world. It also represented a stop-gap measure to buy time while the industrial world pursued the related goal of population control. In the post war era, agricultural aid was also one of many efforts to export market oriented capitalism as a bulwark against communism.[11] Despite the many goals of agricultural aid, the goal of 'improving' agriculture was anything but simple. The American model of agriculture involved an entire package of inputs that included extensive use of pesticides, fertilizers and irrigation. Improving agriculture in

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[9] 71st Congress, 2nd Sess. Congressional Record vol. 72, pt. 8 (13 May 1930): 8866, codified at US Code 35 (2000) §§ 161-164.

[10] This dissertation utilizes the Rockefeller Foundation programs as an example. See, Edward H. Berman, *The Influence of the Carnegie, Ford and Rockefeller Foundations on American Foreign Policy: The Ideology of Philanthropy* (Albany: State University of New York Press, 1983). See also, Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-1953," *Social Studies of Science*, Vol. 16, No. 3 (Aug., 1986).

[11] Ibid.

the developing world meant reorienting local rural culture to excess production and greater market participation. This reorientation favored larger farmers who had the resources and willingness to make dramatic changes in their way of life.[12]

Another disturbing result of agricultural aid was reduction in genetic diversity. As more and more custom plant varieties claimed agricultural soil, crops became increasingly uniform in their genetic profile. This magnified their weaknesses as well as their strengths, making the ravages of disease more widespread. Plant uniformity was a fact of life in any location where custom bred plant varieties were employed, but hybrid plants posed a greater problem in the developing world. By virtue of its climate and unaltered landscape, the developing world served as home to the vast majority of genetic diversity critical to plant breeding. Raw germplasm from the developing world was a critical starting point to plant improvement efforts. As a result, agricultural improvement in the developing world worked against its own interests and raised serious questions about the need to preserve biodiversity.[13] Throughout the twentieth century and into the twenty-first, the reach of intellectual property protection expanded to include open pollinated plants, bacteria and ultimately genetic information.[14] With each breakthrough came a new round of debate over myriad and complex issues, including health, safety, sustainability, human rights, cultural preservation and ethics. In attempting to sort

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[12] These philosophies are preserved in the Rockefeller Foundation Archives materials relating to its program in Mexico as well as its pivotal role in formation of the Consultative Group on International Agricultural Resources (CGIAR), discussed in Chapter 3.

[13] One of the earliest agenda items of the CGIAR was the need for collection and preservation of biodiversity. See, "TAC Report on Proposal to Establish a Network of Genetic Resource Centres," committee report, September 28, 1971, folder 2, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives: 1. These discussions and their outcome are summarized in chapter 3. In addition, international efforts sponsored by the United Nations focused on this issue. See, Swanson, "Why Is There a Biodiversity Convention?"

[14] Congress extended patent-like registration protection to open pollinated plants in through the Plant Variety Protection Act of 1970. 91st Congress, 2nd Sess. *Congressional Record* vol. 116, pt. 33 (28 December 1970), 43590. The United Stated Supreme Court allowed patent protection to living bacteria in 1980. *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980).

through these issues and develop a template for discussion, advocates from all disciplines must look at the history of plants and patents in American society for some guidance. This initial merger of plants and patents forced a re-evaluation of the two institutions and a clear understanding of their respective meanings and roles in American society. How and why did patent laws come to exist? How and why should plants enter into the realm of patents? The answers to these questions helped set the tone for the debate that rages today.

This dissertation cannot answer all of these questions but will explore the history of plants and intellectual property rights in key stages of their interaction in the twentieth century to understand historical values and assumptions that shaped the contemporary debate over these questions. What emerges from this research is a consistent historical philosophy of patents as a tool of economic progress and advancement. Once agricultural inputs took on a greater economic profile by virtue of plant improvement, Congress and the courts recast them in an economic light and grafted them to the patent law. When the debate spread beyond the borders of the United States and ownership of plants took on global implications, the industrial economic model forged primarily in America came up against a global perspective that attempted to keep plants within the realm of common heritage.[15] A more socialized model of exchange involving raw germplasm and improved crop varieties favored developing nations that could not as easily take part in agricultural technology in a private capitalistic model. When this effort failed, custodians of the developing world's germplasm fashioned an economic model based on concepts of

[15] An example is the United Nations' International Undertaking of Plant Genetic Resources, which sought to characterize the world's germplasm as humankind's common heritage. See, Gerald Moore and Witold Tymowski, *Explanatory Guide to the International Treaty on Plant Genetic Resources for Food and Agriculture* (Switzerland and Cambridge: International Union for Conservation of Nature and Nature's Resources, 2005).

fiduciary management of assets held in trust, thus privatizing germplasm but managing its economic power for the benefit of the developing world.[16] If one locates the philosophy of agriculture and patents as vehicles of economic progress in dynamics as old as the United States, as opposed for example to the biotechnology wave of the 1980's, it is not surprising that the ultimate solutions employed by advocates for the developing world followed a similar arc.

Methodology

This dissertation will focus on several key historical events in American history involving plants and patents, both separately and together. In each case, I have reviewed the historical record in an effort to answer the following question: At this particular time in history, what goals and values motivated the actors involved? What were they trying to accomplish and how did the public perceive their actions? Finally, how did these perceptions inform and shape subsequent events, if at all? What emerges is a series of efforts focused on large-scale farming justified by either economic pragmatism or an urgent need to address a looming social or political catastrophe – starvation or Communist influence. The status of plants and patents most often involved an economic solution to an economic problem with its resolution played out largely in the halls of Congress, Executive branch offices, the appellate court system and the corporate boardroom. Even where the mission of breeding was philanthropic, that mission evolved within a progressive mindset that linked cultural well-being to commercial success. The history of patents and agriculture reveals relatively few advocates who took to the bully

[16] In 1994 the CGIAR moved its germplasm collection to the Food and Agriculture Organization of the United Nations where it was held in trust. Summary of Proceedings and Decisions, International Centers Week," 1994: 9-10. http://www.cgiar.org/corecollection/docs/csop1194.pdf (accessed January 3, 2011).These events are discussed in Chapter 5.

pulpit to demand a broader public discussion on the meaning and role of food in America and the world. Those who did had neither the audience nor the clout to make significant inroads on the more dominant economic mindset. It is not possible to examine every event or every published word about those events. It is possible that profound expressions of concern, particularly as to the moral or ethical implications of these events, never survived in the historical record. Historical analysis is critical in terms of both content and venue. The patent system was not structured to give voice to philosophical concerns in any substantive way. What survived and what continues to influence the debate are economic considerations. As a result, we are faced in the twenty-first century with multiple issues relating to biotechnology and agriculture and the dominant template for discussion of these issues is one that stresses pragmatism and economic advancement. This template has been under construction since before the American Revolution and is by now well girded against competing agricultural theories that stress cultural preservation and common heritage.

Chapter one presents an historical overview of America's patent law and the patent office to identify motivations and goals behind the original patent act. A review of the statues, commentary, court decisions and various government publications clearly illustrate the desire that patents play a role in promoting progress by creating economic incentives for authors and inventors to publish their works.[17] Chapter one also examines the early status of agriculture policy before and after creation of the Department of Agriculture in 1862. Interestingly, the Patent Office soon became the informal home of

[17] See, Giovanni Batista Ramello, "Access to vs. Exclusion from Knowledge: Intellectual Property, Efficiency and Social Justice," in *Intellectual Property and Theories of Justice*, Axel Gosseries, Alain Marciano and Alain Strowel, Ed. (New York: Palgrave Macmillan, 2008) and Jack N. Rakove, ed., *The Annotated U.S. Constitution and Declaration of Independence* (Cambridge: Belknap Press of Harvard University Press, 2009).

seed distribution in the nineteenth century. Congress later funded these activities before relocating them to the new department, thus negating any possibility that seeds were simply overlooked as a possible subject of patent protection.[18] Seeds as a front-end agricultural input had little economic status. In fact, the government gave them away in hopes that farmers would accept the risk of failed crops for the possibility of improved crops and share the best results with friends and neighbors. What emerges is a clear historical distinction between products of nature and inventions. The government used patents to draw out valuable inventions; it gave away seeds to help and encourage more profitable farming. The language of patents was economic; the language of agriculture was social.

Chapter two traces development and eventual enactment of the Plant Patent Act of 1930 which extended patent protection to asexually produced plants, which were self-pollinated plants reproduced through cuttings or grafting.[19] Review of the Congressional Record as well as the papers of Herbert Hoover and various publications of the times suggests two primary motivations behind the new law, both of which were founded in economic agendas. The private nursery industry, under the leadership of Paul Stark from Stark Brothers Nursery, proposed and served as chief advocate for the new law. For the nursery industry, the law represented an opportunity to secure exclusive rights to their unique plants, flowers and fruits. The nursery industry resurrected the legacy of Luther Burbank and cast the law as a long overdue righting of an historical wrong that saw Burbank lose the economic benefits from plant after plant as competitors quickly

[18] The Congressional Globe, V. 32. Part 1, 37th Cong. 2nd Sess., Feb, 17, 1862, 855-856. See also, T. Swann Harding, "Henry L. Ellsworth, Commissioner of Patents," *Journal of Farm Economics*, Vol. 22, No. 3 (Aug., 1940).
[19] See footnote 7.

duplicated new varieties.[20] For the nursery industry, therefore, the Plant Patent Act was an opportunity to protect its investment development of new varieties and extend the profit making potential after public release.

Congress and the White House viewed the Plant Patent Act in economic terms as well. In 1930, the effort of the plant breeding industry to improve its own economic footing resonated positively within a Congress battling a fearsome economic depression and a Hoover administration that applauded a private sector industry seeking to solve its own problems.[21] As a result, the Plant Patent Act of 1930 emerged as an economic tool intended to build a strong capitalistic market in the long run by granting economic monopolies in the short run. No concerns appear in the record regarding the broader issue of what it meant to the long-term evolution of American culture to establish property rights in a plant.

Evolution of the Plant Patent Act in chapter two is also examined through the actions, or rather inactions, of Henry A. Wallace who's Hi-Bred Corn Company was emerging just as the Plant Patent Act came into being. It is noteworthy that Wallace did not take an interest in the Plant Patent Act despite his family's historical role as a leader in farm policy both as politicians and journalists. The Wallace family played a significant role in shaping U.S. agriculture policy but spent its political capital on tariff policy, not patents.[22] Economic factors seem to have played a role in the Wallace strategy, at least by implication. Wallace worked in open pollinated, or sexually produced, seed corn, a

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[20] See, Glenn E. Bugos and Daniel J. Kevles, "Plants as Intellectual Property: American Practice, Law, and Policy in World Context," *Osiris*, vol. 7, (1992).
[21] See, Roger Lambert, "Food from the Public Crib: Agricultural Surpluses and Food Relief Under Herbert Hoover," in *Herbert Hoover and the Republican Era*, ed. Carl Krog and William Tanner (University Press of America, 1984), 158-9.
[22] See, "Vote on the New Tariff Bill," *Wallace's Farmer*, May 10, 1930: 8., "Is the Senate Going to Back Down?" *Wallace's Farmer*, May 24, 1930: 6 and *Wallace's Farmer*, June 7, 1930: 3.

distinction that led him away from the patent law just as the nursery industry gravitated toward it. Wallace operated in the safe confines of a system that could not be copied in the public sphere because the plant he released to the public was a genetic imposter whose vigor lasted a single season and then faded, while its parental ancestors remained safely under his control. In other words, hybrid corn growers possessed their own economic protection – the trade secret – that was not available to nurserymen. Wallace's correspondence and excerpts from *Wallace's Farmer* provide a fascinating insight into the tight knit network of plant breeders and validation of the economic potential of hybrid corn. Wallace was every bit the businessman that Luther Burbank was. He simply did not need legal protection for his success. As a result, chapter two portrays the Plant Patent Act as being drafted, debated and enacted as an economic vehicle designed to create profit for the private nursery industry.

Chapter three explores expansion of issues to a global stage. In the twentieth century, American philanthropists and government administrators turned their focus to agriculture in the developing world. Plant breeding was a key component to helping farmers increase their yields. Open pollinated plants did not yet enjoy intellectual property protection and so the traditional government/academic model of free sharing dominated. Developing countries gave freely of their raw germplasm and dedicated researchers worked to combine it in ways that would produce crops ideally suited to specific geographic regions. This dynamic resulted in the accumulation of large stores of germplasm in the hands of informal and cooperative organizations.[23] In time,

[23] By 1991, the CGIAR held approximately 460,000 accessions and between 1987 and 1991 had made approximately 745,000 distributions to other entities. See, CGIAR Secretariat, "Stripe Study of Genetic Resources in the CGIAR," April 26, 1994: 13, contained in "CGIAR Mid-Term Meeting, May 23-27, 1994." http://www.cgiar.org/corecollection/docs/tc9403c.pdf (accesed January 5, 2011).

advancements in technology and law transformed these seed stores from a basic input to a valuable economic asset. These changes left custodians of raw germplasm in an unusual position of both power and perplexity as they wrestled with the proper disposition of something that had been freely given and shared but would soon be eligible for legal protection. To understand the various responses to this new issue, it is instructive to review philosophies that drove agricultural philanthropy in the first instance. For this background, chapter three examines the Rockefeller Foundation's corn program in Mexico and its subsequent role in formation of the Consultative Group on International Agricultural Research (CGIAR). The Rockefeller Foundation Archives provide a compelling picture of genuine desire to improve the lives of others coupled with an aggressive philosophy of American exceptionalism as the means of doing so. Grave concerns over the spread of communism and a soon to be out of control population explosion also drove efforts and helped to bring to the table the World Bank under Robert McNamara, the Ford Foundation under McGeorge Bundy and many governments in the industrial world in the 1960's and thereafter. Their collective efforts helped fund CGIAR and set its policies. In so doing, they made CGIAR the custodian of one of the greatest collections of raw germplasm known to humankind.[24] When advances in biotechnology greatly multiplied the value of those materials, CGIAR was faced with the question how to use them consistently with its mission. Throughout this chapter, the historical record reveals a dominant philosophy that the best way to help farmers was to make their farms

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[24] Although the CGIAR was estimated to hold only 14% of the world's germplasm in its collections, it amounted to 40% of unique germplasm. See, Private Sector Committee, "Strengthening CGIAR-Private Sector Partnerships In Biotechnology: A Private Sector Committee Perspective on Compelling Issues," April 30, 1997: 7, in "CGIAR Mid-term Meeting," May 26-30, 1997. http://www.cgiar.org/corecollection/docs/cg9705k.pdf (accessed January 11, 2011).

more profitable. That which brought market value to agriculture was the best form of aid. This view helped define the attitude of philanthropists and governments toward seeds as a new type of economic asset.

Chapter four is a brief but critical interlude necessary to set the stage for chapter five and the conclusion. After interested parties created CGIAR and allowed it to accumulate its vast collection of germplasm, numerous specific events combined to enhance its value. Chapter four will review the breakthrough in recombinant DNA technology that permitted scientists to alter living material at the genetic level. The research of geneticists Herbert Boyer and Stanley Cohen suggested a future in which combinations of genes were no longer limited to natural compatibility. Genetic traits could be isolated and recombined in host cells to mass-produce valuable proteins. Shortly after the Boyer-Cohen breakthrough, the United States Supreme Court issued its landmark ruling in the 1980 case, *Diamond v. Chakrabarty*, in which it recognized the right to hold a patent on living bacteria.[25] Although the case and the attention it generated focused primarily on non-agricultural applications, particularly pharmaceuticals, it had vast implications for seeds as well. Within five years, the court expanded its precedent to open patent eligibility to all plants. Congress and the Reagan administration quickly jumped on the bandwagon with passage of the Bayh-Dole Act in 1980, which made it possible for research universities and small businesses to retain patents on new technology funded with public money.[26] To observe that the world reacted to these developments with an economic mindset would be an understatement. The Wall Street boom in biotechnology stocks represented one of most significant instances of wealth

[25] See footnote 12.
[26] Pub.L. 96-517, codified at *U.S. Code*, 35 (2000) §§ 200-212.

creation in financial history.[27] All of these events combined helped to transform raw germplasm from an important agricultural input to a significant economic asset. Moreover, these events gave CGIAR entrée into a burgeoning new field where it sorely lacked money and expertise: genetically modified crops.

Chapter Five examines approximately twenty years of debate that took place within CGIAR regarding the proper disposition of its germplasm collection. Critical to the debate was the issue of whether CGIAR should secure intellectual property rights on its seed collection? CGIAR practiced free sharing of seeds with other researchers and entities in a tradition dating back to the early days of Henry Wallace. The more people who worked on plant breeding, the greater chance for breakthroughs. In the new world of biotechnology and intellectual property rights, however, a recipient of CGIAR germplasm could potentially use it to create a new plant variety and then secure exclusive economic rights, thus robbing CGIAR and the developing world of potential profit from its own material. This possibility forced CGIAR to consider not only the economic opportunities in its seeds, but also its responsibility toward the developing nation donors to manage the seeds in a responsible manner.

The political terrain was rocky. CGIAR existed to work with developing countries but it was funded by the industrial world.[28] Both sides expected to see results but defined success in different ways. The industrial world did not appreciate being asked for ever increasing funding when a valuable asset was not being used to its full potential. The

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[27] "Spliced Genes Make Splash on Market," *Science News*, 25 October 1980, 261.

[28] Fifteen entities provided the initial funding for CGIAR: The Ford Foundation, The United Kingdom, Belgium, Denmark, The Netherlands, Canada, The United Nations Development Program, The Rockefeller Foundation, The Inter-American Development Bank, The United States (via USAID), The Kellogg Foundation, The International Development Research Centre of Canada, Germany, Japan, and The World Bank. See, Sterling Wortman to John A. Pino, memorandum, undated, folder 5, box CG I, Record Group CGIAR Rockefeller Foundation Archives.

developing world looked askance at CGIAR placing its donated seed under the umbrella of private property with CGIAR as the owner.[29]

CGIAR, being extremely informal in its structure and operation, also faced the surprisingly difficult question of its legal identity. Who among its multiple boards, committees and research centers actually possessed legal standing to assert and enforce ownership rights? In addition, CGIAR had to face the possibility that it could be held liable for mishandling its own germplasm by failing to honor rights asserted by other researchers.[30]

All of these issues came to a head as the global community became entangled in issues of trade and bio-diversity. The United Nations called for greater efforts to preserve the world's environment while the industrial world created the Trade-Related Aspects of Intellectual Property Rights Agreement (TRIPS) which called on the developing world to step into the intellectual property realm if it wanted to participate in the General Agreement on Tariffs and Trade (GATT).[31]

CGIAR's records are flush with varied and passionate opinions as the world began to realize that intellectual property rights in seeds and plants reached deeply into economic, cultural and environmental issues. CGIAR's ultimate solution, to place the materials in trust with the United Nations' Food and Agriculture Organization, represented on its face a rare exception to the commercial mindset but one that was nevertheless economically defined and driven by the selection of a fiduciary model of

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[29] See, "Report on TAC Review of IBPGR," International Centers Week, October 27-31, 1980, folder 7, box CG VII, Record Group CGIAR, Rockefeller Foundation Archives: 2.
[30] See, "Report of the 16th Meeting of the CGIAR Oversight Committee," November 1998: 3. http://www.cgiar.org/corecollection/docs/over16.pdf (accessed January 15, 2011).
[31] See, World Trade Organization, text of Agreement on Trade Related Aspects of Intellectual Property Rights, http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm (accessed November 14, 2011).

asset enhancement as well as recognition of the economic consequences from failure to preserve the developing world's bio-diversity. Also relevant is that the solution placated CGIAR's largest donor, the United States of America, by saving the seeds within a context that allowed commercial access.

This dissertation will conclude with a discussion of how an economic mindset dominated nearly every phase of intellectual property policy as well as a significant portion of agriculture policy, from 1790 forward. Intellectual property rights and agriculture are two powerful institutions propelled by unique policy considerations toward similar destinations: the economic advancement of their respective practitioners to the ultimate benefit of the general population. Those who operated in and around these two institutions – farmers, politicians, judges, academics, philanthropists – did so under a set of assumptions that clearly separated products of nature from human invention but saw both as economic engines. In the twentieth century, advancements in plant breeding and later in genetics cast these two institutions in a new and much more compatible light. Manipulation of plants and seeds increased their economic value and intellectual property rights offered security and exclusivity for those willing to invest the time and money to create new plant varieties. By the latter part of the twentieth century, improved plant material (and chemicals and fertilizers that went with them) had largely become assets in major international corporations.[32] This development forced the world to confront numerous practical and conceptual issues. Particularly affected were the government and private aid organizations that spread modern agriculture to the developing world through a philosophy of free sharing of inputs and outputs. As aid organizations tried to keep pace with technological advancements, they were drawn deeper into a system that forced them

[32] See footnote 2.

to confront and resolve conflicts between their traditional methods of operation and the economic reality of the world in which they operated. These issues were often more practical than philosophical, however. For many philanthropically-minded constituencies, 'improving' life in the developing world meant enlarging the commercial impact of agriculture through introduction of technology, including hybrid seeds acquired by breeding and genetic modification. Modern farming was a plausible means of achieving myriad goals, including profit, economic development, avoiding starvation and national security. That some small farmers would fall by the wayside was a given.[33] Agricultural aid and intellectual property rights were never about keeping small farmers on their farms. Similarly, aid to developing nations was never about the wisdom of creating profit through an industrial and capitalistic model. It was a given that a larger, market-oriented economy benefited a developing nation. The more confrontational issue involved the proper participation in and distribution of the profits generated by such a system, including the economic value of plants and seeds. Resolving this issue called (and still calls) for a wide-ranging dialogue from a diverse set of experts representing expertise in ethics, morality, cultural anthropology, human rights and economic profit. All points of view have their champions and their forums but, by the close of the twentieth century, the dominant voices in this debate, including some that stood philosophically on the side of common heritage, supported or resigned themselves to a cost-benefit model of determining the proper disposition of plants and seeds. Alternate views remain intense. Opposition to GMO foods, particularly in Europe, the rising popularity of organic products and concerns over common heritage, cultural identity and tradition all continue

[33] See, John H. Perkins, "The Rockefeller Foundation and the Green Revolution," *Agriculture and Human Values,* Vol. VII, (Summer-Fall 1990).

to he heard. That voice, however, is sometimes relegated to the academic journal or the under- funded movement. With this historical summary, I hope to open a discussion and prompt more research on whether a more comprehensive dialogue should take place or whether the current balance of interests are sufficient and proper to serve as the standard by which we manage the wisdom in the earth.

CHAPTER 1. A NEED FOR PROGRESS: PATENTS AND AGRICUTLURE IN EARLY AMERICA

This chapter will examine the enactment, interpretation and administration of patent laws in America, as well as the early interaction between the Patent Office and agriculture. Its purpose is to identify the earliest thinking about the meaning and purpose of patents and seeds in American history. What emerges is a view of patents as a practical economic tool intended to help the American economy grow and compete in its early years. Although not eligible for patent protection, seeds also had economic value and the government used them to promote growth in agriculture. In both cases, patents and seeds, the federal government had the same objective: to get something of economic value into the public domain. This thinking remained intact into the twentieth century and provided the perspective for enactment of intellectual property laws for plants and seeds.

Patents in Colonial America

America was, in significant part, a for-profit venture. Opportunities for profit in private property, agriculture and natural resources drove colonization of North America.[1] The early settlers were more than adventurers and separatists; they were also entrepreneurs who brought with them a firm belief that risk takers and innovators deserved to profit from their effort and ingenuity. They claimed the Americas in the name of their kings and by his authority. They went on to wield shovel and plow as the king's proxies with the resulting profits divvied between them.

[1] In discussing historical events prior to the codification of patent laws, in America, I will use the more generic term 'private property.' I will also use the term 'intellectual property' as a convenient label for property rights in non-tangible things, even though the phrase did not become a term of art until well into the twentieth century.

Those who came and stayed did not abandon this mindset after the revolution secured America's independence. The new Congress extended and formalized these same values. The fingerprints of economic progress mark up many pages of the historical record, including those relating to intellectual property and agriculture.[2]

Exclusivity is a defining characteristic of intellectual property law that gives it economic force. Western society long ago recognized the power of exclusivity in fostering public welfare. For example, a 1474 statute in Venice stated in its preamble: "…if provision were made for the works and devices discovered by [men of great genius] so that others who may see them could not build them and take the inventors honor away, more men would then apply their genius, would discover, and would build devices of great utility and benefit our commonwealth."[3] With this justification, the Venetian government enacted a ten-year ban on duplication of new and ingenious devices registered with the General Welfare Board under penalty of one hundred ducats and destruction of the offending copy.[4]

England's Parliament had slightly different motivations when it enacted a law on patents, but was no less mindful of the underlying economic benefit to society from exclusive rights in commerce. Patronage drove the early English patent system. Kings and queens used letters patent to grant exclusivity of trade in nearly any area or item of

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[2] Historian David Hackett Fischer cautions against any assumption that a generically 'British' culture sailed across the Atlantic and simply replicated itself on American soil, or that the already diverse regional, religious or social variations of British society were not profoundly modified when transplanted in the unique topography and climate of North America. See, David Hackett Fischer, *Albion's Seed* (Oxford: Oxford University Press, 1989), 4-7. Intellectual property laws, however, were the product of western thinking long before the existence of the American Constitution and were replicated in that document precisely because America needed to compete on even ground with other nations. A brief exploration of these broad themes of law and economics helps to place later American actions in context and also supports the argument that general themes of risk and profit dominated government involvement in patents and agriculture both before and after their merger.

[3] "Invention and the Patent System," Printed for the use of the Joint Economic Committee, Congress of the United States, 88th Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, 1964), 11.

[4] Ibid.

commerce. Unlike the Venetian statue, originality of invention was not a pre-requisite in the British system. Rulers gave letters patent to favored subjects or those willing to pay an appropriate fee. A relevant example is the Charter of Virginia, issued by King James I in 1606. The charter contains five references to 'letters patent' and one reference to its recipients as 'patentees.' These are not the patents of modern American law but they embody the modern concept of exclusive rights. The Charter of Virginia made specific grants for claimed terrain not held by Christians and for gold, silver and copper, which the patentees could mine for themselves for payment to the crown of a one-fifth share of gold and silver and a one fifteenth share of copper.[5] Exclusive rights to profits helped to balance the scale against the countless dangers presented by such a journey.

Parliament enacted the Statute of Monopolies in 1624 in order to shackle the crown's profligate use of letters patent. By the time Parliament saw fit to take action, kings and queens had locked up myriad goods and services in the hands of selected individuals for up to twenty years to the great detriment of the English economy. Not wishing to end the practice altogether, but instead curb its abuse, Parliament permitted the crown to continue granting patents but only to true inventors of new manufacture. The American colonies and, later, the new states followed suit.[6]

Opportunity to accumulate assets also influenced America's early agriculture by pushing the idea of private property down the social ladder where a middling level of society discovered a new and attractive mix of independence, private property and

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[5] Hening's Statutes of Virginia, I, 57-66, Documents in Law, History and Diplomacy, Yale Law School, http://avalon.law.yale.edu/17th_century/va01.asp (accessed March 31, 2011). According to Fischer, the American colonies attracted many types of settler, including young British sons of name with no hope of inheriting their fathers' estates. These men came to America specifically to make their fortunes. See, Fischer, *Albion's Seed*, 212-216.

[6] "Invention and the Patent System," Joint Economic Committee, 11.

economic interaction. Many in the American middle class became happily entrenched in a kind of life that Europe could not offer. The rare opportunity to own land, combined with the relative autonomy of American life, yielded a broad populace that was passionate about private property. [7]

Following the Revolutionary War, the newly independent America transitioned from England's military foe to an economic competitor. American independence meant little without prospect of survival. Continued independence demanded a strong economy and America adopted the tools of commerce that had served England and the colonies, including economic reward for innovation. Patents represented one such tool by providing an incentive for inventors to participate in American commerce. The qualities of exclusivity, private property, autonomy and market orientation emerged strongly in the Constitution. Private property in particular enjoyed a two-prong status. It served as the foundation for capitalism and the prerequisite for freedom, individual liberty and national

[7] Abundant land and resources were the most obvious and striking differences between America and Europe. Conditions in colonial America permitted a greater number of adult free men to own enough land to employ themselves and their families. Opportunity for ownership stretched much farther down the social ladder than in Great Britain, as evidenced by the fact that two-thirds of colonials owned land. The threat of losing something so rare fostered dogged determination among colonial settlers to preserve what they had. See, Allen Kulikoff, *From British Peasants to Colonial American Farmers*, Chapel Hill: University of North Carolina Press (2000), 2. Farmers, moreover, operated within a unique system of colonial government. While the early colonies technically belonged to the king, he essentially franchised them out and authorized private parties to exercise the king's rights. Thus, colonists enjoyed a degree of latitude not available in England. In addition, Corporate charters (as opposed to royal charters) permitted a degree of leeway in shaping laws. Parliament did not require settlers organized under corporate charters to send their laws to England for review and approval. See, Mary Bilder, *The Transatlantic Constitution: Colonial Legal Culture and the Empire* (Cambridge: Harvard University Press, 2004), 5. Enlightened thinking resonated within a society that was physically removed from many traditional influences and based in a diverse and independent yeoman population. Property remained central to this discussion but its nature had changed from a benevolent grant to a natural right. The colonists valued their property too much to turn it over to a government which they viewed from a distance and in which they had no voice. See, McCusker and Menard, *The Economy of British America, 1607-1789* (Chapel Hill: University of North Carolina Press 2000), 351-358. The Revolutionary war cut off traditional American sources for imported goods. In addition, domestic military demand placed a huge added strain on domestic production. The need for goods educated the American farmer on the potential advantages of the market and helped to develop a commercial orientation in many communities. See, James A. Henretta, *The origins of American Capitalism – Collected Essays* (Boston: Northeastern University Press, 1991), 241.

stability.[8] The ability to control one's own property in order to provide for one's own well-being fostered not only profit but an honest and incorruptable electorate. That the drafters of the constitution held these ideas sacrosanct is not surprising given their origin and the fact that they had been paid for in blood.

The Constitutional View of Patents

The Constitution's section on patents reflected colonial ideals of private property but leaned more heavily toward economic considerations.[9] The drafters saw value in new ideas and innovations in an economic context more than one of natural rights. Inventions made for personal wealth, which contributed to a stable and well rounded society, but patents represented a means to that end by offering exclusivity in the marketplace in exchange for publication. They were thus an economic tool and not an idealistic one.[10]

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[8] See, Giovanni Batista Ramello, "Access to vs. Exclusion from Knowledge: Intellectual Property, Efficiency and Social Justice," in *Intellectual Property and Theories of Justice*, Axel Gosseries, Alain Marciano and Alain Strowel, Ed. (New York: Palgrave Macmillan, 2008), 73.

[9] Historians have long debated the role of wealth and private property in the wording of the United States Constitution. Certainly the delegates to the Constitutional convention were men of wealth who saw private property and the ability to pursue individual gain as foundational to a politically free society. Private property gave men their freedom and protected that freedom from tyranny and corruption. See, Walter B. Mead, *The United States Constitution: Personalities, Principles and Issues* (Columbia: University of South Carolina Press, 1987), 76. Property rights also played a practical role in the debate, forming the basis of arguments for and against representation, voting rights and eligibility for office. See, Thornton Anderson, *Creating the Constitution: The Convention of 1787 and the First Congress* (University Park: The Pennsylvania State University Press, 1993), 100-101. In short property served both idealistic and practical needs. In the case of patents, the need was both practical and immediate. It is not possible in this brief overview to explore the entire panoply of political writing that inspired American thinkers and the drafting of our enabling documents. My purpose is to suggest that patent laws reflected a measured yielding of idealism to economic reality. As I trace the inspirations behind patent laws through the twentieth century, I will argue that decisions on intellectual property rights in plants and seeds have been dominated by concerns over economic pragmatism more than social, cultural or political idealism.

[10] Political philosopher John Locke, whose writings informed and inspired America's founding documents, did not write about intangible property but historians have commented on the compatibility of Lockean philosophy with patent rights. The Lockean basis of property is a natural right to own one's self and therefore the product of one's labor. When those products satisfy needs for survival, the rights are not conditional but are rather a natural entitlement. See, Axel Gossieries, "How (Un)fair is Intellectual Property?" in *Intellectual Property and Theories of Justice*, Axel Gosseries, Alain Marciano and Alain Strowel, eds. (New York: Palgrave Macmillan, 2008), 10. When Lockean concepts are extended to knowledge and ideas, however, conflicts arise. If I own myself and my labor, then surely I own my ideas, which are the labor of my mind. But unlike things needed for survival, information is non-rival. One person's enjoyment of an idea does not prevent another's enjoyment of the same idea at the same time.

The drafters of the Constitution granted eighteen specific powers to the Legislative branch of government. Among them was the power: "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[11] Commentators note that the patent language is unique in that it represents the only clause in the original Constitution prefaced with an introductory clause to explain its intention.[12] The other seventeen powers granted to Congress are self-explanatory even though their import ranges from the routine, such as establishing post roads, to the ominous, such as declaring war. Had clause eight on patents followed suit, it likely would have read: "To secure for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." The qualifying language, however, makes clear that the drafters viewed the role of Congress within the context of a specific goal, namely to promote progress. The language in clause eight did not mandate any specific action on the part of Congress or, for that matter, any action at all. To the extent that Congress acted, however, it did so subject to the clear mandate that the resulting law must promote progress in science and the useful arts. The mandate imposed by the drafters' qualifying language validated the traditional view that exclusivity in ideas and creativity would encourage inventive activity and that the lack of ability to make a profit would result in

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Thus, the knowledge to produce a cancer drug means that all sufferers of cancer can receive it. Granting a patent on a cancer drug, however, moves the idea out of the public domain for a period of time. Locke focuses on the use value of property (consumption, shelter, etc.) whereas patent law focuses on the exchange value of property, which is of use only in an economic context. One man's rights in a new drug might prevent another man from receiving that drug because the owner of the right refuses to license its manufacture or prices it too high, thus leaving a survival need unsatisfied. In other words, patents could conceivably barricade people from the basic actions that Locke viewed as natural rights. Ramello, "Access to vs. Exclusion from Knowledge: Intellectual Property, Efficiency and Social Justice," 77. This analysis suggests that patents were less in the realm of idealism and more in the realm of economic pragmatism.

[11] U.S. Constitution, art. 1, sec. 8, cl. 8. The language is unchanged to the present day and also forms the basis for copyright law, which is not a focus of this dissertation.

[12] Jack N. Rakove, ed., *The Annotated U.S. Constitution and Declaration of Independence* (Cambridge: Belknap Press of Harvard University Press, 2009), 142.

under-production of goods.[13] The drafters envisioned the new Congress as one empowered to actively encourage development of the arts and sciences via a grant of legally enforceable exclusivity in knowledge or a useful art that could be put to some valuable or beneficial purpose. In short, the drafters empowered Congress to use reward in order to stimulate disclosure of valuable information. The value of knowledge, however, lay in its economic potential. Commentators have noted that the constitutional language on patents is not limited simply to inspiring inventors to invent but also to publish what they invent. They noted use of the word 'secure' in the constitutional language as opposed to 'grant.' In other words, Congress could not give anything to inventors that they did not already possess. Inventors already controlled their discoveries. They were clearly free to hide away their inventions, produce them in secret or donate them for the betterment of humankind. If inventors chose to produce their inventions in for-profit ventures, however, their control extended only as far as the time when someone else conceived or copied the same idea. The drafters of the Constitution recognized that the ideal place for new information was the public sphere, where it could generate still more progress.[14] With the patent clause and supporting laws, Congress had the power to help inventors secure their inventions under a legal cloak of temporary exclusivity.[15] Therefore, patent rights served to promote progress by giving inventors an incentive to publish in exchange for a few years of legally enforceable exclusivity. The bargain between the public and the inventor took on meaning only when economic interests were

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[13] Ramello, "Access to vs. Exclusion from Knowledge," 75.

[14] Patents represented a short term strategy of economic benefit in order to realize the long-term benefit of making valuable information available to more people. See, Gregory S. Alexander, *Commodity and Property: Competing Visions of Property in American Legal Thought 1776-1970* (Chicago: The University of Chicago Press, 1997), 27.

[15] For a legal analysis of the patent clause, see, Roger Sherman Hoar, *Patent Tactics and Law* (New York: The Ronald Press Company, 1950), 4.

at stake, a concept supported the United States Supreme Court, which consistently viewed patent laws as embracing an economic philosophy and operating exclusively within that realm.[16]

The Law of Patents

Congress quickly exercised its grant of authority to promote progress in science and the useful arts by enacting the first patent law in 1790, followed closely by the Patent Act of 1793.[17] Administration of the early patent laws reflected varied philosophies. Patents carried a strong whiff of privilege, which came uncomfortably close to the stench of monarchy and so the law's keepers were cautious and sometimes downright stingy in granting them. Their reticence soon inflamed an already powerful industrial lobby, which succeeded for a time in turning the new patent system into a government sponsored profit machine. In general, however, patent law and its administrators embraced the idea of government use of incentives to stimulate economic growth.[18] This philosophy echoed loudly in the debate over plants and patents.

Thomas Jefferson drafted the 1790 Act in a manner that balanced the twin goals of promoting invention in a fledgling economy while, at the same time, protecting against abuse of monopolies among a populace already skittish about unchecked power.[19] Jefferson's patent law likely offered something acceptable to everyone. Creation of a

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[16] The United States Supreme Court summarized the patent philosophy succinctly in 1954: "The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in 'Science and useful Arts." *Mazer v. Stein*, 347 U.S. 201, 219 (1954). Similarly, in 1966, the Supreme Court stated that the patent system must be related to the world of commerce rather than the realm of philosophy. *Brenner v. Manson*, 383 U.S. 519, 536 (1966).

[17] 1 Stat. 109, ch. 7 (1790), cited in Michael S. Greenfield, "Recombinant DNA Technology: A Science Struggling with the Patent Law," *Stanford Law Review,* no. 5 (May 1992), 1057; Act of Feb 21, 1793, sec. 1, 1 Stat. 319, cited in *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980).

[18] Greenfield, "Recombinant DNA Technology," 1057.

[19] See the Supreme Court's commentary in, *Graham v. John Deere Co.* 383 US 1 (1966), 7.

property right tied directly to the public good exemplified Jefferson's philosophy of property as a social concept that could be properly adjusted to accommodate the country's needs.[20] The law also should have created little conflict with the Federalist view that innovation, creativity and ambition were inherently virtuous and consistent with a self-interested pursuit of wealth.[21] Jefferson's efforts seem to have been pre-emptive rather than promotional, however, since he questioned the premise that ingenuity had to be helped along with an economic carrot and doubted that the potential benefits of any economic monopoly were preferable to general suppression.[22] In commenting on a dispute over rights to an improved flour mill, Jefferson offered a broad and passionate summary of the place of ideas in society: "If nature has made any one thing less susceptible than all others of exclusive property it is the action of the thinking power called an idea . . . the moment it is divulged, it forces itself into the possession of everyone, and the receiver cannot dispossess himself of it. Its peculiar character, too, is that no one can possess the less, because every other possesses the whole of it. He who receives an idea from me, received instruction himself without lessening mine; as he who lights his taper at mine receives light without darkening me. That ideas should freely spread from one to another over the globe . . . seems to have been peculiarly and benevolently designed by nature when she made them . . . incapable of confinement or exclusive appropriation."[23] The mere existence of a patent clause in the Constitution and

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[20] See, Gregory S. Alexander, *Commodity and Property: Competing Visions of Property in American Legal Thought 1776-1970* (Chicago: The University of Chicago Press, 1997), 27.
[21] Ibid., 76.
[22] Merrill D. Peterson, *Thomas Jefferson and the New Nation* (New York: Oxford University Press, 1970), 450.
[23] Quoted in Peterson, *Thomas Jefferson and the New Nation,* 938. Jefferson lived what he preached. He refused to seek a patent on his well-received and brilliant improvement of the moldboard plow, which improved furrow depth by two inches. The design garnered him honorary membership in the English Board of Agriculture and a gold medal from the Agricultural Society of Paris. Competitors widely copied his

the immediate enactment of a patent statue suggests that Jefferson represented the minority view in placing ideas in the realm of philosophy rather than economics. Perhaps not surprisingly, Jefferson named himself by virtue of title as one of the patent commissioners, a role in which he served with diligence and enthusiasm.[24] Jefferson clearly did not abhor or work against patents or the idea that monopoly was an ideal tool for jumpstarting an economy. He was pragmatic enough to recognize their worth to a new country. Jefferson, however, was perhaps naïve in his assumption that three members of Washington's cabinet would have time to review patent applications while trying to nurse a new and deeply divided nation through its infancy.

The 1790 Act required inventors to petition a three-person executive branch committee consisting of the Secretary of State (Jefferson), the Secretary for the Department of War (Henry Knox) and the Attorney General (Edmund Randolf). This tribunal possessed absolute and final discretion, by a simple majority of two votes, as to approval or disapproval of submissions for patents. Having so approved an invention, the committee forwarded its decision to the President who certified a letter patent to the applicant. The President, as drafter of the letter patent, was responsible for describing the invention. Upon receipt of the letter patent, the inventor enjoyed for fourteen years "the sole and exclusive right and liberty of making, constructing, using, and vending to others

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design but the idea of a monopoly on a useful idea held no interest for Jefferson, who not only published his idea but also shared it with Europe. Ibid., 589-590.

[24] Daniel Preston, "The Administration and Reform of the U. S. Patent Office, 1790-1836," *Journal of the Early Republic*, Vol. 5, No. 3 (Autumn, 1985), 334. One can imagine the endlessly inquisitive Jefferson delighting in examination of new machines. Jefferson took a keen and personal interest in the inventive process and, in contrast to his own prodigal financial habits, was stingy in granting patents to ideas. In one case, Jefferson had a mechanism for distilling fresh water from seawater fully assembled in his office, including a still and furnace. He called in expert observers and required the inventor to put the apparatus through its paces on five separate occasions before denying the patent. Ibid., 450.

to be used, the said invention or discovery."[25] The Act then required patent recipients to deliver to the Secretary of State full descriptions of the invention with drafts and, if possible, models exact enough to allow workmen or others skilled in the art to make, construct and use the same "to the end that the public may have the full benefit thereof."[26]

Although the historiography describes the number of patent submissions as 'few,' all were likely subjected to a detailed and critical review. The committee approved only thirty-seven patents during Jefferson's tenure as a Commissioner, perhaps reflecting his determination that economic monopolies not be granted lightly despite the Constitutional references to promotion and progress. Almost immediately, inventors began a drumbeat for economic vigor in the halls of government. Inventors complained that Jefferson, Knox and Randolf were overly strict and unfriendly toward the industrial class.[27]

Congress responded to the call for more liberal use of patents by enacting extreme revisions to the law on February 21, 1793. Congress replaced the high-level examination commission with a simple registration system. The amended law provided that once the Secretary of State received the petition and a sworn statement from the inventor that he was indeed the true inventor, "it may and shall be lawful for the said Secretary of State to

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[25] United States Code, Chapter VII., Section 1, April 10, 1790, re-printed in *List of Patents for Inventions and Designs Issued by the United States, from 1790 to 1847,* compiled and Published under the direction of Edmund Burke, Commissioner of Patents, (Washington: J. & G.S. Gideon, 1847), *v.*

[26] Ibid., *vi.* The law also established procedures, remedies and fees. Persons desiring a copy of the model could take or make one at their own expense. Any person making an unauthorized copy of the patented item was liable for damages and surrender to the patent holder of the offending manufactures. The law established filing fees of fifty cents for the petition plus ten cents per page of specifications. Issue fees were two dollars for the patent letter plus one dollar for the presidential seal and twenty cents for delivery.

[27] George W. Evans, "The Birth and Growth of the Patent Office," Records of the Columbia Historical Society, Washington, D.C., Vol. 22 (1919), 108.

cause letters patent to be made out."[28] From 1793 to 1836 inventors petitioned the Secretary of State who had no obligation or explicit authority to judge an invention sufficiently useful or important to warrant issuance of patent. With no regulations and no guidelines beyond the bare wording of the statute, the patent office became little more than a processor of paperwork.[29]

Loathe to spend money unnecessarily, Congress largely ignored the 'new' patent office which enjoyed an advantage over many other federal offices simply by performing its statutory function. Inventors and entrepreneurs, not to mention rogues, were also quite content with the state of affairs. With little discretion on the part of patent clerks and the only right of challenge or enforcement within the seldom used court system, applicants attempted to patent items that did not work or had been well known and used for years.[30] The thirty dollars filing fee was a small price for a virtual guarantee of exclusivity on anything filed.[31] In fact, on occasion, the patent clerks went so far as to waive fees for those who could not pay, showing more loyalty to the spirit of encouraging invention rather than generating revenue.[32]

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[28] United States Code, Chapter IX, Section 1, February 21, 1793, re-printed in *List of Patents for Inventions and Designs Issued by the United States, from 1790 to 1847*: *viii.* The new law was not an inventor's free-for-all, however. Congress inserted standards declaring that one who improved a patented machine could not thereby manufacture the machine, nor could the original patent holder manufacture the machine with the improvement. Further, simply changing the form or proportions of a machine was not a patentable discovery. Congress also fixed damages at treble the price charged per violating unit. They raised the filing fee to thirty dollars (up from fifty cents) with copies costing twenty cents per written sheet and two dollars for drawings.

[29] Robert C. Post, " 'Liberalizers' versus 'Scientific Men' in the Antebellum Patent Office," *Technology and Culture*, Vol. 17, No. 1 (Jan., 1976), 26.

[30] Daniel Preston, "The Administration and Reform of the U. S. Patent Office, 1790-1836," *Journal of the Early Republic*, Vol. 5, No. 3 (Autumn, 1985), 343.

[31] Ibid., 336.

[32] George W. Evans, "The Birth and Growth of the Patent Office," Records of the Columbia Historical Society, Washington, D.C., Vol. 22 (1919), XXX

Thomas Jefferson supported the 1793 revisions but ultimately came to abhor the new system and blamed it for a proliferation of questionable patents.[33] For all his careful stewardship early on, Jefferson did not use his new office of Vice-President or his subsequent presidency as a bully pulpit to push revisions to the greatly streamlined and inventor-friendly patent process. Congress and the Executive branch essentially blocked open the patent door from 1793 to 1836. They let the paper flow and the private market sort it all out.[34]

The lack of statutory substance in the patent act made the patent office a malleable thing, subject largely to the Superintendent's personality. In 1802, James Madison awarded the Superintendentship of Patents to his close friend, William Thornton, who served in the role for twenty-six years. At that time the Superintendent of Patents was essentially a forgotten clerk within the State Department, ignored by Congress and with no staff, guidelines or discretion. Thornton thus exercised free reign over the process. He hired his own family members to help process the paper that flowed through the office. Unfortunately, the office kept poor records and maintained no patent registry. In 1810, Congress allocated Thornton a suite of offices in the Post Office building but the rooms quickly became an ad hoc museum as the staff filled them with

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[33] Preston, "The Administration and Reform of the U. S. Patent Office, 334.

[34] Additional patent law revisions arrived with the new century. In 1800, Congress amended the law to allow aliens having resided in the US for at least two years to seek U.S. patents. In 1832, Congress waived the two-year requirement so long as the alien inventor then resided in and expressed an intention to become a U.S. citizen. In 1819, Congress gave federal circuit courts original jurisdiction over patent cases. During this time, it appears that Congress was trying to create incentive for foreign inventors to come to the United States with their valuable ideas. Introduction of federal court jurisdiction suggests an increase in patent litigation, which is not surprising given the low standards at the time. See, United States Code, Chapter XXV, Section 1, April 17, 1800, and Unites States Code Chapter CCIII, July 13, 1832, re-printed in *List of Patents for Inventions and Designs Issued by the United States, from 1790 to 1847,* compiled and Published under the direction of Edmund Burke, Commissioner of Patents, (Washington: J. & G.S. Gideon, 1847), *xii - xiii.*

models filed as exhibits with patent applications. The building burned down in 1836 and, with it, whatever meager records existed prior to that date.[35]

The 1836 blaze signaled the end of more than the post office building. It also served as a symbolic purging of the old patent system. Congress overhauled the patent statute in 1836. It established the Patent Office as a stand-alone bureau within the State Department, elevated the Superintendent to Commissioner of Patents and funded new positions for a chief clerk, an examining clerk, two additional clerks, a machinist and a messenger. Congress also granted the patent office its own seal, obviating the need for direct presidential involvement with approved applications.[36] Most significant, Congress also re-established the examination function, this time avoiding the President's cabinet and instead elevating clerks to patent examiners with authority to review and approve applications.[37] Congress basically inserted an initial lower level review with a right to challenge. Under the new law, a three-person board of disinterested persons appointed by the Secretary of State reviewed all challenges to rejected applications.[38] The newly re-tooled office also established a search system to help the examiners in establishing the novelty of new applications.[39] Public demand for access to patent records was growing as well, a sign that the system was beginning to develop some economic energy. Thornton opposed the idea of allowing private citizens to sift through patent files, apparently

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[35] Preston, "The Administration and Reform of the U. S. Patent Office, 1790-1836," 336.
[36] United States Code, Chapter CCCLVII, Sections 2-4, July 4, 1836, re-printed in *List of Patents for Inventions and Designs Issued by the United States, from 1790 to 1847,* compiled and Published under the direction of Edmund Burke, Commissioner of Patents, (Washington: J. & G.S. Gideon, 1847), *vi.*
[37] Post, " 'Liberalizers' versus 'Scientific Men' in the Antebellum Patent Office," 26.
[38] United States Code, Chapter CCCLVII, Sections 7, July 4, 1836, re-printed in *List of Patents for Inventions and Designs Issued by the United States, from 1790 to 1847,* compiled and Published under the direction of Edmund Burke, Commissioner of Patents, (Washington: J. & G.S. Gideon, 1847), *vi.* Congress supplemented the review function 1870 with the obligation of the applicant to submit a detailed claim.
[39] George W. Evans, "The Birth and Growth of the Patent Office," Records of the Columbia Historical Society, Washington, D.C., Vol. 22 (1919), 114.

worried that patent holders might suffer as a result, but Henry Clay, Secretary of State and therefore Thornton's boss, overrode the objection. The office commenced providing copies of patents to the public for a fee.[40]

In forty-six years, patent rights had evolved from commanding the attention of the primary overseers of state, war and law, to commanding no one's attention and finally settling where they still rest today, in the hands of executive branch examiners. Clearly the new nation struggled with the questions of how important patents were and whose attention they warranted. Whether the 1836 revisions were simply part of a Jacksonian era housecleaning is not entirely clear. The result, however, was a process whereby bureaucrats of lower title and greater subject matter knowledge took control, a common dynamic as government grew beyond the ability of executive branch secretaries and legislative bodies to ponder and decide routine and voluminous matters.

Following the 1836 revisions, the spirit of Jefferson re-emerged within the patent office. Patent examiners, mindful that one purpose behind reinstating the review process was to stem the flow of junk inventions being foisted on the American public, became cautious. They took to heart their duty to see to it that the public got its end of the patent 'bargain' memorialized in the Constitution and now re-born in the federal law. As men of scientific background, they played devil's advocate when reviewing applications, actively looking for reasons to reject them. From the law's 1836 revision up to 1843, the approval rate in the Patent Office was approximately sixty percent, a shocking decline for an inventing class long accustomed to getting nearly anything it fancied simply by filing the forms.[41]

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[40] Preston, "The Administration and Reform of the U. S. Patent Office, 1790-1836," 339-342.
[41] Post, " 'Liberalizers' versus 'Scientific Men' in the Antebellum Patent Office," 29.

The varied early history of patent administration suggests uncertainty as to the role of patent rights in America. Regardless of the administrative procedures, however, patents clearly operated within a capitalist system. Although Jefferson favored farmer/producers, artisans, credit for families and small affordable sections of land over Alexander Hamilton's factories, both men assumed that their constituents depended upon and would use the ingredients of capitalism: a vibrant market, private property, wage labor and financial instruments.[42] Congress must have viewed patents as a tool to attract the best people to the United States or to keep them there, and also as a tool to create a well of public knowledge from which talented people could draw deeply. Patent law envisioned a great wall of progress with each inventor's stone lying atop one set by a previous inventor. Getting the stones into the wall required Congress to advance private interests. To the extent the patent law represented a value system in action, the value was a robust economy made possible in part by unique and driven individuals who took it upon themselves to make things happen.[43] Congress designed the patent law to strike a bargain for the benefit of the public: exclusivity as a means to promote public welfare.[44] These historical antecedents extended to plants when they were drawn into the world of

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[42] James A. Henretta, *The Origins of American Capitalism* (Boston: Northeastern University Press, 1991), 294.

[43] Patents did not necessarily translate into a panacea for Americans. Researchers estimated in 1932 that as few as 1% of patents issued had any practical utility. The act of patenting touched many American lives as evidenced by the pages of diverse names in Patent Office records, but it appears that those able to realize financial reward from patents were those who worked steadily and were willing to make mistakes. Between 1916 and 1925, 13% of American patentees accounted for 57.5% of the patents issued. Thomas Edison, for example, obtained seventy-eight patents during the decade. These later data suggest that the true beneficiaries of patent technology were those with resources in time and money as well as creativity. Invention was a scatter gun process, thrown open to everyone with the hope that a few would truly succeed for the benefit of society and the rest would not do too much harm. The true visionaries of patents saw clearly that profits lay not in eureka moments but in a carefully planned scheme of research, finance, manufacture and marketing. See, Lowell Juilliard Carr, "The Patenting Performance of 1,000 Inventors During Ten Years," *The American Journal of Sociology*, Vol. 37, No. 4 (Jan., 1932), 569, 575-576.

[44] *Martinetti v. Maguire*, 16 Fed. Cases 920 (C.C. Cal 1867).

patents in the twentieth century, thus forcing them into an economic model as the criteria for justification.

Agriculture and the Patent Office

The early history of patent law suggests that its drafters and administrators viewed it as an economic tool for building a vibrant American economy. The same philosophy applied to plants and seeds. Unlike inventions protected by patents, however, no one in the nineteenth century viewed plants and seeds as a potential source of profit wanting only the grant of exclusivity in order to flourish. Although a clear line of demarcation separated plants and patents in a legal sense, both contributed to the economic well being of America. As a result, when lobbyists proposed plants as a possible object of intellectual property protection and when Congress judged the advisability of such a marriage, both sides used practical economic advantage as their primary litmus test. Given the dearth of any serious historical commentary on the cultural or ethical ramification of patents on living material, as well as the dire economic circumstance of the late 1920s, it is not surprising that approval of plant patents by Congress did not delve much deeper than the fact that it made good economic sense.

The manner in which government officials employed seeds in pursuit of a sound agricultural economy was the near opposite of that used for patents. In patents, the government offered exclusivity in order to acquire public disclosure of inventive knowledge. In the case of seeds, the government gave them away in the hope that farmers would accept the risk of a failed crop for the possibility of an exceptionally good crop and, in the latter case, save and share good seeds with other farmers. In short, the patent office reversed its normal process when it came to seeds. Instead of trying to transfer

something of value into the public domain by offering exclusivity to its inventor, it gave away something of value to farmers in the hope that it would expand into the public domain by replication and free sharing. In both cases, the government sought in the long run to expand public access to things of economic value, whether tangible or intangible. The country generally benefited as a result from better seed stock in the hands of more farmers just as it benefited from inventive information in the hands of more inventors and entrepreneurs.

The traditional exclusion of seeds by administrators and courts from the patent-oriented bargain of exclusivity in exchange for disclosure lay in the fact that seeds were already in the public domain as a product of nature. No one 'invented' seeds in the eighteenth and nineteenth centuries and court decisions reflect this philosophy. Court rulings generally erected and maintained a barrier between invention and nature. Some carefully crafted exceptions, however, recognized that inventors could and did use the creative process with products of nature. The key to bridging the gap was bringing something of value to the fore through human intervention.[45]

The United States Supreme Court consistently held that if something existed in nature, its mere discovery did not add anything new to the body of public knowledge.

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[45] A 1948 Supreme Court case involving Funk Brothers Seed Company illustrates the dominant thinking that survived well into the twentieth century. A Funk Brothers employee discovered that certain strains of plant inoculants did not inhibit each other when mixed together. The company therefore combined the strains and marketed them in a single product suitable for multiple plants, greatly decreasing the company's packaging costs. Funk Brothers obtained a patent for the new mixed-plant inoculant but the Supreme Court ultimately rejected the patent on challenge. Funk Brothers had done nothing to the bacteria in question. It had simply discovered their respective properties and used this knowledge to mix them together in a way that enhanced their commercial value. The Court stated: "[P]atents cannot issue for the discovery of the phenomena of nature. The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomena of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." *Funk Brothers Seed Company v. Kalo Inoculant Company,* 333 U.S. 127 (1948), 130. This ruling reflects the justification for the Plant Patent Act of 1930, discussed below.

Worse, to grant a monopoly in natural products or information would rob society of the myriad uses to which that product might be put. Thus, one might employ a natural product in a new and useful process, and seek patent protection for the process, but this protection did not grant exclusivity in the natural product itself. This rule held for both principles and products found in nature. To grant a patent on a scientific or mathematical principle would not hold because such principles existed, and had always existed and therefore could only be discovered and not invented. [46] This same logic informed court cases on tangible products as well. A product of nature could be used within an invention but could not stand alone as the subject of a patent.[47] For example, in 1889 the Commissioner of Patents rejected an application for a patent on purified pine needle fibers. The Commissioner stated: "[It] cannot be said that the applicant in this case has made any discovery, or is entitled to patent the idea, or fact, that fiber can be found in the needle of the Pinus australis." To allow the patent would theoretically open the door to patents on elements or principals. The Patent Commissioner prophetically warned that

[46] For example, in the 1852 case of *LeRoy v. Tatham*, the United States Supreme Court stated that while a scientific principle was a fundamental truth that could not be patented, that same truth could be employed in a patentable process. The Court offered an excellent analogy. One could patent the invention of a steam engine, but could not patent the principle of steam power. The invention of a machine to extract, modify and concentrate the natural agency of steam power clearly constituted a patentable invention. The inventive act was not the discovery of the properties of steam power (which had always existed) but rather the application of this knowledge in the creation of a machine that was new and useful. See, *LeRoy v. Tatham*, 14 How. 156 (1852). Similarly, in the 1887 decision in the Alexander Graham Bell telephone patent case, the Court noted that electricity was a force of nature employed by Bell in his invention. If left to itself, electricity would not do what Bell needed for it to do. Bell's invention was a process to control the natural force of electricity to make it accomplish the purpose needed. In other words, Bell employed a force of nature in a new and practical use. See, *Dolbear v. American Bell Telephone Company*, 126 US 1, 532-33 (1887).

[47] In the case of *American Wood Paper Company*, the court ruled that a new process to derive cellulose from wood was patentable, but the resulting cellulose was not since it was indistinguishable from cellulose found in nature. The court said: "A process to obtain [a valuable substance] from a subject from which it has never been taken may be the creature of invention, the thing itself when obtained cannot be called a new manufacture." See, *Am. Wood-Paper Co.*, 90 U.S. (23 Wall.), 593-94.

such broad application of the patent law might lead to patents "upon the trees of the forest and the plants of the earth."[48]

A philosophy emerged throughout the life of patent law in which all three branches of government carefully protected the bargain between the public and inventors, allowing no advantage or reward to those who worked hard and made life-changing discoveries, but brought nothing new to the table in exchange for a temporary monopoly. Finding something that was always there was simply not part of the bargain. The inventor had to also employ it in a new and useful process while leaving the natural ingredient free for the next inventor to use. This philosophy underscored the economic mindset of patent law in demanding value for value and refusing to give value for things already in the public domain, even if revealed only after much human effort and ingenuity.[49]

Seeds existed and self replicated through natural processes. The best way to discover and exploit their economic potential was to get them into the hands of farmers. The public sector took up the mantle of farm support by collecting and distributing seeds and plants to farmers to make of them whatever they could. Dr. David Fairchild

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[48] See, *Ex parte Latimer,* 1889 Dec. Comm'r Pat. 123 (1889), 125.

[49] This economic mindset would become even clearer by the mid-twentieth century, when courts would establish the precedent of patents for products of nature that were isolated and purified in commercial quantities. For example, in 1926 researchers discovered that anemics benefited greatly from cattle liver, although they did not know why. Liver extract was available by 1947 but it was expensive and hard to tolerate for some anemics. After many years of trial and error, scientists succeeded in isolating a useful material for treatment of anemia. They identified it as a vitamin of the 'B' class and gave it the numeral extension of '12' since that was the next number in line. Everyone else had been searching for anemia treatment in liver, but those who ultimately discovered the answer in vitamin B12 had found it in other substances and applied for patents on the B12 compositions. The applicants did not apply to patent crystalline B12 in its natural state nor did they seek patents on B12 derived from other sources. A lower Federal Court of Appeals denied the patent, holding that what had been produced was a product of nature. The Fourth Circuit Court of Appeals reversed. There was no question that vitamin B12 occurred in nature. It could be found in trace amounts in cattle and was also produced by certain microorganisms. It had no utility in its naturally occurring state for two reasons, however. First, not enough B12 was produced in nature to be commercially useful. Second, the B12 produced in nature was not pure. The Court ruled that the patent applicants had created pure vitamin B12 in commercial quantities, thus making it new and useful. The Court further ruled that nothing in the patent law precluded a patent on a composition of natural products since, after all, nature provided the source material for everything that was patented. See, *Merck v. Olin Mathieson Chemical Corporation*, 253 F.2d 156 (4th Cir 1958).

summarized the dynamic in an 1898 Department of Agriculture publication: "Rapid development of any new country is due to discovery of soil and climate suitable to growth of introduced food plants and seldom to the development of endemic species. So thoroughly has this fact been recognized by all colonizing nations that they have established botanic gardens in their new colonies, one important function of which is to secure and distribute exotic economic plants throughout the colony."[50] Colonial America is a case study of this dynamic, being poor in economic crops but rich in fertile land.[51] In the nineteenth century, the majority of Americans either lived on farms or depended on agriculture for their well-being. Farmers routinely sought new and heartier varieties of plants in the interest of both subsistence and economic opportunity. Colonial assemblies helped by appropriating funds to buy seeds as they were able.[52] By 1731, the city of Philadelphia had established a botanical garden and a systematic plant and seed distribution method. Congress got into the act later on, allocating money in 1817 for the introduction of olives.[53] Overall, however, seed collection lay within the purview of enthusiasts and practical minded bureaucrats who appended the activity onto the primary duties of Americans traveling internationally.

Private enthusiasts such as Thomas Jefferson and James Madison used their reputation and connections to obtain seeds. Jefferson sent back new varieties of grass, rice, peppers and trees from France. Benjamin Franklin similarly took advantage of his travels to Europe to collect seeds and cuttings. In 1819 and 1827 respectively, Secretary

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[50] Quoted in Knowles A. Ryerson, "History and Significance of the Foreign Plant Introduction Work of the United States Department of Agriculture," *Agricultural History*, Vol. 7, No. 3 (Jul., 1933), 111.
[51] Knowles A. Ryerson, "Plant Introductions," *Agricultural History*, Vol. 50, No. 1, Bicentennial Symposium: Two Centuries of American Agriculture (Jan., 1976), 248.
[52] Ryerson, "History and Significance of the Foreign Plant Introduction Work of the United States Department of Agriculture," 112.
[53] Ibid.

of the Treasury William Crawford and President John Quincy Adams issued specific instruction to American consuls in foreign countries to send useful new plants back to the United States as well as any new inventions.[54] Congress authorized naval expeditions for the express purpose of seed collection in 1838 and 1849.[55] This was work that a simple farmer could not perform and which the commercial marketplace had not embraced.

Ironically, seed distribution became a prominent feature of the patent office in the eighteenth and nineteenth centuries. No faction, government or private, sought to connect seeds with the primary function of patent administrators. Seeds did not represent a stand-alone commodity; they were inputs to be combined with sun, water and labor to produce something with economic value. That one variety of plant performed better than another was economically relevant to farmers only after the harvest, not before.

Henry Ellsworth formalized seed distribution through the patent office. Following the 1836 revisions to the patent law, President Andrew Jackson named Ellsworth as the first Commissioner of Patents.[56] Like Jefferson, Ellsworth brought a personal enthusiasm for progressive agriculture into his government life and it fit well with his new job in the patent office.[57] A former Secretary of the Hartford County Agricultural Society and owner of large tracts of land stretching from Michigan to Iowa, Ellsworth quickly recognized an opportunity to use his position in the Patent Office to assist American

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[54] Ibid., 113.
[55] Jack Ralph Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000* (Cambridge: Cambridge University Press, 1988), 55-56.
[56] Ellsworth was a Connecticut native who came from political stock. His father, Oliver Ellsworth, had served as the first United States Chief Justice in the Washington administration. A Yale educated lawyer, Ellsworth had previously served as Commissioner of Indian Affairs for Southwest Arkansas. He was also an avid farmer and outdoorsman fascinated with the mechanics and science of agriculture. Earle D. Ross, "The United States Department of Agriculture during the Commissionership: A Study in Politics, Administration, and Technology, 1862-1889," *Agricultural History*, Vol. 20, No. 3 (Jul., 1946), 130.
[57] T. Swann Harding, "Henry L. Ellsworth, Commissioner of Patents," *Journal of Farm Economics*, Vol. 22, No. 3 (Aug., 1940), 662.

farmers in the areas of seeds and statistics.[58] To Henry Ellsworth's way of thinking, the Constitutional mandate behind patents - to promote progress in science and the useful arts – was naturally linked to the dominant occupation of the day: agriculture. How could one comply with the charge of promoting progress and not be an advocate for better farming?[59] Ellsworth believed that encouraging more use by farmers of novel plants was just as important as encouraging new inventions.[60]

Ellsworth had plenty with which to work on this charge. Anything new or interesting floating around Washington eventually found its way to the Patent Office by default, whether intended as the subject of a patent or not. The office became something of a storehouse of random information. Similarly, the patent office became a source of information for people with questions who assumed that an office dedicated to new and original ideas was the place to obtain information and advice. Ellsworth established an informal program within the Patent Office to distribute seeds to farmers free of charge using the Congressional franking privilege.[61] Farmers represented the only constituency with the ability to breed new varieties on a large scale. These farmers bore the risk, reaping the benefits of good results and dealing with the impact of failures.[62] Their fields were the experimental farms that would one day be the turf of commercial and college breeders. They did not view themselves as the owners of beneficial new varieties, however. They intuitively shared the successes with friends and neighbors through a

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[58] Walter H. Ebling, "Why the Government Entered the Field of Crop Reporting and Forecasting," *Journal of Farm Economics*, Vol. 21, No. 4 (Nov., 1939), 718.
[59] Jane S. Smith, *The Garden of Invention: Luther Burbank and the Business of Breeding Plants* (New York: The Penguin Group, 2009), 14
[60] Kloppenburg, Jr., *First the Seed,* 55-56.
[61] Ellsworth once commented that people entering his office seemed eager to communicate to him knowledge of every kind. W. H. Hodge and C. O. Erlanson, "Federal Plant Introduction: A Review," *Economic Botany*, Vol. 10, No. 4 (Oct. - Dec., 1956), 301.
[62] Kloppenburg, Jr., *First the Seed,* Ibid.

cultural dynamic that had existed for centuries.

Ellsworth quickly took his passion for agriculture to the halls of Congress in an attempt to present lawmakers with a new vision of government's role toward good and profitable agriculture. In his 1837 Annual Report, Ellsworth noted that Congress seemed to view husbandry as a natural blessing that required no aid from legislation.[63] Up to that point, those who studied the science of farming did so largely as hobbyists. To most people, farming was an act of human nature as natural as walking or giving birth. One would no more subsidize it than one would pay people to breathe. Ellsworth disagreed, maintaining that government policy, while being kind to commercial manufacturers of agricultural machines and implements, had neglected the practice of agriculture. He noted significant inventor attention to machines and implements for agriculture.[64] Agriculture had benefited from many of these inventions, which had displaced laborers while increasing yields.[65] It was the practice of farming, however, that remained the lifeblood of the United States economy and made the commercial and manufacturing sectors viable.[66] Ellsworth believed that a formal government system of seed selection and distribution could improve yields by twenty percent. He estimated that a ten percent increase in wheat yields would add twenty million dollars to the national economy by decreasing imports and increasing exports.[67]

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[63] Ryerson, "History and Significance of the Foreign Plant Introduction Work of the United States Department of Agriculture," 114.
[64] Ebling, "Why the Government Entered the Field of Crop Reporting and Forecasting," 721.
[65] T. Swann Harding, "Henry L. Ellsworth, Commissioner of Patents," *Journal of Farm Economics*, Vol. 22, No. 3 (Aug., 1940), 621.
[66] Arthur G. Peterson, "Agriculture in the United States, 1839 and 1939," *Journal of Farm Economics*, Vol. 22, No. 1, Proceedings Number (Feb., 1940), 106.
[67] T. Swann Harding, "Henry L. Ellsworth, Commissioner of Patents," 622-623. In addition to seed distribution, Ellsworth also lobbied for systematic collection and reporting of agricultural statistics. As agriculture grew with westward expansion, yields in western wheat began to have an impact on commodity markets. Given the sheer distance and state of the technology, farmers found themselves wanting and

By 1839, the patent office budget included funding for collection and distribution of seeds, plants and agricultural statistics. Within ten years, the patent office was mailing out sixty thousand packets of seeds per year.[68] Patent Office employee Joseph Hold took the office of Postmaster General and immediately took up the cause to make it simple and cheap to send seeds and cuttings through the US mail, thus opening the door to the mail order seed business.[69]

Patents Office critics questioned the new custodians of agricultural data and seeds. They branded 'Patent Office Agriculture' as wasteful, inaccurate and incompetent.[70] Critics did not question the need for such services, only the poor manner in which the Patent Office handled them. In spite of its detractors, the Patent Office endured as the distributor of seeds and plants, as well as the publisher of agriculture statistics, from 1836 to 1862.[71] Critics correctly pointed out the need for either more funding or else a stand-alone office dedicated to agriculture. Patent Office commissioners did not turn the issue into a turf war. In fact, its Agriculture Division advocated vocally for a federal bureau of agriculture.[72]

Southern Congressmen opposed federal legislation to create a bureau of agriculture, claiming it beyond the Constitutional grant of power. The federal government, in their estimation, had no business undertaking the care of agriculture,

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needing regular crop data. In his 1838 report to Congress, Ellsworth argued that agriculture statistics would help guard against speculation and provided a clear picture of the state of the exchange markets. See, Ebling, "Why the Government Entered the Field of Crop Reporting and Forecasting," 719-721.

[68] Kloppenburg, Jr., *First the Seed,* 55-56.

[69] Smith, *The Garden of Invention,* 109.

[70] Earle D. Ross, "The United States Department of Agriculture during the Commissionership: A Study in Politics, Administration, and Technology, 1862-1889," *Agricultural History*, Vol. 20, No. 3 (Jul., 1946), 134.

[71] Guy A. Lee, "The General Records of the United States Department of Agriculture in the National Archives," *Agricultural History*, Vol. 19, No. 4 (Oct., 1945), 243.

[72] Sarah T. Phillips, "Antebellum Agricultural Reform, Republican Ideology, and Sectional Tension," *Agricultural History*, Vol. 74, No. 4 (Autumn, 2000), 816-817.

something they saw as being under the banner of state sovereignty. Supporters of more federal money for agriculture echoed the patent office view, which was philosophically wedded to free labor and scientific farming practices. They wanted to bring a distinctly northern personality to southern farming. The combination of science and farmers' labor would, in the words of Representative James Campbell of Pennsylvania, "encourage, protect and elevate the noblest race of men god ever placed upon his footstool – the laborious, free and independent American farmer."[73] With the country mired in the Civil War and southern representation no longer present, Congress established a stand-alone Department of Agriculture with passage of the Organic Act of 1862.[74] Congress thus codified the long informal function of seed gathering and distribution but left it squarely in the realm of public aid to farmers. The Organic Act stated in its pre-amble: "Among the duties of the new Department of Agriculture are to: procure, propagate and distribute among the people new and valuable seeds and plants." Congress also directed the Commissioner of Agriculture to: "collect as he may be able new and valuable seeds and plants; to test by cultivation the value of such of them as may require such tests; to propagate such as may be worthy of propagation and distribute them among agriculturists."[75] With passage of the Organic Act, the government moved from a collector and distributor of seeds to a tester and propagator. The federal government had entered the business of plant breeding as a public service to America's farmers.

Congress acknowledged in a somewhat scolding tone the lack of serious and formalized effort in government seed distribution, and in the same breath reinforced the

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[73] Sarah T. Phillips, "Antebellum Agricultural Reform, Republican Ideology, and Sectional Tension," *Agricultural History*, Vol. 74, No. 4 (Autumn, 2000), 817-818.
[74] 12 Stat. 387, now codified at 7 U.S.C. § 2201, et. seq.
[75] The Congressional Globe, V. 32. Part 1, 37th Cong. 2nd Sess., Feb, 17, 1862, 855-856.

traditional perception that plants had nothing to do with patents: "A small appropriation is indeed annually made for the distribution of seeds and plants. This has been done under the supervision of the Commissioner of Patents, whose leading and engrossing business is in another direction. With this department, agriculture has no necessary or even natural connection. It has been tolerated rather than fostered and has suffered often from neglect and mismanagement." Congress also noted that it had largely ignored this critical part of the United States economy: "[F]arming interest is the basis of all other interests and the primary source of national prosperity"[76] Abraham Lincoln appointed a personal friend, Isaac Newton, to serve as the first Commissioner of Agriculture. Newton lost no time in trying to further educate Congress as to the importance of agriculture in the national economy, stressing that it was the nation's primary source of wealth and that: "there is no clearer principal of political economy than – as the farmer is enriched, all other classes prosper."[77]

Despite the Congressional scolding of the Patent Office for doing what no one else was willing to do, Congress gave the Department of Agriculture essentially the same charge: distribute information and seeds. Southern and western farmers welcomed the assistance while eastern farmers and private seed dealers grumbled at the thought of a government funded seed store.[78] The Department of Agriculture had established direct seed exchange programs with Europe, Asia and South America by 1868.[79]

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[76] The Congressional Globe, V. 32. Part 1, 37th Cong. 2nd Sess., Feb, 17, 1862, 855-856.
[77] Ebling, "Why the Government Entered the Field of Crop Reporting and Forecasting," 726-727.
[78] Earle D. Ross, "The United States Department of Agriculture during the Commissionership: A Study in Politics, Administration, and Technology, 1862-1889," *Agricultural History*, Vol. 20, No. 3 (Jul., 1946), 142.
[79] Ryerson, "Plant Introductions," 252

Farmers dominated the seed market thru the nineteenth century, helped along by the invention of the refrigerated rail car in 1875, which fostered large-scale commercial production of vegetables. Although the private seed market was beginning to flourish, it had strong competition. Government seed was not only free but also came with the government's imprimatur guaranteeing the best quality. By 1898, the Department of Agriculture under James Wilson had established the Section of Seed and Plant Introduction, the first official agricultural organization of its kind whose activities were devoted exclusively to plant introduction. By 1901, Congress had folded it into the Bureau of Plant Industry.[80] Its focus was distribution of seeds to farmers for the purpose of growing crops. It did not yield scientific results.[81] Still, the Bureau, like the public universities and the Department of Agriculture, was an institution government designed to spur economic advancement by helping farmers help themselves and thus the economy.[82]

By the opening of the twentieth century, both patent administration and agricultural policy worked to build a strong economy by bringing information and products into greater public use. In the case of invention, it did so by exclusivity. In the case of agriculture, it did so through free seeds. In the latter case, the seeds began and ended in the public domain and so there was no need to seek them out or to connect them to exclusivity. This thinking soon changed as the nursery industry gained economic and political power and plant breeding became formal and result oriented. Plants and patents

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[80] Ryerson, "History and Significance of the Foreign Plant Introduction Work of the United States Department of Agriculture," 121.
[81] John A. Stevenson, "Plants, Problems, and Personalities: The Genesis of the Bureau of Plant Industry," *Agricultural History*, Vol. 28, No. 4 (Oct., 1954), 159.
[82] See, Wallace E. Huffman, "Public-Private Research and Development Relationships: Discussion," *American Journal of Agricultural Economics*, Vol. 83, No. 3 (Aug., 2001), 754.

came together when breeders began to assert that directed breeding entailed a creative spirit no different than that of the inventor and therefore deserved the same economic advantages.

CHAPTER 2. PLANT BREEDING AND PATENTS IN THE TWENTIETH CENTURY: A MATTER OF SEX AND POLITICS

From the birth of patent law in 1790, through the nineteenth century and up to 1930, American culture painted a clear line between plants and patents. Both represented economic value and both formed a part of government policy primarily for that reason. Unlike inventions, however, lawmakers, regulators and the courts viewed plants as essentially public property. No need existed for Congress to tempt seeds into the public domain by offering exclusivity to their owners. Seeds resided in the public domain through natural processes and, even if a unique variety had market value, it would self-replicate. The challenge for government, therefore, was to get seeds into the hands of those who would accept the risk of experimentation in the hope of greater economic benefit. The federal government took up this challenge in the new Department of Agriculture, continuing and expanding work that began in the patent office.

This chapter will examine the enactment by Congress of two significant pieces of legislation that extended intellectual property protection to plants. The Plant Patent Act of 1930 extended patent protection to asexually produced plants. It represented the first and only successful effort to extend specific patent protection to plants by an Act of Congress. The Plant Variety Protection Act of 1970 extended patent-type protection to open-pollinated plants in 1970. The United States Supreme Court made asexually produced plants eligible for patent protection in 1985.

The historical record on the Plant Patent Act of 1930 indicates that the industry advocates who lobbied for its passage, the Congress that debated and approved it, and the Hoover administration that stood by with no objection all saw within the law not only a

new and powerful economic tool for the private sector but also an opportunity to curb government expenditures as the Great Depression loomed over the country. The Plant Patent Act represented a move to privatize the cost of seed research by improving its economic potential. Historically, the government had simply collected and distributed new and promising seeds. Later, the government socialized the development cost of seed improvement by funding breeding programs in the Department of Agriculture. By moving plants partially into the patent system in 1930, the government created an incentive for the private sector to take on a greater share of the development cost by giving it a tool to better protect marketable results. In other words, the marriage of plants and patents was, on multiple levels, an economic solution to an economic problem.

The historical perception of the meaning and purpose of patents served to guide the debate. To the extent that plants and seeds possessed an identity in the halls of government, that identity was economic as well. Transferring them to the Patent Act did not fundamentally change their identity; it simply changed their strategic use within that identity. With patent protection, seeds could not only help farmers economically, but private breeders as well. The story begins with the nursery industry and Luther Burbank.

Asexual Breeding

Domestication of plants dates back ten thousand years to the Neolithic period. As hunter-gatherers became farmers and settled in areas with different weather and soil conditions, they began to create unique crops, known as landraces, simply by selecting those that performed the best under the given conditions.[1] These farmers did not use

[1] J. J. Hardon, "Conservation and Use of Agro-Biodiversity," *Biodiversity Letters*, Vol. 3, No. 3 (May, 1996), 92. Some authors, particularly anthropologists, refer to landraces as folk varieties. The concept is the same: local crops that contain important genetic information by virtue of having survived and flourished in a specific climate, soil, geographic location, etc., with the help of farmer selection. See, e.g., David A.

modern breeding techniques and they cannot be called breeders in the sense that they set out to produce new varieties. They nevertheless 'improved' plants by selection for thousands of years.[2] As a result, the earth is full of unique landraces and traditional knowledge, which continue to inform farmers and plant breeders.[3]

Directed plant breeding originated from the work of Gregor Mendel, a nineteenth century cleric who studied rules of heredity in 1865, while the new Department of Agriculture was in its infancy. Academia and science, being more enamored at the time with Darwin and pangenesis, ignored or forgot about Mendel's work and Mendel himself set it aside to dedicate more time to his church duties. Scientists rediscovered Mendel in the early twentieth century as their independent experiments found explanation and validation in his writings.[4] More important, they began to use Mendel's laws proactively to bring about a paradigm shift in plant breeding, converting it from an observational exercise where one looked for a desired trait, to a science where one set out to create a desired trait in an orderly manner. Although time intensive, prone to hit and miss results and very much an intuitive art, breeding took its first steps away from the realm of nature and into the realm of science. A specialized industry began to emerge: the plant breeder operating on a large scale to make profit not from yields but from sales of custom

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Cleveland and Stephen C. Murray, "The World's Crop Genetic Resources and the Rights of Indigenous Farmers," *Current Anthropology*, Vol. 38, No. 4 (1997), 477-478.

[2] Fred Powledge, "Who Owns Rice and Beans?" *BioScience*, Vol. 45, No. 7 (Jul. - Aug., 1995), 443.

[3] Kal Raustiala and David G. Victor, "The Regime Complex for Plant Genetic Resources," *International Organization*, Vol. 58, No. 2 (Spring, 2004), 304. Ironically, many of these same plants are now viewed as 'raw materials' in the contemporary debate on plants and patents. This dynamic will be discussed in subsequent chapters.

[4] Jack Ralph Kloppenburg, Jr., *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000* (Cambridge: Cambridge University Press, 1988), 69. Prior to Mendel, breeders were limited to crossing whole plant varieties. A new variety had to be beneficial in the whole, a quality plant from top to bottom. Mendel's process allowed breeders to select specific traits within plants and breed them into existing varieties. Breeders progressed from creating entirely new varieties to improving existing varieties. As a result, a plant need not be suitable in the whole in order to be a candidate for breeding, but could instead offer a single attractive trait. This fact greatly expanded the number of plants with potential value and collections of germplasm doubled world-wide from 1925 to 1930. See, Kloppenburg, Jr., *First the Seed*, 80.

designed inputs. Plant breeders enhanced the economic potential of seeds as well as the cost of producing those seeds. Breeders transformed the traditional territory of hobbyists and gentlemen farmers into a potentially lucrative commercial enterprise. What was once a secondary aspect of farming – the farmer's keen eye for the best looking plants – became a stand alone endeavor which, like the most successful works of inventors, required time, money and resources. In short, the plant breeder began to take on some characteristics of the inventor. As plant breeding re-emerged and evolved from an incident of farming to a scientific and commercial enterprise, businessmen began to see plants and seeds more naturally within the scope of commercial markets and patent law.

Commercial seed and plant sales still lagged behind the public sector. Although Mendel's work expanded the commercial potential of plant breeding, it found a more natural home within the land grant university system and its dedication to assisting the farmer as a matter of public policy. The Organic Act signaled recognition by Congress that farming warranted significant attention from the mechanism of government, including finding and propagating seeds. Farmers and the government continued to view seed varieties and breeding as an agricultural input designed to make crops as robust as possible, no different than harrowing and spreading manure. Congress placed research within the three-legged stool of land-grant colleges, agricultural experimental stations and the cooperative extension service, thus firmly grounding agricultural improvement in the public sector.[5] One way to close this gap was for private interests to have exclusive rights to their unique plant varieties.

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[5] Frederick H. Buttel and Lawrence Busch, "The Public Agricultural Research System at the Crossroads," *Agricultural History*, Vol. 62, No. 2, Publicly Sponsored Agricultural Research in the United States: Past, Present, and Future (Spring, 1988), 303.

Lobbyists for the nursery industry drafted and championed the Plant Patent Act of 1930. Marketing new varieties of trees, fruits, vegetables and flowers was historically difficult for nurserymen, who could spend years establishing superior plants only to see their work quickly lose its economic value. To sell a new variety of plant that re-produced itself asexually was to give the buyer not only the plant but also the tools to produce an endless supply of identical copies. Upon release of a new variety to the public, a competing nurseryman or even a hobbyist could produce an identical copy with a clipping or bud from the original. A successful nursery needed to reap its profit quickly before its new creation became commonplace. A breeder or nurseryman extracted profit from a new variety during an extremely narrow window of opportunity in which he accumulated plant stock, guarded it carefully and then sold the first generation of new plants for as much as possible. As appreciation for the cost and skills of plant breeding grew, and as anger and frustration on the part of plant breeders intensified, the move to protect the nursery industry gained momentum. As early as 1906, breeders argued to Congress that a new variety of plant was a biological innovation no different than a mechanical one in the sense that both derived from human effort and ingenuity.[6] Still, opponents could argue that a plant was a product of nature, more discovered than invented. Given the historical view of plants, the nursery industry found itself in a gray area, constantly retreating to an argument foreign to the patent lexicon: fairness. Historically, there was nothing fair about the patent bargain. The public struck its bargain of exclusivity for information with the person who filed the successful application, not the person who did the most work or was most deserving. In order to use fairness to tip

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[6] Jane S. Smith, *The Garden of Invention: Luther Burbank and the Business of Breeding Plants* (New York: The Penguin Group, 2009), 302.

the issue in favor of action, the nursery industry needed a victim and an injustice that resonated with lawmakers. They found both in Luther Burbank.

Of Heroes and Horticulture

Between 1873 and 1925, Luther Burbank attached his name to over eight hundred varieties of fruit, vegetable, flower, nut and grain. Burbank led horticulture into the arena of science and in so doing made it an economic force. As America embraced progressivism, Burbank illustrated it by using science not only to understand nature but also to manipulate it. A self described 'infidel' who favored the church of nature over the church of pews and steeples, Luther Burbank longed for the right to seek patent protection for his plants, something he thought he deserved and that would give him fair compensation for his work.[7] He eventually received it posthumously in 1930 in partial tribute to his life's work. Because Burbank was especially gifted in the art of breeding, his name and reputation opened doors in both the marketplace and in the halls of Congress. Appending his legacy to the Plant Patent Act of 1930 was a masterstroke on the part of industry lobbyists. The Plant Patent Act of 1930 not only placed the nursery industry on stronger economic footing, it symbolically atoned for the economic injustices visited on Luther Burbank.

In 1875, a seed dealer named J. H. Gregory paid Burbank $250 for the excusive right to propagate and sell the new Burbank Seedling potato.[8] Burbank retained ten of the tubers and continued to breed them. He advertised the results for retail sale in 1878 but

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[7] Although he did not find eugenics to be scientifically sound, Burbank studied the subject, especially as it applied to children. In 1905, in a speech before the California Board of Trade, Burbank suggested that children might be improved by exposure to nature and not religion. Later published as *The Training of the Human Plant*, the book was quite popular as a call to expose children to science and nature. See, Smith, *The Garden of Invention*, 190-92.

[8] Ibid., 47.

met resistance from the public due to their pale color. The public eventually accepted the Burbank spuds which became the number one potato grown on the west coast. By that time, however, Burbank had long ago lost any ability to compete with his own creation. No one needed to buy from him when so many others cultivated the identical potato.[9]

Burbank's talents and methods were unique. In 1904, despite his complete lack of academic pedigree, Burbank received the largest individual grant then to date, ten thousand dollars annually, from the Carnegie Foundation "for the purpose of fostering your experimental investigations in the evolution of plants."[10] The Carnegie trustees appointed George Harrison Shull, a geneticist who worked at a Carnegie-supported experimental farm, to study Burbank's methods and reduce them to a scientific process. The effort failed when Shull ultimately concluded that the bulk of Burbank's success was due to cross-fertilization, a keen eye for variation and selection and personal habits of concentration.[11]

Burbank's talent for self-promotion and drive for success matched his skill at breeding. He was ever aware that a national reputation was a good business asset.[12] Burbank was also no stranger to invention and its potential in the business world. In 1865, at age sixteen, he purchased a book on how to obtain patents.[13] On May 1, 1892, Burbank wrote a letter to Congressman Thomas J. Geary, ostensibly to comment on a piece of pending immigration legislation but that appeared to have been an excuse to talk

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[9] Peter Dreyer, *A Gardener Touched with Genius: The Life of Luther Burbank* (Berkeley: University of California Press, 1985), 79.
[10] Jane S. Smith, *The Garden of Invention*, 179.
[11] Peter Dreyer, *A Gardener Touched with Genius: The Life of Luther Burbank*, 145-147. Shull would go on to extend the work of William James Beal in establishing reliable hybrid corn, work, which would be continued by Donald F. Jones and ultimately Henry A. Wallace. See, Smith, *The Garden of Invention*, 193, 223.
[12] Smith, *The Garden of Invention*, 95-96.
[13] Ibid., 20.

patents, which dominated the correspondence. In the letter, Burbank complained to Geary that the state of horticultural science was at least fifty years behind where it would be with the benefit of patent protection.[14] In 1911 Burbank wrote in a pamphlet that despite having dumped nearly a quarter million dollars of his own money into his work, he had reaped back less than ten percent of that amount, despite creating products that generated economic value in the millions of dollars. Burbank cryptically professed to be glad that patents had never been available, citing the joy of good work as a superior reward to financial gain and noting that his good business sense had never left him 'stranded' as it had most others who tried their hand at the same kind of work.[15]

Burbank was no stranger to the halls of Congress, a fact that must have helped immensely as Congress debated the Plant Patent Act. Anything to which he lent his name had instant credibility among lawmakers, even when his predictions turned out to be pie in the sky. The spineless cactus case provided an ideal case study of Burbank's reputation and power in Congress. Burbank was fascinated by the possibility of developing a spineless cactus to be used as cattle feed and a water source. For a brief time, Burbank captivated the world with his vision of turning arid land into grazing pasture by breeding the thorn out of the cactus.[16] In 1907, Burbank published a catalogue on plant creations for arid regions. In it, Burbank declared not only that there was not the least doubt that he could produce a spineless cactus, but also that it "will be the most important plant on earth for arid regions." Burbank's optimism and reputation set mouths watering and started money flowing.[17] Without patent protection, however, Burbank faced the threat of

[14] Peter Dreyer, *A Gardener Touched with Genius: The Life of Luther Burbank*, 160-61.
[15] Ibid., 184.
[16] Smith, *The Garden of Invention*, 226.
[17] Ibid., 229-230.

losing his work within a few months of releasing it to the world. In an effort to secure his profits, he formed The Thornless Cactus Farming Company and sold the rights to twenty-seven varieties of cacti for $27,000.[18]

Congress jumped on the bandwagon as well. In 1912, claiming a desire to rectify disparaging comments about Burbank made by "a man connected with the Department of Agriculture," but also perhaps to set the stage for soon-to-be-introduced legislation, Representative Everis Anson Hayes of California took the House floor and delivered a glowing endorsement of Burbank's work. He noted that Burbank was no longer in the nursery business but simply sold his work to others for mass production and retail sale. Despite the fact that Burbank was on the verge of an agreement that would provide him thirty thousand dollars down and fifteen thousand dollars a year, Hayes painted Burbank as a humble toiler in his experimental gardens, wanting nothing more than to help mankind. America, Hayes warned, stood on the verge of losing that largess due to Burbank's lone support of his own work: "A thousand dollars would be a large price for him to receive for even the best of his work, so that while the work of Mr. Burbank has enriched others and blessed humanity, he himself has received but very scanty remuneration. . . . [he] has put all the money he receives . . . about a quarter of a million dollars, into his work . . . His habits are plain and he does not wish for more. There are important experiments, however . . . which may never be completed owing to lack of funds."[19] Following a long recital of Burbank accomplishments, Hayes moved to the spineless cactus. Even though the Department of Agriculture had sent its experts around the world to find the ideal spineless cactus, and had produced a marginally useful plant,

[18] Smith, *The Garden of Invention*, 231. Unfortunately Burbank fell in with unscrupulous businessmen who tarnished his reputation with foolish and even dishonest practices. See, n. 23.
[19] 62nd Congress, 2nd Sess. *Congressional Record* vol. 48, pt. 3 (29 February 1912), 2638.

the Department " . . . in spite of all its organization and its wealth . . .has not obtained a cactus that is in any respect the equal of the cactus produced by Mr. Burbank single handed." Hayes concluded by quoting Burbank's own outrageous statement that the spineless cactus "is worth more than the Burbank potatoes and all my other productions combined."[20]

Four months later, sponsors placed H.R. 23043 on the House Calendar. The bill authorized Burbank to select, with certain exceptions, up to twelve sections (7680 acres) of federal land in the western United States with payment of between $1.25 and $2.50 per acre to be deferred for five years. The land had to be semiarid, nonmineral, nonirrigable and unsuitable for agricultural purposes under its then present condition. In order to purchase the land, Burbank had to establish at least one hundred thousand growing spineless cacti plants on the land for at least two years. The House summarily passed the bill with minor committee amendments and without debate or comment.[21] The bill arrived on the Senate floor two months later. Senator McCumber of North Dakota objected to the special privilege granted Burbank. He noted with some curiosity that the Committee on Public Lands, rather than the Committee on Agriculture, had shepherded the bill. Senator Fall noted that Burbank had set up a corporation to conduct the work that he was alleged to be doing "at his own expense." He also noted that attempts in New Mexico to obtain Burbank specimens for propagation were unsuccessful as "someone claims to have the right to handle the spineless cactus under propagation by Mr. Burbank; and we can get it only by paying a royalty of so much a year." He also noted that the Department of Agriculture claimed at least partial authorship of the Burbank spineless

[20] 62nd Congress, 2nd Sess. *Congressional Record* vol. 48, pt. 3 (29 February 1912), 2640.
[21] 62nd Congress, 2nd Sess. *Congressional Record* vol. 48, pt. 9 (21 June 1912), 8448.

cacti by having worked in partnership with Burbank on its propagation. Despite these allegations, the time allotted for floor debate expired and the bill passed without further comment.[22] While the spineless cacti enjoyed some success overseas, they failed in the United States for a number of reasons. Cattlemen with high demand and little patience did not like the slow growth and were not equipped to provide the irrigation the plants required. Even worse, Burbank had transferred responsibilities for his retail sales operation to businessmen hoping to cash in on his name. These men knew little about marketing live plants. Unable to keep up with demand for Burbank products, they simply acquired cacti from any source, including spined cacti that they smoothed by hand and sold as spineless. The combination of growing demands and fraud sank the program.[23] This series of events, eighteen years before passage of the Plant Patent Act, demonstrate the power of the name Burbank in matters of agriculture policy.

Stark Brothers Nursery took up the scientific and financial legacy left to them by Luther Burbank and parlayed it into the Plant Patent Act of 1930. Stark Brothers was the largest seed breeder in the United States in the early twentieth century and the founder's grandson, Paul Stark, counted Luther Burbank as a friend and peer. The Stark family had been in the nursery business ever since James Stark left Kentucky with a saddlebag full of apple tree shoots and planted them in his first nursery in Louisiana, Missouri.[24] The shoot, or scion, from a tree produced an identical tree for generations on end. The Stark

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[22] 62nd Congress, 2nd Sess. *Congressional Record* vol. 48, pt. 11 (15 August 1912), 10993. Authors Ken and Pat Kraft in their 1967 book, *Luther Burbank: The Wizard and the Man*, claim that H.R. 23043 died in the Senate. The book contains no footnotes and very brief bibliography of secondary sources so it is difficult to trace the source of their claim. The Congressional Record and the fact that Congress passed H.R. 9169 in 1930 (see, n. 57) counter their assertion. See, Ken Kraft and Pat Kraft, *Luther Burbank: The Wizard and the Man*, New York: Meredith Press (1967); 146.

[23] Smith, *The Garden of Invention*, 233-235.

[24] Edward Bernard Garnett, "Paul Stark, Plant Wizard, who is Wearing Burbank's Shoes," *The American Magazine*, 64+, December, 1931: 64.

family built its nursery empire through tireless searching for what grandson Paul Stark called bud sports or single freak limbs that produced one branch of freak fruit on an otherwise unremarkable tree.[25] For example, Paul's father, Clarence Stark mass-produced the Delicious apple from a single tree found in Winterset, Iowa. His use of sports from the apple tree resulted in nineteen million descendent trees around the world.[26] Paul Stark followed suit with the Golden Delicious Apple, which he tracked in 1915 to a single tree in Odessa, West Virginia. He promptly offered five thousand dollars for the tree and had a metal cage built around it with guarded access limited to certified representatives of Stark Brothers Nursery.[27] From that single tree, Stark Brothers produced a new line of fruit. These examples illustrate the advantages and pitfalls of asexual reproduction. Since a competent breeder could use a single tree to produce an endless succession of progeny, profit lay in control and secrecy.

Following his death in 1926, Luther Burbank's widow leased Burbank's experimental farms, including all of the secrets growing there, to the Stark family. Included in the lease was the nurseryman's holy grail: Luther Burbank's seed trunk, which contained seeds for hundreds of Burbank's creations, all of which he had developed alone and in complete secrecy. The Starks established a new experimental garden and, in one season, in addition to hundreds of rare fruits, produced 1,671 vegetables, flowers and grains, many of which had been previously unknown in the world of horticulture, let alone within the general public.[28] The varieties were worth a fortune if Stark could secure exclusive rights to them.

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[25] Ibid., 144.
[26] Ibid.
[27] Ibid.
[28] Ibid.

A Man Honored and a Problem Solved

American nurserymen had talked up patents for new plant varieties since the 1860s, always bumping up against the twin barriers of patenting a product of nature, which the courts abhorred, and the inability to comply with the patent application requirement of submitting an adequate description of the invention.[29] Luther Burbank arguably suffered more than anyone from this barrier. Between 1893 and the time of his death, Burbank had introduced hundreds of new varieties of tree, vegetables, fruits and flowers, but had never received a patent.[30] Burbank went public with his frustrations in 1898 with a letter stating that pirates and imitators were driving him out of business.[31] In 1906 the horticulture industry tried to generate Congressional interest in a plant patent bill but the effort died quietly.[32]

In 1929, Paul Stark formed and served as president of a lobbying group called The National Committee on Plant Patents, an offshoot of the American Association of Nurserymen. From this vantage point, Stark drafted and served as the prime catalyst behind the Plant Patent Act of 1930.[33] Advocates for the Plant Patent Act conceived and executed an impressive strategy of wrapping the issue of plant patents around the economic well-being of the nursery industry, relief from government support and righting a wrong perpetrated on an American icon. The law, coming six months after the 1929 stock market crash, was a combination of Depression-era relief, well-organized lobbying

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[29] Jane S. Smith, *The Garden of Invention,* 299-300.
[30] Travis Brown, *Historic First Patents: The first United States patent for many everyday things*, (Metuchen, N.J.: The Scarecrow Press, Inc, 1994), 144.
[31] Jane S. Smith, *The Garden of Invention,* 301.
[32] Ibid., 301-2.
[33] Glenn E. Bugos and Daniel J. Kevles, "Plants as Intellectual Property: American Practice, Law, and Policy in World Context," *Osiris*, vol. 7, (1992), 81.

and tribute to Luther Burbank.[34] By 1930, the United States was beginning its long struggle through the Great Depression. Droughts in 1930 and 1931 compounded issues of hunger and government relief. Observers viewed the Plant Patent bill as a farmer relief act that would stimulate private investment in plant breeding and reduce the need for government assistance in that particular field.[35] The bill was a perfect fit for Herbert Hoover who, both as Secretary of Commerce and as President, adamantly opposed government relief and price controls. The Plant Patent Act complimented Hoover's view that farming in America was inefficient but could be corrected if farmers would act more like businessmen.[36]

Senator John Townsend, Jr. of Delaware introduced the bill in February of 1930. In addition to being a United States Senator, Townsend also owned thirteen thousand acres of apple orchards.[37] The American Farm Bureau Federation and the National Grange voiced support for the bill.[38] The Secretary of Agriculture responded favorably while the Secretary of Commerce referred the bill to the Commissioner of Patents.[39]

Luther Burbank provided a natural and sentimental focus for the lobbying effort. The Plant Patent Act became, in large part, a tribute to the man who had famously said before his death: "A man can patent a mousetrap or copyright a nasty song, bit if he gives the word a new fruit . . . he will be fortunate if he is rewarded by so much as having his

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[34] A more contemporary example of this type of lobbying were the various calls to make the 2010 Healthcare bill a legacy to the late Senator Ted Kennedy.
[35] Bugos and Kevles, "Plants as Intellectual Property," 82.
[36] Roger Lambert, "Food from the Public Crib: Agricultural Surpluses and Food Relief Under Herbert Hoover," in *Herbert Hoover and the Republican Era*, ed. Carl Krog and William Tanner (University Press of America, 1984), 158-9.
[37] Ibid.
[38] Senate Committee Report, Committee on Patents, 71st Cong. 2d Sess. Report No. 315, reprinted in Robert Starr Allyn, *The First Plant Patents: A discussion of the new law and Patent Office Practice* (Brooklyn: Educational Foundations, Inc., 1934), 62.
[39] Allyn, *The First Plant Patents*, 13.

name connected with the result."[40] Burbank's pristine image reflected on the breeding industry, which Congress and the media portrayed as "plant loving fanatics," "zealots" who worked for "insulting wages" and freely gave their discoveries to the world.[41]

The House Committee on Patents conducted a hearing prior to issuing its report. Representative Fred Purnell of Indiana reiterated the desire to put agriculture on complete parity insofar as possible with industry and labor. No less a giant than Thomas Edison voiced support for the bill, a fact that Purnell used to great effect: "we are all particularly proud to have the endorsement of one of America's, one of the world's, foremost inventors, Thomas A. Edison."[42] In his message, Edison urged Congress to "Give plant breeders the same status as mechanical and chemical inventors now have through the patent law."[43] Edison added: "Nothing that Congress could do to help farming would be of greater value and permanence than to give the plant breeder the same status as the mechanical and chemical inventors now have through the patent law. There are but few plant breeders. The bill will, I feel sure, give us many Burbanks."[44] Jumping on Edison's prediction that the bill would give the nation many new Burbanks, Purnell segued into an adoring summary of Burbank's life "known to almost every schoolboy" and a eulogy to others who tried to follow in his footsteps but "died in comparative poverty."[45] Perhaps the most sobering comment entered into the record were the words of Burbank himself,

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[40] "Patenting of Plants Promises Big Profits and Big Problems," *Business Week*, 26+ August 26, 1931: 26.
[41] Ibid.
[42] Hearing Before the Committee on Patents, House of Representatives, 71st Cong. 2d Sess. Wednesday, April 9, 1930,reprinted in Allyn, *The First Plant Patents*, 67-68.
[43] 71st Congress, 2nd Sess. *Congressional Record* vol. 72, pt. 6 (9 April 1930), 6764-65.
[44] "Patent Injustice," *World's Work*, 61:40-3 (January, 1932), 80. Ironically Edison had spent one million dollars defending his lighting bulb patent and claimed that litigation over his patents cost him more than the royalties he received as an inventor. The real money, he claimed, was in manufacturing and distribution, not inventing. That Edison was lending his name to the memory of a man he admired is obvious.
[45] Hearing Before the Committee on Patents, House of Representatives, 71st Cong. 2d Sess. Wednesday, April 9, 1930,reprinted Allyn, *The First Plant Patents*, 68.

provided courtesy of his widow who forwarded a manuscript page authored by her late husband in which he observed "I would hesitate to advise a young man, no matter how gifted or devoted, to adopt plant breeding as a life work until America takes some action to protect his unquestioned rights to some benefit from his achievements."[46]

Burbank's widow added her own thoughts to those of her husband: "Have just received welcome news of political activity looking into protection of plant breeders and producers of new fruit by patent. As you probably know, this was one of Luther Burbank's most cherished hopes. He said repeatedly that until the government made some such provision for ensuring experimenter or breeder reasonable protection, the incentive to creative work with plants was slight and independent plant breeding would be held back to the great detriment of horticulture."[47] Commenting on the new law in 1930 a few months before its enactment, *Science* magazine pounded the drum of fair compensation for hard effort: "occasionally a good size fortune will be paid for a half-dozen strawberry plants but this is a rare exception; usually the plant originator gets little or nothing. . . . the first price is all he ever receives. In a few years, the plant is anybody's plant . . ."[48]

An elephant remained in the living room, however. The patent law was, by design and interpretation, a cold-blooded creature. Concepts of fairness, tribute and reward were anathema to patent law. The public demanded something new and useful for its grant of temporary exclusivity. The courts had repeatedly admonished that effort alone did not warrant exclusive rights when it merely uncovered what nature had produced. The Commissioner of Patents, Thomas Robertson, aptly summarized this problem in his

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[46] Ibid.
[47] Ibid.
[48] "Patents on Plants," *Science*, Vol. 71, No. 1843 (Apr. 25, 1930), xiv.

comments on the proposed bill. Although he pledged support for the bill, Robertson warned that it could be found unconstitutional if it were used to grant patents to applicants who simply discovered a new variety of plant growing in nature and reproduced it asexually via the well-known art of grafting.[49] Robertson, in his comments, had in fact described the precise methodology of nurserymen for which they sought patent protection. The House Committee report on the Plant Patent Act nevertheless supported patentability of plants by claiming that a new plant variety from cultivation, having been created through human agency, was a 'discovery' within the meaning of Article I, Section 8 of the Constitution.[50] Unlike discovery of a wholly formed and useful mineral in the earth, nature would not necessarily re-produce a mutant plant or limb absent careful human cultivation, which 'corrects' the natural process to reproduce the desired result in large numbers.[51]

The Senate Committee report was more pragmatic, stating that the purpose of the Act was to place agriculture "on a basis of economic equality with industry."[52] The Senate report also suggested that the bill would essentially privatize the nursery industry, theretofore dependent for the most part on government support for its survival. The bill would also bring down plant prices for buying public because breeders would no longer need to recoup all of their costs in a year or two but instead would enjoy seventeen years of exclusivity. An earlier draft had proposed a five-year plant patent. Those who were

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[49] Hearing Before the Committee on Patents, House of Representatives, 71st Cong. 2d Sess. Wednesday, April 9, 1930, reprinted in Allyn, *The First Plant Patents*, 70.
[50] Bugos and Kevles, "Plants as Intellectual Property," 82. The committee members might have also argued that plant breeding was a distinct method for producing something and therefore an 'art.' See, Roger Sherman Hoar, *Patent Tactics and Law* (New York: The Ronald Press Company, 1950), 35.
[51] Hearing Before the Committee on Patents, House of Representatives, 71st Cong. 2d Sess. Wednesday, April 9, 1930, reprinted in Allyn, *The First Plant Patents*, 64-65.
[52] Senate Committee Report, Committee on Patents, 71st Cong. 2d Sess. Report No. 315, reprinted in Allyn, *The First Plant Patents*, 62.

well aware of the time and effort required to produce a new variety for market quickly rejected the idea.[53]

A few members of Congress expressed doubts about the wisdom of allowing a patent on something produced in nature, particularly a plant that produced food. Echoing the philosophy of Paul Stark, the First Assistant Commissioner of Patents conceded that the Act could set the value of a twig at one million dollars.[54]

In floor debate, lawmakers referred to the bill as "remarkable" and a "departure from anything we have ever done."[55] Senator Clarence Dill of Washington expressed grave doubts about the constitutionality of the bill's provisions and the practical ability of humankind to "lay our hand on nature and say 'You can go only this way and that way'"[56] Representative Fiorello LaGuardia of New York voiced strong objection to the bill. His floor comments suggest that he was convinced that the language of the bill permitted seed patents and could be used to prevent a farmer from harvesting his own crops.[57] Ultimately, however, the bill passed on a voice vote, framed primarily as economic stimulus legislation.[58]

The bill contained limitations beyond asexual reproduction and the authors were vague in describing how plant patents would be administered by the Patent Office. The

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[53] "Millions for Plant Inventors," *Popular Mechanics Magazine*, Vol. 54, No. 5, November, 1930: 763.
[54] Ibid., 764.
[55] 71st Congress, 2nd Sess. *Congressional Record* vol. 72, pt. 7 (14 April 1930), 7017-18.
[56] Senate proceedings, April 14 1930, 7017-18, reprinted in Allyn, *The First Plant Patents*, 68.
[57] 71st Congress, 2nd Sess. *Congressional Record* vol. 72, pt. 8 (5 May 1930), 8391-92.
[58] Bugos and Kevles, "Plants as Intellectual Property," 82. Interestingly, Congress quietly passed a second bill relating more directly to Luther Burbank a few weeks later. H.R. 9169 came through the House and Senate with no debate. It provided a five-year extension for the Burbank family to complete its purchase of the arid lands granted to it in 1912 for propagation of the spineless cacti. In June, President Hoover's Secretary forwarded six House Resolutions to the Secretary of the Interior for comment. Among them was H.R. 9169. On June 18, Secretary Wilbur responded that he had 'the honor to advise' that he did not know of any objections to the bill. See, Ray Lyman Wilbur to Herbert Hoover, June 18, 1930; "Bills-Recommendations by Bureaus"; Presidential Subject File; Box 77; Hoover Papers; Herbert Hoover Presidential Library, West Branch, Iowa.

bill applied to sports (bud variations), mutants (seed variations) and hybrids (breeding) if achieved through asexual reproduction. The qualities that made the plant new and useful came under the heading of distinctness, which could be found in habit, immunity, resistance, color, flavor, productivity, storage, perfume, form or ease of reproduction. Congress appears to have drawn a line at the idea of a patent on food *per se*. The bill excluded tubers, specifically potatoes and artichokes, since in those cases the thing sold as food was also the thing used to propagate the plant.[59] Key to the debate that would ensue nearly fifty years later was new Section 162, which provided: "No plant patent shall be declared invalid for noncompliance with Section 112 of this title if the description is as complete as reasonably possible."[60] In other words, Congress acknowledged the fact that a plant breeder could not possibly provide specifications for a plant in the same way that an engineer could provide schematics for a steam engine.[61]

The Hoover Administration viewed the Plant Patent Act as a non-event.[62] On May 16, 1930 the President's Secretary forwarded the bill (S. 4015) to Hoover's Commerce Secretary, Robert P. Lamont, who replied the next day stating, "I do not know of any

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[59] Hearing Before the Committee on Patents, House of Representatives, 71st Cong. 2d Sess. Wednesday, April 9, 1930, reprinted in Allyn, *The First Plant Patents*, 64.
[60] US Code 35 (2000) § 162.
[61] In 1985, this variation in the description requirement was held to be the primary reason for enactment of the Plant Patent Act. See, *Ex Parte Hibberd*, 227 USPQ 443 (Bd. Pat. App. 1985).
[62] The biggest patent news in Washington, D.C. in 1930 was not plant patents but the new home of the Patent Office. Nothing puts bureaucrats on edge like the size and quality of office space. Things erupted about the time of the Plant Patent Act when the Public Buildings Commission decided to relocate the Patent Office to the new Commerce Department Building, along with the rest of the Commerce Department, save the Bureau of Standards. The Patent Office complained that would have no room to expand in the new quarters and the local D.C. patent bar grumbled about the office being taken from their immediate vicinity where they had naturally congregated over the years. The plea was a lost cause, however, as it was Hoover, as Secretary of Commerce, who had concluded that move would save the Patent Office $260,000 per year and improve its efficiency. See, U.S. Grant 3d to Walter H. Newton, January 12, 1931; "Cabinet Offices-Commerce-Patent Office Correspondence 1929-1933"; Presidential Subject File; Box 14; Hoover Papers; Hoover Library.

objections to its approval" and indicating that the Budget office would be investigating additional costs to the Patent Office for implementation and administration.[63]

The new law re-united the Patent Office with the Department of Agriculture. The law provided that the President could direct the Secretary of Agriculture to furnish the Commissioner of Patents with information or to conduct research on his behalf in order to carry the law into effect.[64] By October 13, the Patent Office was in need of that assistance. About eight weeks after issuance of the first plant patent, Lamont advised Hoover that "The Patent Office has received several applications under the new law and Commissioner Robertson feels that he should have the benefit of the assistance of the appropriate bureau or division of the Department of Agriculture." The President signed an executive order to that effect five days later.[65] In practice, patent applicants filed in duplicate with one copy going to the Patent Office and the other to the Department of Agriculture's Horticultural Crops Research Branch, which reported on the novelty of the plant.[66] It is perhaps not surprising that the Patent Office in the Hoover Administration did not immerse itself in the policy question of plant patents. As Secretary of Commerce, Hoover had sent a clear warning to the Patent Commissioner in 1928 stating that it was "possible that out of zeal and personal loyalty some of the members of your Bureau are engaged in political activities . . . I feel it is desirable that you pass out the word cautioning employees about any possible suspicion in this matter."[67]

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[63] Robert P. Lamont to Herbert Hoover, May 17, 1930; "Bills-Recommendations by Bureaus"; Presidential Subject File; Box 77; Hoover Papers; Hoover Library.
[64] Orson. D. Munn, "United States Plant Patent No. 1," *Scientific American*, November, 1931: 303.
[65] Lawrence Richey to Robert P. Lamont, October 18, 1930; "Cabinet Offices-Commerce"; Presidential Subject File; Box 14; Hoover Papers; Hoover Library.
[66] Travis Brown, *Historic First Patents: The first United States patent for many everyday things*, (Metuchen, N.J.: The Scarecrow Press, Inc, 1994), 144.
[67] Herbert Hoover to Mr. Robertson, memorandum, January 28, 1928; "Commerce Department-Patent Office"; Commerce Papers; Box 143; Hoover Papers; Hoover Library.

Reaction to the New Law

The media generally viewed the new plant patent law with skepticism or disinterest, but also with little doubt as to its purpose. The law, good or bad, was designed to help an industry become more profitable. Both advocates and critics evaluated the law largely from the standpoint of its economic viability.

In 1934, attorney Robert Starr Allyn published an abstract of the new law, which he called "a timely gesture of sympathy to the farmer and plant breeder, following closely on the heels of the decline of prices in 1929."[68] Even in 1934, the idea of a farmer having a role in patents was humorous to some. Starr, after noting the significant patent contributions of machinists, electricians, mechanics and engineers stated: "Even farmers are rewarded for implements and processes," apparently forgetting that the Patent Office granted a significant number of early patents for agricultural implements likely invented by farmers or agricultural enthusiasts.[69]

Despite the adulation of Burbank, critics did not envision the plant patent system working nearly so smoothly as predicted. *Business Week* magazine viewed the new law with trepidation. Patent law was designed for machines, which were precise and could be controlled. The combination of a complex patent system with "the variable mysteries of plant germination" and the potentially large profit now offered, created a potentially litigious debut for the new law.[70] The Patent Office and the Department of Agriculture fully expected litigation over the matter and the magazine author agreed: "Nature isn't going to alter her complex process just because Congress passes a law."[71] Another critic

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[68] Allyn, *The First Plant Patents*, 10.
[69] Ibid.
[70] "Patenting of Plants Promises Big Profits and Big Problems," *Business Week*, 26+ August 26, 1931: 26.
[71] Ibid., 29.

noted that "The sudden passage of the Plant Patent Act of 1930 with very hasty consideration of the problems involved has created a situation which will require some time to clear."[72] According to those who damned with faint praise, Congress had righted an injustice in perfunctory manner. They had "enjoyed a momentary glow of righteousness and promptly forgot the matter."[73] In short, Congress had thrown a Depression-era bone to plant breeders in order to keep them away from government's kitchen door, using posthumous tribute to Luther Burbank as a justification. As is often the case, Congress left the prickly details to the administrators in the Patent Office which likely wished that Burbank was still around to breed them out.

Criticism of the new plant patents joined with leftist criticism of the entire patent system based on its growing penchant for red tape and approval of worthless inventions. In 1932, for example, *World's Work* magazine took the patent office to task for its wasteful approach to fostering "the keen American instinct for contrivance."[74] It cited three significant problems. First, the process for obtaining a patent was slow. A potentially useful invention could be checked against a patent search, but the search would not include the thousands of applications pending at any given time, thus a patent application might infringe on a patent applied for and not yet granted but well ahead in the queue.[75] Second was the tendency of the patent office to issue patents on inventions of dubious worth. Great Britain had granted 360,000 patents in 300 years where as the

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[72] Allyn, *The First Plant Patents*, 15.
[73] "Patenting of Plants Promises Big Profits and Big Problems," *Business Week*, 26.
[74] "Patent Injustice," *World's Work*, 61:40-3 (January, 1932), 40.
[75] Critics in 1932 cited the example of Phillip Drinker and Louis Shaw and their invention of the artificial a lung. The inventors applied for a patent in 1928 but elected to put their invention to work right away due to the urgency of need and its ability to save lives. After three years of use and the award of a medal from the Franklin Institute, the inventors were still awaiting their patent and helpless in the interim against infringers. Ibid., 41- 42.

United States had granted 1.8 million patents in 140 years.[76] The patent-glut led to the third criticism. Since it fell to the patent holder to enforce his rights, the costly American system of jurisprudence favored the large corporation over the individual inventor. The 1.8 million patents issued in the United States had generated fifteen thousand trial verdicts in addition to the estimated thirty thousand lawsuits that had been commenced but ultimately resolved prior to or during trial – a litigation rate of approximately 2.5%. Critics estimated that the American patent process, in addition to favoring the resource heavy corporation, transferred approximately one hundred million dollars in resources out of the field of invention and into the legal system.[77]

The process was not only bulky and expensive but also decidedly industrial. Of the fifty-five outstanding American patents noted between 1791 and 1930, only three (the cotton gin, the reaper and barbed wire) had any direct connection to agriculture. The rest were industrial and technological, reflecting the course American had taken.[78] In sum, by the time Congress added plant patents to the system, it was already heavily dominated by industrial sciences and showing its weakness as a driver of economic development.

Other publications, however, expressed excitement about the possibilities for the new law, especially for deserving breeders. Writers in *Popular Mechanics Magazine* pointed out the delicate balance in creating new economic possibilities while preventing total disruption of the market, noting that the Plant Patent Act excluded plants reproduced by seeds and tubers - thus eliminating potatoes, wheat, corn, rye and oats - because "these

[76] Ibid., 43.
[77] Ibid., 40.
[78] Ibid., 41.

plants are such standard products that to grant the right to use any new varieties of them exclusively might so monopolize the market that skyrocket prices would prevail."[79]

The Patent Office issued Plant Patent No. 1 to Henry Bosenberg on August 18, 1931 for a plant characterized as a "climbing or trailing rose." The unique quality of the plant, as reflected in the published patent, consisted of nothing more than an assertion that the plant was "characterized by its everblooming habit."[80] Mr. Bosenberg disclaimed any right to the plant's color or other physical characteristics, making claim only on its blooming capacity which he stated "provides a succession of blossoms on a single plant from about the end of May to the middle of November or until stopped by frost."[81] Bosenberg conceded that he had developed the plant only in the latitude of New Brunswick, New Jersey by graftings from the then-famous Van Fleet Rose. Critics expressed skepticism and reiterated their concerns that the law's vagueness, now evident in Plant Patent No. 1, begged for litigation.

Orson D. Munn, editor of *Scientific American* and a member of the New York Bar, posed myriad questions about the enforceability of the patent based solely on the "everblooming" quality of a plant grown in only one place to date. Munn claimed that "the true value of a plant patent can be determined only after a legal battle has been fought and decided by the Supreme Court."[82] Others agreed, noting that the economic viability of a plant patent was far from settled. Any challenge would go to the United States Supreme Court only by writ of certiorari and then only if the case posed a significant legal issue subject to conflicting rulings in two or more of the ten federal

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[79] "Millions for Plant Inventors," *Popular Mechanics Magazine*, Vol. 54, No. 5, November, 1930: 763.
[80] *The Official Gazette of the United States Patent Office,* Vol. 409. No. 3, Tuesday, August 18, 1931: 615.
[81] Orson. D. Munn, "United States Plant Patent No. 1," *Scientific American*, November, 1931: 303.
[82] Ibid.

circuit courts of appeal.[83] In other words, a safe and secure patent emerged only at the end of a long and costly road of litigation.

The Patent Commissioner's 1932 report to Congress contained a new data section entitled "Plant Patents" which, in its debut, listed seventeen plant patents issued out of 68,585 total patents granted for the year.[84] The Commissioner offered no comment on passage of the law in his narrative, despite the presence of a dedicated section entitled 'Aiding Industry.'[85]

The nursery industry did not appear to harness the power of patents to the extent projected leading up to passage of the new law. By 1936, the patent office had issued 167 plant patents, of which seventy-seven were for roses.[86] Nor had the industry achieved an economic boom. The *New York Times* noted "the fear that patents might enable introducers to obtain exorbitant prices for new varieties has not been born out by the facts. Such a policy, with any article not an absolute necessity, would of course be suicidal."[87] The commercial nursery industry was also not the only constituency to exploit the law. In 1938, as the nation noted issuance by the patent office of the 300th plant patent, one of the leading plant 'inventors' was a New York chemist who had developed a valuable line of poplar trees, as well as General Electric which had developed a pure white lily by bombarding it with x-rays.[88]

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[83] "Patent Injustice," *World's Work*, 43.
[84] Annual Report of the Commissioner of Patents to the Secretary of Commerce for the Fiscal Year ended June 30, 1932 (Washington: United States Government Printing Office, 1932), 6.
[85] Ibid., 1-3. In fairness, the report is heavily statistical and the 'Aiding Industry' section is dedicated to 'Special Applications,' which are those taken out of the normal queue for expedited review.
[86] J. Horace McFarland, "Patents For Plants," *New York Times*, April 19, 1936, X12.
[87] Ibid.
[88] "Patented Plants Exceed 300 Mark," *New York Times*, November 6, 1938, 71. In 1954, the Patent Office sponsored a 'modest' exhibit as part of the National Capital Flower and Garden Show to explain the Plant Patent Act of 1930. By then, 1,231 plant patents had been issued but the paper reported that the majority of viewers observed professed no knowledge that a plant patent law existed. See, John E. Booth, "Even Plants

The first court decision on a plant patent held that the patent could not be enforced against the producer of an identical plant if the plant was not produced from the patent holder's stock.[89] In essence the court permitted another breeder to discover another freak spur and use it to produce the same plant. Such was not possible for two inventors who happen to invent the same machine. The first one to the patent office won and the other lost. The opinion was consistent, however, with granting a patent for an alternate process that produced an identical object. In the case of the Plant Patent Act, the process (grafting) was not patented. The result (the plant itself) was the subject of the patent. Already one could observe the court struggling with difficulty of comparing two plants with the same appearance and trying to determine if one breeder infringed on another's patent because the two plants looked alike.

The Value of Silence: Henry Wallace and Hybrid Corn

The potential economic impact of plant patents carried the day when Congress passed the new law in 1930. The historical record reveals a process by which supporters and skeptics evaluated the law primarily in terms of its impact on the marketplace. Even those who harbored doubts about the law focused their commentary on the time and cost of litigation as a potential foil to increased profit. A voice is missing in the historical record, however.

Have Constitutional Rights," *New York Times*, January 3, 1954, X31. See also, Bess Furman, "Behind The Scenes," *New York Times*, March 14, 1954, X29. By 1963, the number of plant patents stood at 2,150, a miniscule number compared to the millions of patents issued, but the long term advantages to plant patenting was noted. Before the Act, the United States lagged in plant breeding with most new varieties coming from Europe. By 1963, over half of the best plant breeders, especially those who bred roses, resided in the United Sates. See, George M. Hart, "The Plant Patent Story," *New York Times*, April 14, 1963, 128.

[89] Roger Sherman Hoar, *Patent Tactics and Law* (New York: The Ronald Press Company, 1950), 36. (Citing *Cole v. Youdath*, 31 P.Q. 95, March 1937)

An issue of agriculture policy in the late 1920s should have drawn the attention and comment of Henry A. Wallace and *Wallace's Farmer* magazine.[90] Henry Wallace possessed not only the scientific knowledge but also the public reputation and mass media platform to be a significant voice on any agricultural issue, but commentary from the seed-corn sector on plant patents was minimal and disinterested. The history of sexually bred hybrid seeds during this same era sheds light on why this may have been the case. First, breeders of open pollinated plants saw no economic advantage to spending political capital in pursuit of patents. The science of hybrid breeding carried its own tools for maintaining exclusivity. Second, the process of sexual plant breeding operated within a completely different procedural paradigm then asexual breeding, one that required significant sharing of materials among the breeding community. Finally, the scientific structure and performance of hybrid seeds made them unlikely candidates for patent protection because of their ever-changing nature. Therefore, the same economic motivations that pushed asexual breeding into the halls of Congress in 1930, acted to keep sexual breeding out. Both constituencies wanted the same thing: a robust private market where the product of long, expensive and creative work could be sold for profit. The nursery industry required a law to achieve this goal; the seed corn industry did not. What Henry Wallace and other breeders wanted to accomplish as businessmen, they could accomplish without patents. This distinction worked to the great advantage of the

[90] There were three prominent members of the Wallace family: "Uncle" Henry Wallace, the founder of *Wallace's Farmer* and grandfather of Henry A. Wallace; Henry C. Wallace, son of "Uncle" Henry and father of Henry A. Wallace, who served as Secretary of Agriculture from 1921 to 1924; and Henry A. Wallace, Secretary of Agriculture, Vice President of the United States and founder of Pioneer Hi-Bred Seed Company. Henry A. Wallace is the primary focus of this discussion and, for convenience and simplicity, all references to 'Henry Wallace' or 'Wallace' are to Henry A. Wallace. Any reference to Uncle Henry or Henry C. are specifically noted as such.

nursery industry.[91] As will be seen in the next chapter, this fact also allowed the hybrid seed industry to expand globally under its traditional methodology, absent any intellectual property protection until 1970 and patent protection until 1985. As new laws, scientific breakthroughs and Supreme Court decisions continually pushed sexually bred seeds into the intellectual property arena in the1970s and 1980s, the upheaval was larger and more complex than with the nursery industry in 1930. An understanding of the origins of hybrid seed and the reasons for its seclusion from patent law helps put these later events into perspective.

Sexual breeding, such as with corn, is accomplished by cross (or open) pollination rather than self-fertilization. Plants that reproduce in this fashion do not reproduce true to form. For example, the male part, located in the tassel, pollinates the female silk, which feeds each individual kernel of the ear. Which pollen fertilizes which seed is a matter of random drift. Breeders had to segregate their hybrids from other varieties in the fields as the qualities that make the hybrid valuable could be ruined in one year if pollinated openly by a genetically diverse plant.[92] Thus, each plant is potentially different in terms

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[91] A bill in Congress can suffer from direct opposition aimed at its defeat as well as the 'Christmas tree' syndrome in which opportunists 'hang' amendments on a bill like so many ornaments. Each amendment potentially opens the debate to a new set of issues and constituencies, often turning the bill into a monstrosity that fails to make it out of committee or dies quietly on a list of bills ready for floor debate that are never called up. The Plant Patent Act of 1930 avoided this dynamic. Asexual plant production came into the patent arena a full forty years before Congress gave sexual plant production patent-like treatment in the Plant Variety Protection Act of 1970 (discussed in the next chapter.) The breeders who worked with open pollinated plants could have easily mounted their own charge on the Plant Patent Act to demand some type of accommodation for their efforts as well. That they did not do so reflects the fact that they did not need plant patents as badly as asexual breeders and saw no other reason to challenge the basic premises of the Act. This conclusion is not to suggest that Henry Wallace bore the burden of pursuing debate on plant patents for sexually produced plants (although he would have been an ideal candidate given his background and interests) but to argue that that both sides of the breeding industry saw the issue in purely economic terms.

[92] Kloppenburg, Jr., *First the Seed,* 95. Systematic breeding involves planting alternate rows of two different varieties (A & B) and detasseling the 'A' rows to make them the female recipients of the male pollen from the 'B' rows, thus producing an AB corn variety. By 1918, breeders were experimenting with double-crossed varieties in which a second round of breeding took place. A & B corn had been bred to produce AB corn, which was then planted with CD corn to produce ABCD corn. Yields improved in the

of its genetic make-up. In fact, each kernel on a single cob of corn could be pollinated from a different plant. A degree of variation emerges with each new generation and so it is difficult to hold a patent on something that will change in its later iterations.[93] Although a barrier to patent protection in 1930, this biological fact compensated breeders by providing an alternate and built-in protection. Unlike grafts from Burbank plants, hybrid seed could not be used to produce identical copies in successive generations, and so a holder of hybrid seed could not mass-produce it and become the breeder's competitor. In fact, breeders needed each other's seeds and data. Henry Wallace could not work in isolation like Burbank or Stark.

There is no record of friendship or collaboration between Henry Wallace and Paul Stark.[94] As to Luther Burbank, Wallace exchanged brief correspondence with another plant breeder working on a Burbank biography who sought Wallace's recollection about the genealogy of the Ross family name, which appeared in both the Wallace and Burbank family trees. As for plant patents, Wallace offered a brief but significant observation in a 1930 letter to Donald Jones: "Referring to Burbank, I was much interested when George

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first year of planting but subsequent yields from saved seed declined sharply. As a result, farmers using these experimental hybrids had to buy new seed every year in order to maintain high yields. See, Paul Raeburn, *The Last Harvest: The Genetic Gamble that Threatens to Destroy American Agriculture* (Lincoln: University of Nebraska Press, 1995), 127-131. Even if a quality variety can be established, hybrid corn traits are in constant flux. Pests and disease evolve over time in response to their changing environment and a new variety of corn is certainly a change for the pests that feed on it. Thus, breeders require constant sources of new germplasm from outside extant stock in order to stay ahead of disease or to maintain and improve yields. The Department of Agriculture estimates that new crop varieties are resistant to pests and disease for an average of five years. "Agricultural Resources and Environmental Indicators," Chapter 3.2, USDA Publication (1990), 1.

[93] Kloppenburg, Jr., *First the Seed*, 95.

[94] The only record of contact reveals a warm request from Stark to Wallace in 1946. Stark requested from Wallace a transcript of comments Wallace had made before the National Garden Conference for insertion by Clarence Gannon into the *Congressional Record* along with those of other government officials who had spoken. Stark enclosed reporters notes with some underlining of his own and suggested that Wallace could enlarge on them. Paul Stark to Henry A. Wallace, 30 March 1946, Henry A. Wallace Papers, Iowa State University Microfilm Collection, Reel 39, Frame 892, Iowa State University Library. Wallace made multiple changes to the notes and returned them to Stark for transcription. Undated secretary's note, Henry A. Wallace Papers, Reel 39, Frame 894.

H. Shull was in Des Moines last December in hearing his telling of his annual visits to Burbank. It seems that Shull was much interested in the way in which Burbank was exploited."[95]

Wallace's Farmer magazine similarly reflected the relative disinterest of its editor. A 1930 edition of the magazine contained a blurb indicating that President Hoover had signed the Plant Patent Act for those who produce "a new variety of apple or strawberry or gladiolas." The magazine saw no significant angle for grain farmers in the new law although it indicated some of them might find a prize waiting in the garden: "Most corn belt farmers will not be interested in the bill but there are a few of them who have discovered varieties of fruit which are worthy of a patent."[96]

While Wallace's correspondence suggests general disinterest in plant patents, it also provides clear insight into the culture of free sharing of both seeds and information that dominated hybrid corn research in the 1920s. For example, E. N. Bressman, like Wallace an Iowa State College graduate, who worked at an Oregon agricultural college, wrote to Wallace in 1926 to request crossed inbreds from Iowa as well as a "few kernels" of the inbred parent lines.[97] Wallace not only provided the seed but also its history: "The corn which I sent you is a cross of the C16 . . . with the Lancaster 24 with an inbred 2 eared strain and an inbred Reid Yellow Dent . . . It stands up well without blowing down."[98] The courtesy was reciprocal. On September 17, 1930, Bressmen wrote to

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[95] Henry A. Wallace to D.F. Jones, 17 February 1930, Henry A. Wallace Papers, Reel 57, Frame 696. Whether Wallace was referring to the patent issue is not clear but, given the date of the letter and Burbank's public comments, it is the most likely assumption. Clearly, Wallace had the opportunity to expound on the issue at any length and chose not to, at least not to Jones in this particular letter. The remark was given as an aside and Wallace quickly moved on to a completely different topic. If the subject captivated or even interested him, it is not evident.
[96] "Patenting Plants," *Wallace's Farmer*, June 7, 1930: 2.
[97] E.N. Bressman to Henry A. Wallace, 20 April 1926, Henry A. Wallace Papers, Reel 56, Frame 566.
[98] Henry A. Wallace to E.N. Bressman, 15 May 1926, Henry A. Wallace Papers, Reel 56, Frame 597.

Wallace stating: "I have about 25 ten-kernel samples of corn from Siberia, Russia and Baltic regions. Would you be interested in having these? If so, I would be glad to mail them to you."[99] Perhaps more telling is Bressman's follow-up, which states that all of the seeds had been posted to Wallace and "If you do not want the Flint variety you can send them on to someone else or discard them."[100]

The notion of plants and seeds as freely available inputs in economic endeavors dominated Wallace's correspondence. In July of 1930, Wallace wrote to New Jersey breeder George Shull, the same man who had tried in vain to study Luther Burbank's methods for documentation and reproduction, about a plant he could not locate but wished to grow, the Valerian Officianalis: "If it happens to grow anywhere near where you live, I wonder if I could ask you to ask one of your students to dig up several plants and express them to me." The letter concluded with some free sharing of shop talk: "You may be interested in knowing that we are growing 180 acres of corn this year in which we are using an inbred as a male parent."[101] In a similar letter to breeder Donald Jones in Connecticut, Wallace made no bones about his desire to profit from the seeds of another breeder: "I have just read your Bulletin 310 on Canada-Leaming corn . . . If such seed may be obtained year after year I wish you would give me the name of the grower . . . I would like to try it in some of our crosses and in case it combines well I would like to be able to go back and get fresh seed each year."[102]

Wallace approached breeding like an academic, with open communication and free sharing, but he approached the commercial marketplace like a businessman. There is

[99] E.N. Bressman to Henry A. Wallace, 17 September 1930, Henry A. Wallace Papers, Reel 3, Frame 381.
[100] E.N. Bressman to Henry A. Wallace, 29 September 1930, Henry A. Wallace Papers, Reel 3, Frame 464.
[101] Henry A. Wallace to George H. Shull, 22 July 1930, Henry A. Wallace Papers, Reel 3, Frame 84.
[102] Henry A. Wallace to D.F. Jones, 18 February 1930, Henry A. Wallace Papers, Reel 57, Frame 701.

no question that he saw his hybrids as something that would help farmers improve their yields, but also as a valuable commodity. When it came to his inbred parental lines, he secured their value through exclusivity, just as with the patent law. He did not, however, need a patent because he could distribute his hybrids while simultaneously protecting the parent lines, something that the asexual breeders could not do. Wallace's outlook was no less economic than that of nurserymen, it was simply more independent of government intervention.

Prior to hybrids, the only market for commercial seed sales was first-time planting. The seed business in the early 20th century was comprised of small family owned businesses that took public seeds developed by land grant universities and essentially mass produced them by planting and harvesting them. One seed yielded a stalk of corn with several ears and several hundred seeds. Pre-hybrid farming consisted of planting non-hybrid, open pollinated varieties that yielded re-usable seeds. Thus, after a purchase and successful growing season, the farmer reaped seeds to sell or use for feed, as well as enough to hold back for replanting the following spring and perhaps to share with a neighbor. This dynamic had ecological as well as social consequences. Wide planting of seeds in different areas helped to create a diverse set of seed characteristics.[103]

Public excitement over hybrid corn came only after decades of work and promotion. George Shull delivered a paper on pure-line corn breeding in 1908 but it was 1920 before commercial seed was ready.[104] Double cross hybrids had been around since

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[103] H.G. Wilkes, "Plant Genetic Resources: Why Privatize a Public Good?" *BioScience*, Vol. 37, No. 3, Whence Seeds for the Future? Biologists Address Global Agricultural Issues (Mar., 1987), 215.
[104] Smith, *The Garden of Invention*, 232. Even as late as 1936, however, farmers were still in need of education on the basics of hybrid use. A writer to *Wallace's Farmer* that year asked whether he could re-plant his hybrid yields in the subsequent year. The reader was directed to USDA Farmer's Bulletin No. 1744 stating that only the first generation of seed should be used for planting. Second generation yields

1921 but the farm community was slow to embrace them. Nudging farmers in the right direction was where Wallace's media power became important. In 1924, *Wallace's Farmer* put out the call to its readership to help form an experimental pool for the use of crossed inbred strains. Wallace sought volunteers in a manner similar to the precedent set by Henry Ellsworth at the Patent Office: "We have a small quantity of seed corn produced by crossing two inbred strains, which we will distribute in fourth-pound lots to those who send in a dime or ten cents in stamps. . . . The kernels are badly shaped and would be discarded by the poorest farmer in Iowa . . . At tasseling time, pull its tassels out and you will get some crossed seed for planting in 1925. . . . please report the yield of 100 hills of the hybrid and 100 hills of your home corn next fall, so that we can begin to find out if this new fashion in corn breeding has progressed far enough yet to mean anything. . . . [we] would be glad if some of our experimentally minded readers would help us."[105]

At that time, public institutions still performed much of the research but Wallace acted as cheerleader: "This method is so new that no one knows much about it as yet, but the corn professors at the experiment stations think that it is full of promise."[106] Wallace clearly saw the promise as well, being only two years away from establishing the Hi-Bred company and three years from winning the Iowa Corn Yield Test, a competition invented by Wallace because of his disdain for contests based on the best looking ear of corn. The true test, in Wallace's mind, was yield and his sickly looking inbreds proved superior to the big robust ears that won blue ribbons on looks alone. By shifting the contest to yield

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would be ten to twenty-five percent less. "It is this fact that necessitates producing the hybrid anew for each season's use." "Second-Year Hybrid Seed," *Wallace's Farmer*, February 1, 1936: 11.

[105] "Hybrid Seed Corn for Distribution," *Wallace's Farmer*, May 16, 1924: 4.

[106] Ibid.

rather than looks, Wallace created a contest he would win and Iowa farmers would help to promote. In the Iowa Corn Yield Test following the fall 1926 harvest, hybrid corn consistently defeated open-pollinated corn in every section of the state. The test, an annual event since 1920, had never featured hybrids. Notably, every hybrid that produced the highest yields was a Hi-Bred variety produced by Henry Wallace working with other breeders.[107] Wallace stressed the need for farmers to continue working in open pollinated strains, however, as the best performing ones formed the base for breeding lines. Such strains would, in Wallace's opinion, increase the wealth producing power of Iowa by at least half a million dollars annually.[108]

As editor of a respected farm journal, not only could Wallace bang the drum for hybrids, which he often did, he could simultaneously market his own company. In a 1926 letter to corn breeder Donald Jones, Wallace stated: "I think advertising in Wallace's Farmer might be of some value because of the fact that our readers have been trained to some extent in this idea."[109] Wallace remained unconvinced, however, that the naturally independent and skeptical farmer would alter his planting regimen simply by reading an article in a magazine. Direct mail or "a salesman traveling through the country in a Ford" were also possibilities. Salesmen and mail order were expensive but that played into Wallace's clever strategy of over pricing the corn initially both to draw attention to it and then to add the final carrot for skeptics by reducing the price in the future.[110]

One of Wallace's key salesmen, Roswell Garst, agreed with Wallace that seeds, like insurance, had to be sold face to face. His 1931 letter to Wallace outlined an ideal

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[107] H. A. Wallace, "Hybrid Corn Wins Iowa Yield Test", *Wallace's Farmer*, February 11, 1927: 1.
[108] Ibid., 14.
[109] Henry A. Wallace to D.F. Jones, 22 April 1926, Henry A. Wallace Papers, Reel 56, Frame 570.
[110] Ibid.

blend of government and trade association support for hybrid corn, specifically Pioneer Hi-Bred corn. Wallace would tap into institutions farmers already trusted and used them to sell a private, for profit product.[111] Garst also recognized that the true asset of hybrid corn production was the parent lines, which were stable and formed the basis for the valuable hybrid seed. That was where Wallace needed to exercise his power of exclusivity.[112]

Given the state of farming in the 1920s, hybrids clearly demanded commercial development. Creating a quality hybrid was not easy, fast or cheap. Breeders established quality inbred lines by trial and error, discarding multiple cross attempts in the process. Even a good inbred variety was hard to mass-produce because its yields were so poor. Breeders required over 61,000 acres to produce seed stock sufficient for nine million acres of planting.[113] These data roughly equate to one acre of seed stock for each 147 acres of planting. According to the 1920 census, the vast majority of Iowa farms (40.1%) were between 100 and 174 acres in size with an average income of $20.94 per acre. In 1920 only 137 farms in Iowa (0.1 %) were 1000 acres or larger. The vast majority of

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[111] Garst summed up the strategy and his enthusiasm for it: "I think I never saw such cooperation as we are going to get from various county agents. . . . The county agents are going to line up group meetings for me with my lantern and slides . . . I am going to spend four days giving 3 talks a day. . . I am sure no commercial outfit ever had so find [sic] cooperation between a semi-official body like the Farm Bureau as we will have and think we will establish a sales basis this winter for more Hi-Bred corn that we can possibly produce. If times return to even 40 or 50¢ corn, the demand for Hi-Bred seed is going to astound you." Roswell Garst to Henry A. Wallace, 14 December 1931, Henry A. Wallace Papers, Reel 59, Frame 30-31.

[112] Garst did not, however, believe that Wallace should try to grow the market hybrids on his own property: "[I] . . . think it might be well to keep the Hi-Bred corn company in a position where it furnishes the parent stock on a royalty basis with a definite control of production method and handling. This would give you the cream of the profit in the form of royalty and yet would allow for a rapid expansion without endangering your control of the company in any way. . . If times pick up between now and spring, of which I have no expectations, I would produce it one a really large scale. I will produce it up to 10,000 bushel if times stay only as good as they are." Roswell Garst to Henry A. Wallace, 23 December 1931, Henry A. Wallace Papers, Reel 59, Frame 123.

[113] "The Story of Hybrid Corn," *Wallace's Farmer*, August 13, 1938: 10.

farms (87.5%) fell into the range of 50 to 499 acres.[114] In raw numbers, a farmer might benefit from dedicating one acre to developing his own hybrids for the benefit of increasing yields by several bushels per acre. The time required to tend the hybrid acre, however, in addition to the years required to develop stable parent lines, not to mention the knowledge required to recognize and exploit desired traits, made it clear that large-scale introduction of hybrids was possible only as a commercial or publicly funded venture. By the decade of the 1930s, breeders and investors had established approximately 150 seed corn companies for the purpose of producing hybrid seeds and forty already existing companies had expanded their operations.[115] Private industry had begun to overshadow the Department of Agriculture. Funk Brothers, Pfister, De Kalb, Northrup King and Moews all rated mention along with Pioneer Hi-Bred as established giants or up-and-comers by 1938.

Unlike nurserymen and their asexual varieties, intellectual property rights did not present the most significant hurdle to hybrid corn breeders. Hybrids rendered seed sharing among farmers virtually impossible. Saved seed from hybrid yields diminished with each subsequent generation, ensured a continuing need for new seeds. Breeders maintained their monopoly through a combination of secrecy and licensing agreements. The private seed corn industry managed to do what the nurserymen could not because the end user of their products, the farmers, could not re-produce the hybrid plants in the same way as the purchaser of a Burbank plant. Assuming their breeding lines were properly

[114] Iowa Data from Census of 1920, "Agriculture-Legislation-McNary-Haugen Misc."; Commerce Papers; Box 8; Hoover Papers; Hoover Library.
[115] Jorge Fernandez-Cornejo, “The seed industry in U.S. agriculture,” Agriculture information bulletin no. 786, United States Department of Agriculture (2004), 25.

handled, hybrid corn growers offered investors assurance of a yearly demand for the product. These factors led to commercialization of the seed corn business.[116]

As the demand for quality seed stock became greater and the seeds more expensive, fraud emerged. Burbank copies were perfect replicas but many corn farmers ended up with low quality seed from dubious sources. Experimental stations responded by forming crop improvement associations comprised of local farmers who inspected and certified crops and seeds to provide some degree of quality assurance through patronage of participating dealer. Hybrid corn certification proved to be a nightmare. Breeders were loath to disclose trade secrets, their primary security in a patent-free market, for purposes of certification. Said Henry Wallace in 1938: ". . . with a multitude of men working on certification, it is hard to keep anything secret for long."[117] On a more practical level, it was nearly impossible for even the savviest farmer to certify four different parent lines, two inbred lines and a finished variety throughout thousands of acres.[118] Wallace summed up the problem and its logical, not to mention self-serving, solution in market terms: ". . . about all that can be done is to certify that the producer is honest, which the big companies have to be anyway if they want to stay in business very long. They have everything invested in their hybrids, they say, and have a far greater stake in seeing that they are properly produced and handled than any certifying agency could have."[119]

In summary, the hybrid seed industry pursued the same ultimate goal of the nursery industry, which was to create economic value in its products by improving their quality, and to protect that enhanced value through exclusive control of the product. The

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[116] Ibid.
[117] "The Story of Hybrid Corn," *Wallace's Farmer*, August 13, 1938: 17.
[118] Ibid., 16-17.
[119] Ibid.

asexual plant breeders sought out a legal tool to establish exclusivity while the sexual plant breeders found it within the biology of the plants with which they worked. It is not surprising, therefore, that the historical record reflects a nursery industry that proposed and wrote the plant patent law in 1930 and a hybrid industry that took no public stand on the bill when it came before Congress.

Biological processes aside, the grain farming community remained far more concerned with federal trade policy than patent policy, as did Henry Wallace and his family publication. As Secretary of Agriculture in the Harding administration, Henry's father, Henry C. Wallace, battled constantly with Harding's other cabinet members, particularly Commerce Secretary Herbert Hoover and Treasury Secretary Andrew Mellon, who viewed Wallace's agriculture policy as too unfriendly to business and industry. To the extent the Wallace family could muster political fire, they aimed it at government price supports and tariffs. To the extent Henry Wallace dedicated time to politics in the late 1920s it was taken up by the McNary-Haugen legislation, not patents. If there was an economic benefit to be gained for grain farmers, it would be in the area of outputs rather than inputs.[120] Similarly, in May, 1930 as Congress debated the Plant

[120] The Wallace family cause for farmers is well-illustrated by the many lives of the McNary-Haugen farm relief bill to create a federal farm board to purchase surplus U.S. commodities and sell (or, some claimed, dump) them on the world market. Debate on the bill was intense and emotional, including allegations of ignorance, stupidity and, worst of all, communist leanings hurled against the bill's supporters. Reaction against the bill was swift and vitriolic when it was first introduced in 1924. A letter to Calvin Coolidge described the bill as "unsound in principle, unworkable in practice, destructive in effect and unconstitutional as well." It was also described as vicious, ineffective and potentially disastrous and humiliating for the United States. See, Unsigned letter to Calvin Coolidge, 27 March 1924; "Agriculture-Legislation-McNary-Haugen Misc."; Commerce Papers; Box 8; Hoover Papers; Hoover Library. The proposal even pitted congressmen against their own constituents. Rep. Henry T. Rainey lashed out at the Illinois Agricultural Association regarding its "demand" that he support the legislation as well as his perception that the Association was attempting to force his support through the media rather than deal with him directly. Personal affronts aside, Rainey served up a damning criticism of the bill. Accusing the association's president as being either "densely ignorant" or "willfully false" as to the level of government involvement in the private business sector: "As a result of the Russian Revolution, Lenine [sic] and Trotsky never attained greater powers than you demand that Congress shall confer in this bill . . . will it not easily

Patent Act, *Wallace's Farmer* was consumed with the Hawley-Smoot bill, dedicating the magazine to regular updates and conducting a reader survey to document farmer opposition.[121]

In addition to the science of sexual breeding and the political priorities of grain farmers in the late 1920s, a third factor warrants acknowledgement. Henry A. Wallace was a man defined by his search for meaning in life. Very much his grandfather's grandson, Wallace sought that meaning within two related outlets: agriculture and spirituality. As Uncle Henry had taught him, keeping agriculture alive and well was a

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follow that the government will take over also the land as the Soviets of Russia did after the Revolution? The Bolshevik organizations in Chicago, which plan the overthrow of this Government, and are financed with Russian gold for that purpose, must be delighted with the things you expect to accomplish in this bill. No reign of terrorism they can ever initiate, with its attendant murders and burnings, could ever accomplish more than you seek to accomplish in this bill." See, Henry T. Rainey to S. H. Thompson, 9 April 1924; "Agriculture-Legislation-McNary-Haugen Misc."; Commerce Papers; Box 8; Hoover Papers; Hoover Library. When finally the bill came to the desk of Calvin Coolidge after many years and iterations, his veto message was somewhat more subtle in content but no less scathing in conclusion: "The difficulty with this particular measure is that it is not framed to aid farmers as a whole, and it is, furthermore, calculated to injure rather than promote the general public welfare." See, Calvin Coolidge to The United States Senate, veto message regarding S.4808, 25 February 1927; "Agriculture-Legislation-McNary-Haugen Misc."; Commerce Papers; Box 9; Hoover Papers; Hoover Library. The result was doubly bitter for Wallace. By 1932, Wallace would be forced to sell his interests in *Wallace's Farmer* to Dante Pierce of the *Iowa Homestead*. See, John C. Culver and John Hyde, *American Dreamer: The Life and Times of Henry A. Wallace* (New York: W.W. Norton & Co., 2000), 93. This must have been galling not only for the loss of the paper started by his grandfather but also for the loss to an agriculture press loyal to Herbert Hoover. The *Iowa Homestead* came out strongly against McNary-Haugen in editorials on March 13 and March 27, 1924. Further, Dante Pierce supplied Hoover with clippings of *Wallace's Farmer* Editorials on DC tariff policy while Congress debated the McNary-Haugen bill. See, Dante M. Pierce to Herbert Hoover, September 11, 1925; "Agriculture-Legislation-McNary-Haugen Misc."; Commerce Papers; Box 9; Hoover Papers; Hoover Library. In 1929, Pierce was notified by President Hoover of his selection to serve on The Commission on Conservation and Administration of the Public Domain. See, Memo to File, 17 October 1929; "Congress of the United States-Correspondence-1929"; Presidential Papers; Box 110; Hoover Papers; Hoover Library.

[121] "Vote on the New Tariff Bill," *Wallace's Farmer*, May 10, 1930: 8. *Wallace's Farmer* participated with The Standard Farm Papers and Capper Press to conduct a reader survey. The papers invited readers to cut out and complete a ballot indicating 'yes' or 'no' on whether Hoover should veto the Hawley-Smoot bill. The article's tone was somewhat fatalistic but nevertheless sought to present the issue in a balanced manner: "Our readers probably have their minds already made up if they have been following the discussion. We are quoting here, however, statements on both sides so that readers can make a final comparison." Ibid. Two weeks later, however, the publication came out in full advocacy mode. The new printed ballot included the heading "They Say He Should Veto" and included the current vote tally of 391 for veto and 24 for passage. "Is the Senate Going to Back Down?" *Wallace's Farmer*, May 24, 1930: 6. The ultimate outcome of the poll, not surprisingly, was that 95% of the 1,763 Iowa respondents opposed the bill. *Wallace's Farmer*, June 7, 1930: 3.

way to serve both man and God.[122] It is tempting to dismiss or marginalize Wallace's spirituality in the context of patents but the fact is worth mention because Wallace's own correspondence makes clear that he drew no such line between his spiritual life and secular business dealings. It is telling, for example, that Wallace readily discussed business matters with an astrologer.[123]

Historians have cited numerous influences on Wallace's spirituality, including psychologist and philosopher William James.[124] That Wallace was willing to publicly

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[122] Wallace's grandfather, "Uncle Henry" Wallace was the early motivator of both outlets. Uncle Henry, a Presbyterian minister, established *Wallace's Farmer* as both an agricultural and spiritual primer, filling with farm information and bible lessons. John C. Culver and John Hyde, *American Dreamer: The Life and Times of Henry A. Wallace* (New York: W.W. Norton & Co., 2000), 20

[123] In 1931, Wallace stated in a letter to astrologer L. E. Johndro: "I am vice president of a publishing company. Am an editor. I am a corn breeder and am president of the Hi Bred Corn company. This may eventually bring me more money than my editorial connection . . . fundamentally I am neither a corn breeder nor an editor but a searcher for methods of bringing the inner light to outward manifestation and raising outward manifestation to the inner light. . . . If the publishing business does not blow up in the next year or two I shall doubtless continue as editor for at least 10 years but giving much attention to my seed corn business and supervising statistical studies of weather and economic cycles. But <u>most important</u> I shall be seeking an opportunity to find the religious keynote of the new age." Henry A. Wallace to L.E. Johndro, 22 October 1931, Henry A. Wallace Papers, Reel 10, Frame 237-238. (Emphasis in original). Jhondro responded: "it ought to be clear to all that <u>all</u> terrestrial phenomena – events, prices, cycles, etc, etc – are EQUALLY EFFECTS of this law of invisible force [of electromagnetic cycles of every celestially charged body in space] and that consequently to rummage around in the data of world events in the usual statistical way of economists to the end of setting up certain sets of these EFFECTS as the CAUSE of the other world conditions is the crowning folly of the observational approach that admits of no cause that is not immediate and present of earth confined. . . . it is possible to lay down a curve of (for example) commodity prices for the past hundred years (whether baded [sic] on American or British prices) and over this lay down a curve based on nothing but the alternate electric angles of certain major planets as they circle about the sun and get an almost perfect correspondence of the two." L.E. Johndro to Henry A. Wallace, 16 January 1931, Henry A. Wallace Papers, Reel 5, Frame 149-153. (Emphasis in original)

[124] John C. Culver and John Hyde, *American Dreamer: The Life and Times of Henry A. Wallace* , 32, 78. Wallace was so taken with James that he elected to leave the Presbyterian church rather than heed the conclusions of the elders that James' writings were not appropriate for his Sunday School class. Ibid., 50. Wallace must have found in James a man who, like himself, found connection between his passion for science and God. James saw religion as a tool used by people to bring order to their lives and give them a sense of greater purpose. God is not known or understood by this process but rather used, and if this use proves beneficial, then God's actual existence is irrelevant. That the end result is a very real change in personality and action makes the phenomenon 'real' by virtue of both its cause and effect. James couched this process in the popular scientific terms of the day: "The Gods we stand by are the Gods we need and can use . . . All without reference to anything but human working principles. It is but the elimination of the humanly unfit and the survival of the humanly fittest, applied to religious beliefs." See, William James, *The Varieties of Religious Experience* (Cambridge: Harvard University Press, 1985), 266, 399-400, 403, 406. James saw religion as inspiring men to be less self-centered. Although wealth allowed a few people to pursue higher ideals, it by and large caused people to simply pursue more of it and fear its loss, two qualities that James saw as "the chief breeders of cowardice and propagators of corruption." Similarly,

associate with fringe thinkers is further evident in active participation in the Theosophical Society, including his help in establishing the Liberal Catholic Church in Des Moines, an offshoot of the Theosophist church, and even considered ordination.[125]

During this time of intense exploration of his spirituality, Wallace began to take a more universal view of the world but did not abandon the common sense view that economic success in business was generally a good result for what ailed the planet. In 1931, Wallace shared his universal outlook on the nation's ills with Gifford Pinchot, first Chief of the United States Forestry Service under William Howard Taft and later Governor of Pennsylvania: "As a matter of fact, the cornbelt problem is now very little different from the agricultural problem, and the general agricultural problem is very little different from the problem of all the people, while the problem of all the people in the United States is not so very much different from the problem of the entire world."[126] Wallace, however, was far from hostile to business, being a successful publisher and corn breeder himself. In a second letter to Pinchot commenting on a speech from the

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poverty freed people to pursue a higher life: "Liberation from material attachment, the unbribed soul, the manlier indifference, the paying our way by what we are or do, and not by what we have . . . the more athletic trim . . . the moral fighting shape." See, Ibid., 256-57, 291-93.

[125] John C. Culver and John Hyde, *American Dreamer: The Life and Times of Henry A. Wallace*, 78-80. In a hand-written addendum to a 1927 letter, the U.S. Regionary Bishop of the church asks Wallace: "Are your domestic affairs that [sic] same so that it is still impossible for you to consider ordination? If so is there anyone else you can heartily recommend to lead the movement in Des Moines?" Irving S. Cooper to Henry A. Wallace, 12 July 1927, Henry A. Wallace Papers, Reel 1, Frame 171. The organization proved to be much more controversial than an astrologer trying to predict market trends with planetary movements. Wallace was presumably an Adyar Theosophists as that is the branch that established the Liberal Catholic Church. Charles Leadbeater, a leading member of the Society, was a minister and active in leading Theosophy to the more ritualized worship of Old Catholics, a group that split from the church following the First Vatican Council in 1870. Leadbeater was allegedly ordained an Old Catholic Bishop by Josiah Wedgewood, whose own legitimacy as an Old Catholic was later challenged after six liberal catholic priests were subjected to charges of perversion in 1919. In 1906, Leadbeater himself had been accused of advocating, and likely participating in, masturbation for boys. During an investigation, Leadbeater confessed to his views and to giving the boys 'indicative action'. He resigned from the Theosophical Society but returned as a member in 1908 without official position. See, Bruce F. Campbell, *Ancient Wisdom Revived: A History of the Theosophical Movement* (Berkeley: The University of California Press, 1980), 116-118, 125-126. It is hard to believe that Wallace was unaware of this controversy as he is known to have attended meetings that same year.

[126] Henry A. Wallace to Gifford Pinchot, 25 July 1931, Henry A. Wallace Papers, Reel 8, Frame 420.

Pennsylvania governor, Wallace said "I thought you waived the red flag just a little too much at the business man . . . At the present time, I am not so certain as you seem to be that there is much to be gained by setting off the common people on the one hand against the wealthy people on the other hand. It seems to me that all of us are suffering from a lack of confidence between classes and confidence between nations, and that what we now need is not more strife but more unity. We are all of us in trouble now and anything that will help the business man will also help the farmer and the laboring man and vice versa."[127]

By 1938, with the Plant Patent Act eight years in existence, *Wallace's Farmer* hailed non-patentable hybrids as "The most dramatic agricultural event of this generation."[128] Farmers had planted fifteen million acres in hybrids in 1938 and yields from those acres would exceed the yield of fifteen million acres of open pollinated corn by 120 million bushels.[129] Telling the story in "simple farm language" the magazine trumpeted the wonder of hybrids, not to mention the fact that Pioneer Hi-Bred and Henry Wallace were on the ground floor of this new innovation.

In conclusion, the history of plants and patents in the early twentieth century reveal two market segments involved in commercialization of plants and seeds. Both segments pursued the same goal: to create higher quality products and profit from sale of those products through exclusive control in the marketplace. One segment, the nursery industry, obtained exclusive rights to its products by securing their eligibility for patent protection. The other segment, the hybrid seed industry, maintained exclusive rights through a combination of secrecy and the natural characteristics and behavior of open

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[127] Ibid., 13 October 1931, Henry A. Wallace Papers, Reel 10, Frame 99.
[128] "The Story of Hybrid Corn," *Wallace's Farmer*, August 13, 1938: 1.
[129] Ibid.

pollinated seeds. Although hybrid seeds remained outside of intellectual property laws, they retained a similar economic identity in terms of production methods and exclusive control of parent lines. The nurseryman could patent the asexually produced fruit tree; the hybrid seed developer could keep his parent lines under strict control. In both cases, exclusivity created commercial value. Within the boundaries of the United States, this philosophy held firm for both patents and plants from the colonial era into the twentieth century. Outside of the United States, a new paradigm emerged.

As the United States moved through the Great Depression and the Second World War, its dominant role in foreign policy emerged with ever-increasing urgency. Overseas aid turned from military supplies to food production. Feeding the world became a key factor in America's battle against the spread of communism, world hunger and unchecked population growth. Public and private money flowed into these causes. Cold war warriors and millionaire philanthropists controlled most of those funds and they looked upon modern farming with its fertilizers, irrigation and hybrid seeds as the ideal tool to feed the world and 'Americanize' it at the same time. As this movement grew, non-profit aid organizations attained a new and prominent position in the acquisition, transfer, use and storage of raw germplasm which represented the critical input for hybrid seeds. On a world stage, however, values and agendas were more diverse and would put to the test the historical American economic mindset of intellectual property rights.

CHAPTER 3. AGRICULTURE AND PHILANTHROPY IN THE DEVELOPING WORLD: WHO OWNS THE WISDOM IN THE EARTH?

The ramifications of exclusive economic rights in plants and seeds became wider in both scope and consequence in the second half of the twentieth century. Issues that evolved within the United States began to concern a world growing in population and hunger. As the United States clung to its traditional views of plants and patents, the economic pillars on which those views rested strained under the weight of a global culture that did not operate under the same set of assumptions. Ultimately, however, they held. Even philanthropic organizations packaged agricultural aid in a way that rewarded size, technology and a market orientation. American philanthropies partnered closely with governments and scientists that believed in modern agriculture. As a result, those who provided funding and scientific expertise for agricultural development gauged success in economic terms. Saving the developing world involved changing it as well.

As the Second World War gave way to The Cold War, the United States government emerged on the global stage as a dominant political and economic force determined to rebuild the world economy in a way that would simultaneously create new economic opportunities and contain communism. Private philanthropy also entered its heyday during this era as the Rockefeller and Ford Foundations expanded their visions for a better world. The two institutions often worked arm in arm to address global issues in ways that resolved local needs while advancing American interests and ideals. Agriculture in developing countries represented one area in which philanthropies made significant advancements. Providing agricultural aid to developing nations through the introduction of improved seeds was inexorably linked to collection and storage of

germplasm, a critical component of breeding operations. In the early years of these efforts, open pollinated seed was still outside the realm of intellectual property laws and so the processes and networks of free sharing entered the developing world along with the new farming methods. This state of affairs suited the philanthropic model because its breeders needed a rich supply of germplasm and the developing world certainly had one. Developing nations gladly partnered with aid organizations by donating local seed in return for improved seed, training and local outreach. Keeping germplasm free and accessible suited all parties.

Intellectual property laws began to catch up to open pollinated plants in the 1960s and 1970s when the European nations collectively established the International Convention for the Protection of New Varieties of Plants (UPOV) in 1961 and passage of the Plant Variety Protection Act in the United States (PVPA).[1] Environmentalists also gained credence by pointing out the troubling shrinkage of both plant diversity and its natural habitat. As the industrial world's economic view honed in on seeds, the developing world and its foundation partners remained aloof and non-threatening. The developing world had no intellectual property laws for plants, nor the bureaucratic infrastructure to evaluate and enforce them. Moreover, they provided no marketplace for the type of seed likely come under intellectual property protection. In order to preserve the status quo, the Rockefeller Foundation spearheaded a coalition of industrial nations, private foundations and the United Nations to create the Consultative Group on International Agricultural Resources (CGIAR). This informal association of donors and

[1] UPOV is an international convention that allows for registration and patent-like protection of seeds. It contains critical exceptions, however, most notably the right of farmers to save seeds of a protected variety for self-planting or sale to others for reasons other than duplication. It has been modified numerous times. As of 2004, fifty-five countries had adopted some version of the convention. Robert J. Jondle and Elizabeth Bennett-Jarvis, "Legal Protection for Plant Intellectual Property," *Seed World* (July/August 2005): 6-7.

managers worked to establish a series of agricultural research centers based on the Rockefeller models in Mexico and the Philippines.

By the time genetics ushered in a new level of private ownership of living material, the philanthropic quarter had amassed one of the largest seed collections in the world courtesy largely of developing countries that shared them freely. As science progressed and biodiversity declined, those seeds became increasingly more valuable. Changing circumstances forced the custodians of those freely donated and shared seeds to re-examine how and by whom those seeds should be used and maintained, especially in light of their source.

This chapter will trace the arc of agriculture and philanthropy in the developing world from the 1940s to 1980. It will examine the Rockefeller agricultural program in Mexico, which served as a template for development of the Consultative Group on International Agricultural Resources. It will also summarize the Plant Patent Act of 1970 which set the stage for a new view of the economic value of open pollinated plants. As these events unfolded, the clear economic motivations, even in connection with humanitarian aid, emerged. In addition, concerns over unchecked population growth exacerbated aggressive use of commercial agriculture as an immediate solution to the challenge of feeding the world at the expense of more long-term concerns over the environment and culture of farming in the developing world. Finally, the ambitious and well-intentioned goals of agricultural aid fell prey to severe economic strains within a decade, forcing those who wanted to continue their work to look for new sources of income just as the 1980s ushered in the genetic revolution and an entirely new economic status for plants and seeds.

The Rockefeller Model for Agricultural Aid

American philanthropy blossomed in the early twentieth century. Men who had made their fortunes in industry established foundations for myriad reasons. Those foundations sought to improve the lives of others in the United States and, in many ways, throughout the world. The manner in which they operated, the subjects of and motivations behind their actions suggested fealty to the same economic factors that allowed them to amass their fortunes. The aid that foundations offered, including agricultural aid, came with, and as the result of, a capitalistic mindset that advanced both economic and political ideals. Foundations reflected these goals and values in the way they operated and in the people who worked for them.

Historians have observed that foundations reflected the systems that created their underlying wealth: efficiency, organization and large-scale production. These qualities were hallmarks of American capitalism, an ideal that philanthropists readily shared along with money, supplies and knowledge.[2] Since the Progressive Era, those wishing to help the less fortunate nearly always equated help with instruction in the American way of doing things. Aid was not so much shared as handed down and often the only way to make use of American aid was to adopt the culture to which it came attached. To improve the lives of the less fortunate was to broaden their scale of production and make them participants in markets. Philanthropy did not raise the standard of living for the whole population so much as it rewarded that portion willing and able to adopt a new type of thinking.[3]

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[2] Edward H. Berman, *The Influence of the Carnegie, Ford and Rockefeller Foundations on American Foreign Policy: The Ideology of Philanthropy* (Albany: State University of New York Press, 1983), 13.
[3] Ibid, 27.

Motives ranged from a genuine desire to help the less fortunate to fear that failure to do so might erode the American fabric domestically or threaten it abroad. Great men and women used their fortunes to create foundations and they selected other great men and women to run them. These visionaries often limited their hires to an exclusive class that perpetuated and cross-fertilized itself in the halls of academia, government and commerce. Foundations were a bastion for Ivy Leaguers and the upper echelons of the corporate, government and academic world.[4] The worldview bred in this rare air was nationalistic and patriarchal; it meted out aid designed to expand and perpetuate those values. Foundation boards were system oriented, believing that advancement was a matter of systemic processes that were naturally capitalistic.[5] To help someone was not to give him what he needed in order to survive but to teach him how to produce it for himself. Foundations did not operate with the primary goal of preserving culture, except perhaps American culture. For them, the world presented threat and opportunity. To prevent the latter and take advantage of the former involved exporting an economic system that reflected American values.[6] Within this philosophy lay the double-edged sword of philanthropy. Technology developed within a cultural context and it reflected the needs and ideals of that culture. Intellectual property and agriculture in America were two examples, both serving specific needs relating to a strong economy. When governments and philanthropies exported agricultural systems, they could not divorce those systems from the context in which they had been developed. Therefore, to the extent the recipient differed from the donor, the technology became less efficient or even

[4] Ibid., 32. According to Berman, foundation boards are essentially self-replicating. He cites a study that found that over half of the trustees of the 13 largest American foundations attended Harvard, Princeton or Yale. In addition, most were white, Protestant males. Ibid.
[5] Ibid., 161- 62.
[6] Ibid., 16-17.

unworkable. Something had to give and it was often the cultural dynamics of the developing world.[7]

Agricultural aid fit firmly into this historical analysis. Economics and politics are closely tied to food. Myriad agendas and motivations emerged in the effort to modernize farming in developing countries. Some donors feared unsustainable increases in population and the resulting demand on food supplies. Others feared ignoring a potential breeding ground for Communism. Inevitably, along with help came an economic mindset with a long historical pedigree. Large-scale farming stabilized societies in terms of hunger but also in terms of politics and economics. Large-scale farming also fostered industrial capitalism, something commentators saw as a key Cold War goal of the Ford and Rockefeller Foundations appended to their humanitarian aims.[8]

The species of aid that embraced advancement through science and technology was not unique or new to developing countries. The United States navigated a similar process as agriculture progressed into the twentieth century. Subsistence farming gave way to commercial farming under the careful hand of farmers, scientists and politicians who approached the land grant system with a decidedly commercial bent. The farmers who would succeed were those able, intellectually and financially, to break from old routines and risk failure for reward.[9] Philanthropists exported a truly 'American' system that ran from the bank to the field to the commercial market place. The system 'Americanized' its recipients coming in and going out. The Rockefeller Foundation and

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[7] Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-1953," *Social Studies of Science*, Vol. 16, No. 3 (Aug., 1986), 458.
[8] Felicia Wu and William P. Butz, *The Future of Genetically Modified Crops: Lessons from the Green Revolution* (Santa Monica: Rand Corporation, 2004), 29.
[9] Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-1953," 76.

its agricultural programs is a case study in these dynamics, as well as a precursor to the system of agricultural aid that exists today.

According to Raymond Fosdick, former chair of the Rockefeller Foundation, John D. Rockefeller, Sr. became a rich man "not infrequently by methods which, if permissible at the time, no longer accord with social conscience or the requirements of law."[10] Despite his business methods, Rockefeller Sr. donated a portion of his income to charity since his first job as teenage clerk in Ohio. His lifelong habit culminated in The Rockefeller Foundation, which came into being in June of 1909 with $50 million of Standard Oil stock as its seed capital. Like many of his peers, Rockefeller was a self-made man of humble beginnings who achieved his success through a combination of fortunate timing, hard work, determination and self-discipline. The foundation therefore espoused large-scale enablement rather than charity. It frowned upon personal or immediately remedial efforts in favor of "those which go to the root of individual or social ill-being or misery."[11] One did not give a poor man a meal, but rather created an economic environment through which he could obtain a job and a paycheck with which he could buy his own meal.[12]

Early in its existence, the Rockefeller Foundation became impressed with the power of private money to work a positive change in agriculture. Positive, in this case, meant economic improvement. Helping a farmer to produce more and better crops resulted in more income for that farmer and therefore a higher standard of living. From 1906 to 1919, the Foundation worked in cooperation with the Department of Agriculture

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[10] Raymond B. Fosdick, *The Story of the Rockefeller Foundation* (New York: Harper & Brothers, 1952), 5.
[11] Ibid., 23.
[12] E. Richard Brown, *Rockefeller Medicine Men: Medicine and Capitalism in America* (Berkeley: University of California Press, 1979), 33.

in the American south to address the boll weevil problem in cotton production.[13] The foundation also sponsored a wheat improvement program in China in the 1920s.[14]

Philanthropy soon merged with foreign policy. The Rockefeller Foundation began funding the War-Peace Studies Project in 1939. The study ultimately concluded what the World Wars had highlighted: national and economic security depended in part on access to and protection of food, staples, minerals, petroleum and other raw materials. The clear goal of foreign policy, therefore, was to preserve those goods, within a non-communist, capital-oriented world.[15] Seeds, being the primary input for agricultural research, soon became a factor in the global tug-of-war between capitalism and communism. Crop improvement relied heavily on access to a diverse base of raw materials, necessitating a seed storage program that offered free seeds to researchers. Healthy seed banks necessitated collection of germplasm from all over the world. When war and diplomacy shut off traditional roads of exploration in the mid-twentieth century, seed collectors found it too difficult to obtain samples from unfriendly or dangerous places. Seed banks suffered, underscoring the critical need for American activism in global issues of hunger and agriculture. Friendly international relationships not only allowed America to export its economic way of life, but also permitted access to badly needed germplasm. Rockefeller Foundation support for international crop research illustrated this point by quickly expanding to include collecting, classifying and preserving germplasm from other countries. Between seed collection and crop research, the Rockefeller Foundation created a body of knowledge in plant breeding that was unparalleled by mid-century. It

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[13] Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-1953," 75.
[14] Wu and Butz, *The Future of Genetically Modified Crops*, 16.
[15] Berman, *The Influence of the Carnegie, Ford and Rockefeller Foundations on American Foreign Policy*, 41-42.

led the world in knowledge about maize in developing countries due to its work in Mexico in 1943 and Columbia in 1950.[16]

Mexico and its agriculture had been a topic of discussion among the foundation board as early as 1933. Franklin Roosevelt sent Henry Wallace to the inauguration of Mexico's new president, Abelardo L. Rodriguiz in 1932. The trip sparked Wallace's interest in agriculture as a way to help the Mexican people.[17] Breeders had been working on corn improvement in Mexico at the urging of Henry Wallace but they had little success with American varieties in Mexican soil and climate.[18] Wallace commented to Rockefeller Foundation president Raymond Fosdick that the best way to improve the conditions for people in Mexico was to increase the yield per acre of corn and beans. The Foundation responded by sending three academic advisors to Mexico: E.C. Stakman from the University of Minnesota, Paul Mangelsdorf from Harvard and Richard Bradfield from Cornell. These men eventually recommended a special program of agricultural research and development. By 1943, the Rockefeller Foundation was working with the Mexican Department of Agriculture. This move signaled a major shift in the Rockefeller Foundation strategy. For the first time in its history, the Foundation became not only a source of funds but also an operational director, providing and supervising on-site staff to implement its program. J.George Harrar, a plant pathologist and future president of the Foundation, headed up the project. He was soon joined by geneticists, soil scientists and entomologists. By 1950, eleven American scientists were working on site in Mexico.

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[16] Uma Lele and Arthur A. Goldsmith, "The Development of National Agricultural Research Capacity: India's Experience with the Rockefeller Foundation and Its Significance for Africa," *Economic Development and Cultural Change*, Vol. 37, No. 2 (Jan., 1989), 314.
[17] John H. Perkins, "The Rockefeller Foundation and the Green Revolution," *Agriculture and Human Values,* Vol. VII, (Summer-Fall 1990), 8.
[18] Fitzgerald, "Exporting American Agriculture," 465-466.

Wheat soon followed corn as a target of improvement. Mexico became the largest Rockefeller agricultural program to date.[19]

Harrar's staff included Norman Borlaug, an Iowa-born plant pathologist who had studied at the University of Minnesota and done agricultural research for the for the duPont Nemours Foundation.[20] Borlaug and the other Rockefeller sponsored scientists were all products of the land-grant university system and its model of agricultural practice.[21] Critically, these academic consultants steered the focus of the Rockefeller Program toward scientific agriculture and increased yields.[22] These men made no bones about the need to bring significant change to Mexico in order for it to succeed agriculturally. Significant change, in this case, was a decidedly commercial approach to agricultural production. Foundation personnel went to Mexico in order to transform a select group of farmers into modern, commercially oriented producers.

Harrar realized early on that the road would not be smooth: "We were foreigners in a country which was suspicious of the motives of the United States."[23] Mexican suspicion toward American motives went all the way back to the Mexican-American War. Harrar's team wanted to minimize these problems but not at the cost of losing

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[19] Fosdick, The Story of the Rockefeller Foundation, 182-186.

[20] Norman Borlaug biography, Official Website of the Nobel Prize, http://www.nobelprize.org/nobel_prizes/peace/laureates/1970/borlaug-bio.html (accessed August 25, 2011). Borlaug won the Nobel prize in 1970. His official biography described him as a "pragmatic, goal-oriented scientists" and a "practical humanitarian." Ibid. This mind set is evident in his work for the Rockefeller Foundation.

[21] Fitzgerald, "Exporting American Agriculture," 461-463. In her article, Fitzgerald quotes Eugene Davenport, Dean of the Agricultural College at the University of Illinois (1895-1922) as representative of the prevailing attitudes under which men such as Harrar and Borlaug matriculated: "I do not agree with the proposition that the college... should... take the message to every individual, on the principle of letting no guilty man escape. There will always be lost souls in farming... and there will be men not worth saving; for this is public business and not charity." Ibid.

[22] John H. Perkins, "The Rockefeller Foundation and the Green Revolution," *Agriculture and Human Values,* Vol. VII, (Summer-Fall 1990), 8-9.

[23] Dr. J. George Harrar, interviewed by Barbara Lane, April 1961 to February 1962, Record Group 13, Oral History, box 17, Special Collections, Rockefeller Foundation Archives, Rockefeller Archive Center, Sleepy Hollow, New York, 45.

control of the program. The Rockefeller group readily acknowledged the need to work with foreign governments in terms of funding, education and promotion of the American brand of agriculture, but were loathe to do so on any terms but their own. They even used the Foundation's tax-exempt status as a tool to steer clear of bureaucracies as noted in a 1969 letter from Harrar to Dean Rusk: "[W]e operate in foreign countries as a tax-exempt institution. In fact, we so advertise in making our arrangements with those countries and in requiring concessions from them which enable us to work effectively and outside of the bureaucratic structure."[24]

The Rockefeller Foundation brought an American mindset to agriculture not only in terms of economics but also in terms of aggressiveness. Norman Borlaug zealously advocated a steamroller approach that brought swift and recognizable change to a receptive audience. Borlaug's philosophy was to overwhelm his audience with success: "One of the most basic ingredients of change is capturing the imagination of the traditional farmer, the politician, the scientist, and the only way to do this is to make tremendous differences at the outset."[25] In Borlaug's view, crop scientists had to forget about teaching old dogs new tricks and instead forge genuine relationships with progressive thinking locals. He wanted to link up with young people and treat them as peers, not as a "consultant looking down from on high."[26] The equality of the relationship only went so far in Borlaug's mind, however. He was willing to be a co-worker but determined to be an aggressive one as well. His strategy was to "insist, prod, push until

[24] John G. Harrar to Dean Rusk, 2 September 1969, Record Group IV 2A26, folder 11, box 2, Special Collections, Rockefeller Foundation Archives, Rockefeller Archive Center, Sleepy Hollow, New York.
[25] Norman E. Borlaug, interviewed by William C. Cobb, June 1967, Record Group 13 Oral History, box 15, special collections, Rockefeller Foundation Archives, 44-45.
[26] Ibid., 46-47.

you get them there."[27] Harrar offered a similar but slightly less harsh assessment: "We realized quite soon that if we were going to introduce scientific methods into Mexico on the scale which would be necessary to make any significant progress, we would have to try to enlist our Mexican friends to work with us, to accept our philosophies and our judgments, and to progress together." The Foundation staff found senior Mexican scientists to be apathetic so they had to "revert to the soil" and prove themselves with results.[28]

Progress was not always fast. For example, it required nearly ten years of slow incremental increases to convince Mexican farmers to apply 120 pounds of fertilizer per acre. The starting point had been twenty pounds per acre. George Harrar recalled the extreme skepticism of Mexican farmers, who at first called the fertilizer 'venemo' but, after seeing its results, began to ask where they could get the 'medicina.'[29] This recollection illustrates the challenges of bringing an American style of crop production to an indigenous population that equated chemical fertilizer first with poison and later with medicine, rather than a tool for enhancing soil and crop nutrition. Critics who expressed disapproval at such significant uses of fertilizer infuriated Borlaug: "This made my blood boil."[30] Borlaug's similarly had no patience for economists and politicians, especially those in embassies and the United Nations, who he viewed as operating within a false sense of reality.[31]

As a result of the myriad cultural, political and scientific challenges, pragmatism and progress were the watchwords in Mexico. Foundation employee Sterling Wortman

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[27] Ibid.
[28] J. George Harrar, Lane interview, 36-37.
[29] Ibid., 50.
[30] Norman Borlaug, William C. Cobb interview, 44.
[31] Ibid., 47-48.

recalled warnings form George Harrar that Central American agricultural programs would be rife with problems and that his job was to figure out a way to get over, around or under them so long as he put them in his rear view.[32] Harrar's attitude was to "[L]et nature tell us what our problems were."[33] In other words, grow Mexican crops and determine what kills them. Hybrids, in Wortman's view, were not the answer to the problems faced by Mexican farmers. By that time, double-crossed hybrid corn was all the rage in the United States, but it was not necessarily the answer to agricultural issues in developing countries. Hybrids required intense oversight and complete segregation from planting through detasseling, harvesting, drying, storing, shelling and sacking. These requirements placed a high demand on technical competence not always found in developing countries. Wortman blamed mechanical pickers, among other things, as contributing to an over emphasis on hybrid uniformity, even to the point of height and angle of ears. But, as one researcher warned him: "Do not take this breeding program to a point of high uniformity. We have just gotten to the point in the United States at which our farmers are judging the worth of a hybrid not so much by what it will yield, but by how uniform it is. We're getting to the point where we're worrying about the chrome on the vehicle instead of the engine that's in it."[34] Other options existed for improving yields. The Rockefeller Foundation tested five to eight thousand varieties of wheat and a similar amount of corn, eventually producing two to three dozen viable lines. Cultural obstacles emerged in addition to Wortman's concerns about the technical challenges of hybrid production. Despite improved results, locals rejected some varieties of beans and

[32] Sterling Wortman, interview by William C. Cobb, 2 & 4 August 1966, New York City, "Sterling Wortman," box 26, Record Group 13, Special Collections, , Rockefeller Foundation Archives, 58.
[33] Harrar, Lane Interview, 38.
[34] Wortman, Cobb Interview, 66.

maize based solely on color.[35] Ultimately, hybrid corn accounted for less than twelve percent of Mexican corn acreage by 1963 while improved wheat accounted for ninety percent of wheat acreage as early as 1957. Researchers account for this by pointing out that the Mexican corn farmers were subsistence farmers working on an average of three hectares, while wheat farmers worked on an average of seventeen hectares. The latter were more suited and eager to adopt the American commercial model.[36] Wortman concluded that hybrids worked only when managed by private companies with sales incentives, and not government monopolies. He believed that open pollinated varieties improved by mass selection were preferable: "I think we have to defeat the idea that a hybrid corn program is necessary, because I think it is neither necessary nor good."[37] Wortman's views and the practices that resulted in Mexico reflect a focus on pragmatism and the bottom line. The program directed farmers toward hybrids or, in the alternative, gave them the best seeds and more modern practices. In either case, the end result was to increase yield and profit.

The Rockefeller strategy to avoid political distractions was not misplaced. Despite the Foundation's best efforts, politicians hovered over the operation, particularly those who saw agricultural progress as a public relations tool for personal advancement. The Foundation personnel soon found themselves in the middle of partisan political battles. Senator Ramos Milan chaired the National Corn Commission and used it to further his goal of becoming Mexico's president. The Rockefeller Foundation work was, for him, a stream of photo opportunities. Nazario Ortiz Garza served as Minister of Agriculture and also placed his sights on the Office of the President. The two men competed for control

[35] Harrar, Lane Interview, 50-51.
[36] Fitzgerald, "Exporting American Agriculture," 469-470.
[37] Wortman, Cobb interview, 69.

of the most valuable asset issuing from the Rockefeller Foundation's research: improved seeds. Mexico's president directed the Foundation to give its seeds to the Corn Commission under Milan, but Garza directed the Foundation to place the seeds in his custody, an order he refused to put in writing. The foundation dodged the controversy by providing duplicate seeds to both men.[38] The positive results also brought attention from politicians who sought immediate expansion before they had the technical staff to make it worth while or worse, in order to create jobs for political allies.

The first and most lasting installation in the Rockefeller Foundation's Mexican program was the International Maize and Wheat Improvement Center, better known by its Spanish acronym, CIMMYT. The Mexican government and the Rockefeller Foundation led a multi-party effort that gave the new entity it legal status via a civil partnership agreement. The parties established the facility in 1963 and formalized it in 1966. The concept of free sharing of research results was reflected in the entity's purposes under Article 5(f) of its enabling document: "To publish and divulge the results obtained from research programs and carry out what may be necessary to promote the immediate and efficient application of these results to the improvement of quality and quantity of maize, wheat and other important food crops on a local and international level."[39] Profit on the new hybrids was not an option, although it appears that profit could be made by the sale of breeding stock. Articles 9(a) & (b) referenced commercial sales from research as well as "[T]he fees which may be collected to pay the cost of production of certain genetic materials that will be supplied to parties interested in the promoting of

[38] Ibid., 92-96.
[39] CIMMYT Civil Partnership Agreement, folder 5, box CG VII, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center, Sleepy Hollow, New York, 3.

cereal production."[40] This vague reference did not indicate the parameters of such sales but they were clearly contemplated.

The Rockefeller Foundation program in Mexico demonstrated a clear philosophy that national well-being in the long run was found in commercial opportunity.[41] The Green Revolution wrapped this idea in the gift of free information and assistance but the information given away carried with it an expensive way of farming.[42] The people who represented the Foundation in Mexico were wholly dedicated to the idea of changing agriculture to a more economic and market-oriented process and anyone who disagreed was simply in the way. In addition to Borlaug and Harrar, the Rockefeller philosophy is found in the writings of John A. Pino, an animal husbandry expert and Rockefeller Foundation employee who went to Mexico and eventually assumed a leadership role. When the Mexican government placed restrictions on imported chicks, Pino advised American poultry producers in Mexico on how to set up breeder flocks and poultry hatcheries in Mexico, which allowed them to remain in business in that country. Pino's attitude reflected a clear interest and pride in keeping the American poultry industry alive and well in Mexico: "I think our advice, as far as these commercial companies were concerned, was invaluable to them. They wouldn't go anywhere and pay for this kind of advice because it wasn't available."[43] This mindset of economic pragmatism was well-preserved as many of the same people who made the Rockefeller program in Mexico a

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[40] Ibid.
[41] Berman, *The Influence of the Carnegie, Ford and Rockefeller Foundations on American Foreign Policy*, 25.
[42] Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-53," 469-470. For example, Mexican farmers did not traditionally rotate crops, opting instead for repeated plantings until soil was played out and then finding a new field. The American answer of rotation, fertilizer and irrigation required money and the ability to establish a fallow – all indices of commercial farming. Ibid.
[43] John A. Pino, interview by William C. Cobb, May & June 1967, Record Group 13 Oral History, box 17, Rockefeller Foundation Archives, 60.

success played central roles during formation of the Consultative Group for International Agricultural Resources (CGIAR). As CGIAR was taking shape, however, European nations and the United States Congress were taking critical steps to expand concepts of intellectual property to include open pollinated seeds. These steps placed the type of work done by the Rockefeller Foundation in Mexico in a new economic light. Adjustment to the new status of open pollinated seeds was not fast or easy.

Intellectual Property Rights for Open Pollinated Plants

From 1930 to 1970, the crop breeding business matured and took up a central place in global agricultural development efforts. Those efforts are discussed in Chapter three and began well before the final critical steps took place. Congress took a major step toward enhancing the value of sexually produced plants in 1970. The Plant Variety Protection Act (PVPA) complemented the Plant Patent Act by granting limited non-patent intellectual property protection to sexually produced plants.[44] Like the Plant Patent Act of 1930, the PVPA found its political legs in an economic argument: helping the United States breeders complete with their European counterparts by giving them economic incentive to expand their research and development.

European nations took steps to establish an international union for the protection of plant varieties in 1961. Its standards for intellectual property protection on plant varieties became effective in 1968 when the requisite minimum of three states - Germany, the Netherlands and the United Kingdom - ratified and adopted them.[45] American seed sellers responded by urging Congress to amend the Plant Patent Act of

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[44] 91st Congress, 2nd Sess. *Congressional Record* vol. 116, pt. 33 (28 December 1970), 43590.
[45] Glenn E. Bugos and Daniel J. Kevles, "Plants as Intellectual Property: American Practice, Law, and Policy in World Context," Osiris, vol. 7, (1992), 91. All three of those nations would eventually become active donors to CGIAR.

1930 to include sexually produced plant varieties. Critics raised numerous objections, including the fact that crop plants changed genetically from year to year. A plant patented one year would no longer fit its patent description after one or two generations.[46] Congress removed the final version of the law from the Patent title of the United States Code and placed it in the Agriculture title. It mimicked the international standard by setting up a system of seventeen-year protection certificates issued through the United States Department of Agriculture.[47]

As with the 1930 law, economics drove the 1970 law. Industry trade associations dominated subcommittee hearings and for the most part spoke strongly in favor of the legislation, with the primary emphasis being economic development. The companies almost universally claimed that they would invest more funds in their operations with the benefit of exclusive rights in their plants. Senator Jack Miller of Iowa, a co-sponsor of the bill, stated that private companies could not afford to invest in breeding programs without the opportunity to make a profit and that the drafters had designed the legislation to "serve as a stimulus for investment of private funds in variety research and development of seed."[48] In relation to UPOV, Miller stated that without the PVPA, "people can go around us in other countries that compete which us in world markets."[49]

The significant time and cost of breeding drove the economic argument. The successful transfer of a specific plant trait to a specific local plant variety required multiple generations of breeding, a time estimated by the Department of Agriculture to be

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[46] Ibid., 92.
[47] Ibid., 94.
[48] U.S. Congress, Hearing before the Subcommittee on Agricultural Research and General Legislation of the Committee on Agriculture and Forestry, United States Senate, 91st Cong. 2nd Sess., June 11, 1970: 48-49.
[49] Ibid., 52.

twelve years.[50] Evaluations of a new plant introduction could require an additional decade.[51] The potential pay-off, however, was also significant. Raw materials collected in Asia in the early 1930s at a cost of about fifty thousand dollars resulted, twenty-five years later, in a 1956 soy bean worth one billion dollars per year in revenue.[52]

Testimony at the Senate Subcommittee hearings was varied but generally favored the proposed law for economic reasons. The American Seed Trade Association presented itself to the subcommittee as a growing, dominant and profitable business that did not really need the protections the law offered. It conceded, however, that the PVPA would permit the government to conduct basic research and private industry to do applied research.[53] Responding to a claim that the PVPA would hamper the free flow of germplasm, the Association claimed that the decision to hold valuable seed for financial gain "will be determined by the policy of the individual experiment station" but that had not been the case with hybrid corn and sorghum, even though the biological protections built into the seed were more theft proof than legal protection.[54]

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[50] Jorge Fernandez-Cornejo, "The seed industry in U.S. agriculture," Agriculture information bulletin no. 786, United States Department of Agriculture (2004), 4

[51] W.H. Hodge and C.O. Erlanson, "Federal Plant Introduction: A Review," *Economic Botany*, Vol. 10, No. 4 (Oct. - Dec., 1956), 330.

[52] Ibid., 331-332. The dichotomy between public and private breeding is important in the marketplace. When a variety is bred privately for sale under a trade name, several extra generations are used in order to establish absolute homogeneity in every aspect of the plant. Public breeding, by contrast, will release a variety after five to seven generations of breeding, not worried about the cosmetic aspects of certain traits. The extra generations dedicated to private, for-profit motives uses up breeding resources and delays getting the new variety to market. See, A. Allan Schmid, "Biotechnology, Plant Variety Protection, and Changing Property Institutions in Agriculture," *North Central Journal of Agricultural Economics*, Vol. 7, No. 2 (Jul., 1985).

[53] Ibid., 54.

[54] Ibid., 62. Dale Porter, legal counsel for Pioneer Hybrid Corn Company offered a slightly different take on the position that the bill would have no effect on free sharing of germplasm. The terms of the bill allowed registration within one year of public use of a new variety, including a one-year look back provision that would allow registration of any variety released publicly up to one year prior to enactment of the law. Porter Observed: "One of the reasons we needed that provision in this act is so that companies having new varieties to release during the pendency of this proposal would not hold those varieties up in order to get protection subsequently but would be free to release them while this is under consideration. It would be very undesirable for a company to sit on a new variety and not release it today in anticipation that

In a similar vein, the National Council of Commercial Plant Breeders advised that "considerable investment" would be made if legal protection provided profitable opportunities in plant breeding, citing the green revolution and crediting its success with improved varieties made possible through such breeding.[55] Stoneville Pedigreed Seed Company flatly committed to increase its research expenditures for cotton by over 50% should Congress pass the bill.[56] Similarly, the cotton industry reported that ten of its producers representing 65% of cotton acreage would "at least double" their expenditures on cotton varietal development with the establishment of a protection system.[57]

Echoes of the 1930 law appeared as well. Coker's Pedigree Seed Company claimed that its Hampton 266 variety of soybean accounted for 83% of the soybean acreage of South Carolina, but the company had nevertheless lost hundreds of thousands of dollars on the product since many seed growers simply purchased the variety from Coker and reproduced it.[58]

In a crowning move, Paul Stark, the father of the 1930 law, came forward to testify on behalf of his counterparts working in sexually produced varieties, although his comments before the Committee were perfunctory and seemed to border on disinterest. He stated that work on a law to protect sexually produced varieties had been going on for forty years following passage of the Plant Patent Act in 1930: "[S]ince that time we have been working on this sexually produced thing, and all these people have worked out something. It is the first time we have ever gotten all to seem to agree on something."

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this might become law in the future." See, U.S. Congress, Hearing before the Subcommittee on Departmental Operations of the Committee on Agriculture, United States House of Representatives, 91st Cong. 2nd Sess., June 10, 1970: 38.

[55] Ibid., 66.

[56] Ibid., 75.

[57] Ibid., 78.

[58] Ibid., 73.

Stark highlighted the benefit of increased plant production due to the "requirements of our increasing national and world population."[59]

A significant voice of protest emerged in the Campbell Soup Company. Campbell's objected to the impact of the bill on free exchange and ready availability of germplasm. They claimed that mere work on the new law had had a chilling effect within the scientific community: "As a result of activity in recent years leading up to the present proposed Plant Variety Protection Act there has been a perceptible reluctance among plant breeders to exchange genetic material." Final enactment of the law "would essentially eliminate exchange of valuable germplasm and severely curtail the development of new varieties." Moreover, those qualities that made plants unique – acidity, vitamin content, flavor – required sophisticated equipment and highly trained personnel to establish in a plant line. The same result could easily be obtained via control of parental material by the breeder.[60]

The American Frozen Food Institute also opposed the bill as special interest legislation that would allow the private sector to cash in on publicly funded breeding. In his testimony, Thomas House claimed that the United States allocated $400 million annually, fully half of the USDA's agricultural research budget, to public breeding either

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[59] Ibid., 79. In his written comments, however, Stark carefully protected his hard won turf. While in favor of the Plant Variety Protection Act, he went on to state: "However, I wish to further state that I am definitely opposed to combining this proposed Plant Variety Protection Act for sexually produced plants with the successful 40 year old Plant Patent Amendment to the Patent law covering asexually produced plants." The agreement in 1929 was to remove sexually produced plants from the 1930 law when the lobbyists were "officially informed that inclusion of sexually produced plants … would show variations in plant characteristics that would make enforcement under the patent law impractical or impossible." Based on this "all agreed" to limit the new law to sexually produced plants. Exactly who "all" were is not clear. Ibid., 80.

[60] Ibid., 83-84. A clever Senator Jordan threw a wet blanket over the testimony in his introduced Eldrow Reeve from Campbell by stating: "I do not think that I have ever held a hearing that was more for one side than this one has been-except one. That was when I happened to be on a committee with the power to accept money. Someone wanted to give us $20 million for a building, and I did not have a bit of trouble getting it through. You may proceed Mr. Reeve." Ibid., 82.

at the USDA or at public universities. Even if a private breeder crossed two varieties to produce something new, he argued, those two starting point varieties represented "perhaps fifty man years of genetic research by the Department of Agriculture and one of our great universities."[61] Under such circumstances, he asserted, the resulting variety should not be the subject of a private monopoly.

The comments of Representative Thomas Kleppe of North Dakota illustrate the economic mindset of the Congress during the House Subcommittee hearing: "It seems to me that the spirit of competition is what comes into play here. If you develop a better seed and the farmers want to buy it, fine, then they will pay a little higher price for it. If they will not pay that price for it they will not buy it, so we are getting right back to the spirit of competition which is really the basis for our whole system of life in the United States. I think that is what is involved here."[62] Another example from floor debate is the comments of Representative William Poage of Texas who spoke of a "tremendous blight" affecting that year's corn crop and averred that more and better plant breeding would alleviate the blight. The proposed bill would enable people to "get some research done in a hurry."[63]

In both 1930 and 1970 Congress was attempting to create financial incentives for private investment to replace government support in the plant breeding industry. Although there was certainly some comment in 1930 on the wisdom of granting patents to things that grew in the soil, there does not appear to have been a conscious decision by Congress in either 1930 or 1970 to take up and resolve the question of patentability of

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[61] Ibid., 90.
[62] U.S. Congress, Hearing before the Subcommittee on Departmental Operations of the Committee on Agriculture, United States House of Representatives, 91st Cong. 2nd Sess., June 10, 1970: 34-35.
[63] U.S. Congress, Senate floor debate, 91st Congress, 2nd Sess. *Congressional Record* vol. 116, pt. 30 (8 December 1970), 40295.

living material on any grounds other than economic. This is the landscape in which CGIAR emerged and began to wrestle with its own attitude toward material that was eligible for intellectual property protection.

The Birth of CGIAR

By 1946, Rockefeller Foundation concern about improving agriculture bumped up against growing Foundation concerns with over-population. The new Rockefeller Foundation President, Chester I. Barnard, linked the population issue to the Mexican agricultural program, questioning whether the foundation was acting responsibly by helping to improve life expectancy through greater food production while doing nothing to address the consequences of a dangerously overpopulated planet.[64] By 1951, the Rockefeller Foundation had produced a white paper concluding that global tensions were the direct result of both overpopulation and inequitable distribution of resources. The authors also concluded that: "Agitators from Communist countries are making the most of the situation."[65] At a 1965 conference on subsistence and peasant economics, John D. Rockefeller III ranked population growth ahead of nuclear arms control in terms of its threat to the world. Rockefeller made clear that agricultural improvement was merely a 'holding action' or 'buying time' until the population problem could be addressed. The link between the two was the subsistence farmer who controlled forty percent of the cultivated land in the world. Rockefeller's comments make clear that the aggressive approach to agriculture in Mexico that Borlaug and Harrar exhibited came from the top down. The challenge, according to Rockefeller, was to help the farmer use seed,

[64] John H. Perkins, "The Rockefeller Foundation and the Green Revolution," 9-10.
[65] John H. Perkins, "The Rockefeller Foundation and the Green Revolution," 11. The report was titled: "The World Food Problem, Agriculture, and the Rockefeller Foundation" June 21, 1951. Ibid., n.47.

insecticides and machines and to induce him to put aside centuries old methods of farming to experiment with total strangers in a way that would risk his very survival.[66]

In 1970, the Ford Foundation coordinated a white paper based on a meeting of agricultural assistance agencies. The authors noted that a "new vitality" of agriculture had reached "farms usually considered traditional, even subsistence, in their production patterns." Such practices, however, had the potential for myriad disruptions, including "strains on marketing systems and older patterns of trade; disparities in per capita income; rural unemployment and urban migration; and even political unrest." The authors characterized all of these potential negatives as "short-run difficulties" compared to the problem of addressed world population growth. The challenge, they concluded, lay in creating incentives for profitability and the answer to that challenge was "more modern farm technology."[67]

Controlling hunger through improved agriculture was never far from the issue national security. The major foundations and relief organizations were sensitive to the political impact of philanthropy, which is not surprising given the pedigrees of men like McGeorge Bundy and Robert McNamara. A 1969 letter from John Harrar to Ford Foundation President McGeorge Bundy illustrated this concept on the eve of CGIAR's creation: "Thank you for your letter of February 18 with respect to your conversation with Averell Harriman with respect to miracle rice. I have been rather intrigued by the rumors that both mainland China and North Vietnam have been trying to get seed and, as you know, a recent report states that some has reached Cuba. I would agree with you that

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[66] John D. Rockefeller III, "The Challenge of Population and Food," in Clifton R. Wharton, Jr., Ed., *Subsistence Agriculture and Economic Development* (Chicago: Aldine Publishing Co., 1969), 3-5.
[67] "Accelerating Agricultural Modernization in developing Nations: A Summary of Findings and Suggestions of Agriculturalists from Development Assistance Agencies," February 3-6, 1970, box CG II, folder 2, Record Group CGIAR, Rockefeller Foundation Archives.

we ought to continue to watch future developments and at the right moment learn the thinking of the new administration. I am sure you are right also that there are two points of view involved and that there may be strong feeling on one side or the other."[68]

The diverse agendas merged within a group of power brokers who wanted to alleviate hunger not only by producing more food but also fewer people. Population control grounded the Rockefeller Foundation's long standing view that helping developing nations involved educating them on how to feed themselves and how to control their populations. In November of 1969, John D. Rockefeller, III and Robert McNamara solicited numerous individuals to participate in "[A] high level meeting of major international, national and private agencies concerned with population growth and stabilization." John Harrar described the meeting as informal and off-the-record in his invitation to McGeorge Bundy, President of the Ford Foundation.[69]

Those involved in agriculture certainly saw the potential for disaster in unchecked population growth and the resulting need for extreme action. John G. Harrar pointed this out to John D. Rockefeller, 3rd in his comments on a population conference held in 1970:

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[68] John G. Harrar to McGeorge Bundy, 25 February 1969, Record Group IV 2A29, folder 7, box 2, Special Collections, Rockefeller Foundation Archives.

[69] John G. Harrar to McGeorge Bundy, 10 November 1969, Record Group IV 2A26, folder 7, box 2, Special Collections, Rockefeller Foundation Archives. Proposed participants and their affiliations for the 1969 conference on population and economic development were as follows: McGeorge Bundy or David Bell – Ford Foundation; Bernard Berelson – Population Council; M. Candau – World Health Organization; Gen. William Draper – IPPF; Robert Finch – HEW; John Hannah – USAID; John Harrar – Rockefeller Foundation; Paul Hoffman, UNOP; Milos Marcura – United Nations; Robert Marston – National Institutes of Health; Robert McNamara- IBRD; Galo Plaza – OAS; John D. Rockefeller III – Rockefeller Foundation; Maurice Strong – Canadian International Development Agency; Plus Presidents or ministers for family planning or economic development from Chile, Columbia, India, Kenya and Malaya. "Possible Participants in a Villa Serbelloni Conference on Population and Economic Development," unsigned memorandum, 22 May 1969, Record Group IV 2A26 folder 11, box 2, Special Collections, Rockefeller Foundation Archives, Rockefeller Archive Center, Sleepy Hollow, New York. This was not an isolated event. In 1971, the Rockefeller Foundation determined to host a second meeting on "excessive population growth, and the nature, extent and effectiveness of current population control programs." John Harrar to David E. Bell, 26 January 1971, Record Group IV 2A26, folder 19, box 3, Special Collections, Rockefeller Foundation Archives.

"I would certainly agree in principal that 'the end objective of family planning is the quality of life.' The fact is, however, that the quality of life is so unsatisfactory for so many millions of people now that unless population stabilization can be brought about in some reasonable time dimension, survival will become the major concern … I think that realistically it has to be made clear that the only approach to this goal is through the establishment of massive and effective efforts toward ZPG."[70]

Given Harrar's bleak outlook and his sense of urgency regarding the solution, it is not surprising that the Rockefeller agricultural team pursued change so aggressively and with a focus on economic improvement of the developing world's agriculture, even at the cost of farmers who would not or could not change.

While it was wrestling with the population issues, the Rockefeller Foundation also organized two meetings, in April 1969 and a year later in April 1970, to discuss a more formal and coordinated effort at agricultural assistance for the developing world using the model of its operations in Mexico and the Philippines. Despite its aversion to bureaucracy and red tape, the Rockefeller Foundation recruited entities that had the reputation and the funds to grow its two successful agricultural projects into a global network of crop improvement. Attendees represented the World Bank, the Ford and Rockefeller Foundations, the United Nations Food and Agriculture Organization and the United States Agency for International Development.

Robert McNamara attended for the World Bank and served as a key figure for the upstart group in terms of both financing and credibility. McNamara embodied the melding of philanthropy and American exceptionalism that defined agricultural

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[70] J.G. Harrar to John D. Rockefeller III, memorandum, 17 April 1970, p. 1, Record Group IV 2A26, folder 17, box 3, Special Collections, Rockefeller Foundation Archives.

assistance to developing countries in industrial and capitalistic terms. McNamara had assumed the helm of the World Bank in 1968 after seven years as United States Secretary of Defense. In that earlier role, McNamara developed a belief that standards of living trumped military strength in issues of global stability, thus explaining his interest in the idea of agricultural assistance.[71] Standards of living related closely to population stability, which McNamara also viewed as a contributing factor in preventing the rise of authoritarian governments.[72]

Financial commitment was key to getting the new program off the ground and the Rockefeller Foundation recruited participants for their purse strings as well as their commitment to world hunger.[73] The parties discussed the extensive work already done by the Rockefeller Foundation and the potential for expansion under an umbrella of private and public support. McNamara estimated that existing agricultural research institutes would require operating capital of $14 million per year by 1975. Five new research centers would require an additional $50 million of capital investment and another $20

[71] See, William Clark, "Robert McNamara at the World Bank," *Foreign Affairs*, Vol. 60, No. 1 (Fall, 1981), 167.

[72] For an excellent summary of McNamara's view of population and political stability in his own words, see, Robert S. McNamara, "Time Bomb or Myth: The Population Problem," *Foreign Affairs*, Vol. 62, No. 5 (Summer, 1984), 1119.

[73] The financial needs were real and immediate, even for the existing program. For example, Rockefeller's CIMMYT facility in Mexico was looking at a deficit of $225,000 in 1970. Lowell Hardin of the Rockefeller Foundation thought that USAID could pick up the underage but it did not have the funds. According to Hardin, USAID "Pushed the notion that the World Bank should get its feet wet by picking up this $225,000." Hardin agreed that the World Bank "as the lead horse in the consortium [should be encouraged to] pick up CIMMYT's deficit as an act of good faith." Lowell Hardin, "Background Notes on Consultative Group Meeting," May 8, 1970, Discussions Re Establishment of Consortium on International Agricultural Research 1970-1971, box CG I, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center, 1. Hardin speculated on the players in the new consortium in addition to the World Bank, which he clearly viewed more as a funding source than a manager: "Based on discussions thus far, I would assume that the Scandinavians, the West Germans, the Dutch, possibly the Japanese, possibly the Australians would be among those invited to the first meeting. This assumes that the French, the British, like the Canadians and the Americans, will proceed on a bilateral basis." Ibid., 3.

million per year for operations. McNamara and others stressed that the foundations would have to take the lead in planning, organizing and managing the institutes.[74]

McNamara took a lead role in garnering support of his Board of Directors at the World Bank and providing its endorsement. McNamara's memo to the board demonstrated the pragmatic and economic approach shared by the other players. McNamara stressed the need to bring the developing world into modern agricultural practices: "[F]arming and ranching methods based on new technology must take the place of the traditional low yield approaches characteristic of a considerable part of the areas where there is most need for greater productivity." As far as crops were concerned, a "package" of technology had to be made available in which "improved water and fertilizer usage is supplemented by higher yielding varieties, pest and disease control, and better husbandry."[75] Regarding his attendance at the Rockefeller-sponsored agricultural conferences, McNamara stated that: "It was made plain to me … that an active role for the Bank Group would be warmly welcomed."[76] McNamara even claimed a share of credit for the CGIAR concept: "I have been tentatively thinking that something along the lines of the consultative groups which we have organized for the coordination of development assistance might be an appropriate vehicle."[77] McNamara had no desire to get into the business of agriculture, however: "The existing institutes have their own

[74] Sterling Wortman, "Funding of International Agricultural Institutes," meeting notes, April 8-9, 1970, Discussions Re Establishment of Consortium on International Agricultural Research 1970-1971, box CG I, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center. Interestingly, although Sterling Wortman reported that it was McNamara who estimated the cost of the existing research centers at $14 million annually by 1974-75, McNamara took a different tack with the World bank Board of Directors: "Present estimates by the foundations and the institutes are that by 1974-75, if the existing four institutes are to do the work that may reasonably be expected of them, their core budgets will reach about $14 million." See, Robert McNamara to Executive Directors, memorandum, 31 March 1970, Discussions Re Establishment of Consortium on International Agricultural Research 1970-1971, box CG I, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center: 4.
[75] McNamara to Executive Directors, memorandum, 2.
[76] Ibid., 3.
[77] Ibid., 4.

boards of trustees … while some representation of new donors might well be appropriate – just as the foundations are now represented on the institutes' boards – it would be extremely important to preserve the independent character of the existing institutes."[78] World Bank participation would not be in the form of a development loan: "[T]he Executive Directors agreed that that the Bank Group should be prepared, while applying its normal lending standards and procedures, to finance high priority agricultural research, to the extent possible in cooperation with other institutions, national and international. … assistance we provide for international institutes … might have to take the form of a grant … directly out of net earnings in excess of reserve requirements."[79]

The World Bank board adopted McNamara's recommendation of funding in the form of grants rather than loans and set the figure at three million dollars for 1972, "if the requisite funds are not available from other sources."[80] Funding was extremely informal given the magnitude of the project. Eight participants pledged amounts ranging from $1 million to $7 million, with the latter being from the United States. Membership in CGIAR, however, did not require a financial commitment and there would be no central fund. Participants would be allowed to fund specific projects on a project-by-project basis.[81]

The Rockefeller Foundation convened a follow-up meeting in February of 1971. The general theme of changing farm practices in the developing world from subsistence

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[78] Ibid.
[79] Ibid., 5.
[80] Unsigned memorandum, "Summary of Proceedings of First Meeting of CGIAR," June 9, 1971, folder 4, box CG I, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center: 1. The relatively small nature of the World Bank's commitment of three million dollars to CGIAR is apparent in light of McNamara's statement that the World Bank would commit ten billion dollars toward agricultural projects in the next five years. Ibid.
[81] Richard Demuth to Delegates, memorandum, February 5, 1971, Discussions Re Establishment of Consortium, box CG I, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center: 4.

to commercial, even at the expense of some small operations, dominated the conversation. McNamara did not attend a follow-up meeting but sent a message that touted the "brilliant results" of the green revolution, adding: "[W]e have learned that the traditional farmer is not at all an immovable block to progress; with the right kind of incentives and support, he shows himself to be as adaptive and venturesome as any man."[82] Paul Hoffman, Administrator of the United Nations Development Program (UNDP) also sent his personal message of economic reorientation. He claimed that "[U]nless the improvement we propose makes production much larger, or a great deal better in quality, we are unable to persuade the farmer to change from his own known way of doing things. This is especially true when the proposed changes involve spending more than the farmer is accustomed to spend and more money than he has readily available to him. A small change is all very well, but if it doesn't double, or multiply by many times the present yields, we shall get nowhere." Like the foundations, the UNDP was well aware of the fact that population growth exacerbated the problem: "[T]he ever-new crop of children who are entering the population cycle, whose very numbers are predicted, put a newly realized element in the farming problem in all its aspects."[83] Similarly, both the World Bank and even the United Nations cast the effort in terms of aggressively demonstrating to the developing world the potential of new methods of farming and doing so ahead of growing population trend. By this time, the organizers had toned down financial estimates from McNamara's initial estimate of $50 million to

[82] Ibid., Annex III.
[83] Ibid., Annex IV.

"something on the order of $32 million in 1975." That number was not insignificant, however, as the participants estimated the funding gap it would create at $21.8 million.[84]

Organizational work on the CGIAR progressed steadily to the point of an organizational meeting to create the new entity in mid-1971. Despite the hard preliminary work, the Rockefeller Foundation promoters took nothing for granted. Two weeks before the event, Sterling Wortman urged George Harrar to attend personally: "I would urge you to attend this meeting if you possibly can, since it should be the crucial one. We should know by the end of that day whether the Consultative Group will get underway in an effective way … it seems to me that it is most important that you be present, not only because of our need for your judgment regarding arrangements proposed there but to gauge the degree of commitment of other donors."[85] That Wortman viewed the attendees as 'donors' rather than participants or members shines a light on the Rockefeller view that governments and bureaucracies were things to be gotten over, under or around. Funding was lacking but the vision was solidly in place.

If funding was a primary concern, economic potential was not far behind. In May 1971, the Agency for International Development sent a letter to the Ford Foundation with "views widely held in the Agency" regarding the pending and expected meeting to establish the CGIAR. The agency's clear desire was to shine a brighter light on the potential for the agricultural research centers to foster economic growth as sponsors of developing technologies: "[W]e believe it essential to take greater account of the social and economic impact of the new agricultural technologies which the International

[84] Ibid., 2.
[85] Sterling Wortman to J. George Harrar, memorandum, May 4, 1971, folder 4, box CG I, Record Group CGIAR, Rockefeller Foundation Archives.

Centers have been so important in developing and disseminating. This should influence the choice of alternative technologies to research."[86]

The organizers of CGIAR met on May 19, 1971 in Washington, DC. Twenty-four delegations attended and twenty-eight delegates participated. Delegates from Canada, the United States and the United Kingdom, as well as the Ford, Rockefeller and Kellogg Foundations came ready to join. Australia, France and Germany required further permissions.[87] The meeting summary did not list or mention any private entities.

David Bell of the Ford Foundation described the new entity as "[A]n interesting new invention which offers the hope of tying together first-class scientific judgment and major sources of financing."[88] If there was any question as to which of the two roles was to be served by the invited attendees, the foundations quickly dispelled it. In typical Rockefeller fashion, the foundations reported on "agreements reached in earlier informal meetings" regarding high priority research.[89] One unnamed participant suggested that the United Nations' Food and Agriculture Organization should simply assume the duties

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[86] Alex B. Daspit to Lowell S. Hardin, 4 May 1971, folder 6, box CG I, Record Group CGIAR, Rockefeller Foundation Archives.

[87] By December of 1971, initial financial commitments in $ U.S. were as follows: Ford Foundation ($3,000,000); United Kingdom ($588,400); Belgium ($420,000); Denmark ($250,000); Netherlands ($350,000); Canada ($1,850,000); United Nations Development Program ($1,700,000); Rockefeller Foundation ($3,000,000); Inter-American Development Bank ($100,000); United States via USAID ($3,525,000); Asian Development Bank (No specific commitment); Kellogg Foundation ($230,000); International Development Research Centre of Canada ($73,000); Germany ($1,300,000); Switzerland (No specific commitment); Sweden (No specific Commitment); Norway (No specific commitment); Japan ($48,000); World Bank ($3,000,000 commitment to supplement shortfalls not met by other donors). See, Sterling Wortman to John A. Pino, memorandum, undated, folder 5, box CG I, Record Group CGIAR Rockefeller Foundation Archives.

[88] David E. Bell to unspecified, memorandum, May 24, 1971, folder 1, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives.

[89] Richard Demuth to Delegates, memorandum, February 5, 1971, Discussions Re Establishment of Consortium, box CG I, Record Group CGIAR, Rockefeller Foundation Archives: 2.

proposed for the new entity but "there was a clear majority in favor of establishing a consultative group."[90]

The first stated objective of CGIAR was: "[T]o examine the needs of developing countries for special efforts in agricultural research at the international and regional levels in critical subject sectors unlikely otherwise to be adequately covered by existing research facilities."[91] Other stated objectives included coordination with other research programs and: "[T]o encourage full exchange of information among national, regional and international agricultural research centers."[92] Participants authorized the United Nations' Food and Agriculture Organization to designate no more than five developing nations for not more than two-year membership, each to represent a major region of the developing world.

The participants quickly decided that they were not able or qualified to oversee the operations of agricultural research centers around the globe and so they created a Technical Advisory Committee (TAC) of twelve persons consisting of "distinguished international experts" nominated by the sponsors. TAC became the heartbeat of CGIAR. Located at the Rome headquarters of the Food and Agriculture Organization, TAC reflected the Rockefeller spirit - a committee of scientific experts, not administrators or politicians. CGIAR charged TAC with advising on gaps and priorities in agricultural research on behalf of developing countries, establishing and evaluating feasibility studies, fostering an international network of research institutions and exchanging of information

[90] Ibid.
[91] David E. Bell memorandum, May 24, 1971.
[92] Unsigned memorandum, "Summary of Proceedings of First Meeting of CGIAR," June 9, 1971, folder 4, box CG I, Record Group CGIAR, Rockefeller Foundation Archives: 3.

among them.[93] Ironically, despite the strong admonition that TAC would be scientific in its membership and outlook, the organizers selected as the TAC chair Sir John Crawford, an economist and Chancellor at Australian National University. One other economist served on the TAC, Dr. David Hopper, President of the International Development Research Center in Canada. The remaining members were scientists in various fields of agriculture. The only member of TAC from the United States was John Harrar, President of the Rockefeller Foundation and himself a plant pathologist.[94]

As CGIAR took shape, the Rockefeller Foundation acted as a coordinator in fundraising, even so far as 'suggesting' to potential members what their contributions should be. On December 13, 1971 Arie Kruithof, Secretary to CGIAR, met with Lowell Hardin, John Pino and Sterling Wortmann at the Rockefeller Foundation to review pledges for financial support in anticipation of meetings with four new donors for the 1972 fiscal year: Germany, Belgium, Denmark, and the World Bank. According to the meeting notes: "[I]t was agreed that [Mr. Kruithof] might suggest utilization of [financial commitments] as follows … " Two days later, Kruithof advised that Richard Demuth preferred to allow the new donors to express their own preferences before receiving suggestions. He also asked that the Rockefeller Foundation not publish its proposals for giving.[95]

With CGIAR established, there existed a coordinated effort of crop research aimed at helping developing countries improve agricultural yields through application of more modern techniques. The documents surrounding the formation of CGIAR suggest

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[93] A.H. Boerma to John G. Harrar, 29 April 1971, folder 1, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives.
[94] David E. Bell memorandum, May 24, 1971.
[95] Arie Kruithof, Lowell S. Hardin, John Pino and SterlingWortmann, meeting notes, December 13, 1971, folder 5, box CG I, Record Group CGIAR, Rockefeller Foundation Archives.

that it came into existence to help foster a more commercial approach to farming in the long run and to resolve immediate financial problems in funding crop research in the short run. Fashionable predictions of a doomed planet if issues of overpopulation were not immediately addressed made all of these concerns more urgent. Using crop improvement as a crutch in the interim only accelerated interest in commercial farming methods to the exclusion of other concerns. For these reasons, the economic drivers behind American agriculture remained firmly in place within CGIAR.

CGIAR's Growing Identity Crisis

At its inception, CGIAR was little more than an informal group of donors interested in financing expansion of the Rockefeller model for agricultural research (*i.e.*, aggressive change with minimal obstruction). While the loose structure allowed science to dominate over politics, it soon presented structural and legal problems that directly affected CGIAR's most valuable asset: its seeds. Two dynamics emerged. First, diverse agendas plagued CGIAR from the start. The United Nations organization brought cultural and environmental issues to the table while the governments of the industrial world pushed economic pragmatism. These conflicts exposed the lack of strong central leadership within CGIAR. Second, CGIAR wrestled for years with the question of how it could maintain its key asset, raw germplasm, within a system of free contribution and free sharing while operating within a larger paradigm that threatened to punish it for its lack of legal identity and protocols. The story of how CGIAR addressed these issues is a case study of the relentless advancement of economic interests and the ultimate failure to resist them for lack of historical precedent.

CGIAR's centerpiece was its existing and planned agricultural research centers. The research center scientists, like the team in Mexico in the 1940s, focused their efforts on increased crop yields through introduction of improved plant varieties. Critical to their efforts was collection and use of diverse seed samples from developing nations which, as cooperative partners with CGIAR, freely donated their germplasm in exchange for training, education and return of improved seeds for planting. Over time, this process resulted in CGIAR having custodianship of an extensive and enviable collection of germplasm. As the value of its seed collections become more apparent, the weaknesses of the CGIAR structure became more troublesome. The CGIAR board allocated funds and set policy based on the advice of various committees, but its members walked a fine line between control and cooperation in terms of the research centers, which had their own boards and remained largely independent in terms of day-to-day work and direction of research.

As the program grew in size and value, CGIAR's board disagreed over objectives and strategy. A number of disparate interests sat on and around the CGIAR table and when it became clear that CGIAR held a valuable commercial asset, those interests began to split along familiar lines. Some saw CGIAR's seed banks as an economic asset to be exploited for profit while others saw them as a trust asset to be preserved and shared in the same spirit in which they were donated.[96] Numerous questions soon came to the fore, most critically: Did CGIAR have a legal identity and who, exactly, owned its vast collection of seeds? These questions became increasingly urgent as the ability to claim

[96] According to Harry H. Stine, CEO of Stine Seed Company, public seed banks are no longer a critical resource for the private seed industry but serve and extremely important role of preserving traits, which, while not needed on a routine basis, could become critical for overcoming a new disease or pest that exhibits immunity to all current defenses. Author interview, Harry H. Stine, 12 July 2011.

intellectual property rights in plants expanded around the globe through both UPOV and the PVPA, which were both in their infancy as CGIAR came into existence.

TAC's Vision: Expansive and Expensive

Members of TAC quickly set about examining CGIAR in light of their charge to identify gaps and priorities in agricultural research on behalf of developing countries. The committee immediately recognized the critical role of germplasm in CGIAR's mission and wasted no time in submitting a proposal to establish a network of genetic resource centers. The centers' purpose, according to TAC, would be for: "[E]xploration and collection of plant genetic resources, their long-term conservation, their evaluation and distribution of information on their characteristics and availability, and the promotion of their utilisation on current breeding programmes throughout the world."[97] Describing developing world nations as "centres of genetic diversity," TAC advocated not only for collection and conservation, but also for "vigorous plant introduction programmes" in those locations. TAC envisioned eleven genetic resource centers in Italy, Turkey, Afghanistan, India, the Philippines, Ethiopia, Nigeria, Mexico, Costa Rica, Peru and Nanking. The centers were to be associated with national scientific institutions and located only in countries free of any restriction on exchange of plant material, with open quarantine policies and with no restrictions on exploration.[98] The authors stressed conservation of the traditional methods of research and specifically included non-CGIAR entities as participants: "To be effective, genetic resources conservation must have a

[97] "TAC Report on Proposal to Establish a Network of Genetic Resource Centres," committee report, September 28, 1971, folder 2, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives: 1. Much of the CGIAR material was generated in cultures that used European spellings for certain words such as 'utilisation' instead of 'utilization' or 'centre' instead of 'center.' When quoting these materials, I will adhere to the European spellings in the original.
[98] Ibid., 2.

world-wide impact, demanding a completely unrestricted exchange of plant materials and data relating to them, between developing and developed countries."[99]

With its aggressive proposal, TAC cast the CGIAR mission in a broader perspective and highlighted the problematic nature of agricultural improvement along the industrial model. It also made the critical connection between the economic benefit of commercial agriculture in the developing world and the economic necessity of responsible stewardship of genetic diversity. TAC served a warning to CGIAR that the new organization had the potential to be its own worst enemy, particularly if CGIAR adopted a shortsighted view of the nature and purpose of plant germplasm. Replacement by local farmers of primitive cultivars with advanced varieties exacerbated the challenge of maintaining a diverse population of indigenous plants growing and multiplying in nature, also known as landraces. Referring to the very regions CGIAR was attempting to help with agricultural aid, TAC warned that "[T]he richness in primitive types is fast disappearing, as new and superior man-made cultivars replace the old varieties. However, it is to these old varieties that the breeders in all countries have to turn to obtain the factors of resistance, quality and other characteristics for the further improvement of the current cultivars."[100]

TAC members were keenly aware of the culpability of the Rockefeller Foundation program, which CGIAR was designed to replicate and perpetuate on a larger scale. TAC pulled no punches in its assessment. Use of uniform varieties "wiped out" genetic diversity, which opened the door to epidemic, disease and pests. For example, Turkish wheat crops were 95% improved varieties, 85% of which was improved Mexican

[99] Ibid., 1.
[100] "TAC Report on the Collection, Evaluation and Conservation of Plant Genetic Resources," committee report, April 4, 1972, folder 9, box CG I, Record Group CGIAR, Rockefeller Foundation Archives: 1.

wheat, the very wheat for which the Rockefeller Foundation and Norman Borlaug had received worldwide praise. Grain legumes in Indo-Pakistan, the near east and North Africa had declined by 2.2 million *ha* over the seven-year period 1963 to 1970 due to the introduction of Mexican varieties. This funneling of genetic diversity had worked to the detriment of grain selection and breeding programs. TAC concluded: "We thus need desperately to maintain as much genetic variability as possible for our breeding programmes – but at the same time the greatest genetic variability occurs in the developing countries where it is necessary to replace the old cultivars with others of higher quality or yield. This is a challenging paradox to which a solution is urgently required."[101] In short, feeding the world in the short term could destroy it in the long term.

TAC readily conceded that expense and multiple international borders threatened to hamper the effort: "No country can today support an advanced and competitive agriculture based on indigenous plants alone."[102] Even if one found a plant-rich country with much valuable diversity, it was invariably a developing country that did not have the money or the expertise to select and artificially maintain the resource. The solution, according to TAC, was regional or world seed collections that would preserve and provide the improved materials to the developing countries that they could not afford to create or maintain themselves. Although the TAC members had readily conceded that myriad questions remained unanswered as to targeted species for collection, place of

[101] Ibid., 2.
[102] Ibid., 3. That there was money to be made was not in question. The report made reference to an improved peanut variety that had increased producer incomes by $9 million annually. In addition, a new variety of wilt resistant tobacco had increased revenues by over $100 million over a twenty-five year period. Ibid.

storage, manner of evaluation and ultimate use, the committee did not relent in pushing the issue before the CGIAR board.[103]

The CGIAR board blanched at the proposal on both economic and policy grounds. An internal Ford Foundation memo expressed concern about expanded collection and storage of plant genetic resources, which was moving quickly toward an annual expenditure of $1.6 million. The memo's author clearly did not believe that CGIAR's funding members had anticipated such expansion, especially when existing facilities seemed to be adequate.[104] The Ford Foundation memo illustrated what would become a growing division of opinion between the propriety of broad environmental projects and those focused on producing more food. In the minds of many, protecting endangered landraces was not CGIAR's primary focus unless those landraces were being used to increase crop yields for farmers. The memo also reflected a hint of politics creeping into the results-driven model on which CGIAR was based: "This is a difficult one. The RF believes this to be much more money than is required given the role that existing and prospective international centers can perform – along with the banks in the industrialized nations. USAID has reservations too. This is bound up in: (a) the ecology movement (b) giving FAO a role (Trust Fund and offices) (c) strong push for Sir John Crawford's Australian colleague, Sir Otto Frankel … Perhaps an out would be to request a low priority for it[.]"[105]

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[103] John A. Pino, "Notes on third meeting of TAC," April 10-13, 1972, folder 3, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives: 4.

[104] Lowell Hardin to Hill and Collins, memorandum, October 31, 1972, folder 9, box CG I, Record Group CGIAR, Rockefeller Foundation Archives. John Pino's undated handwritten notes indicate that the cost estimate for the centers was $5 million for five years. See, John A. Pino, "Notes on third meeting of TAC," 4.

[105] Ibid. Harrar at Rockefeller had become concerned as well. Harrar cautioned against TAC being bogged down in egos and procedural minutiae: "It is certainly important that the Steering Committee be composed of individuals who fully understand the purpose of the program and share the belief that it must be operated

The sentiment of the Ford Foundation and others is reflected in the notes of John A. Pino from the Rockefeller Foundation regarding CGIAR's November 1972 meeting to discuss the issue: "In discussions which JAP had prior to and during the meeting, it was obvious that practically none of the major donors were sympathetic to this proposal." Pino offered a laundry list of concerns from the Rockefeller Foundation including the order of priority for preservation and the inappropriate emphasis on preservation of non-food crops. Pino bristled, however, at any suggestion of wholesale dismissal of seed collection, stressing that the research centers definitely required working collections of germplasm. In his mind, however, that need was limited to rice, wheat, maize and, eventually, sorghum and millet. The question in his mind was what to do about other less critical crops that were threatened by modern farming. One representative suggested that the entire seed program was a task best left to the FAO and funded "through its regular channels." The FAO representative professed willingness and authority under its charge to support the proposal but for a lack of funding, an excuse Pino found to be "rather weak." The CGIAR board, in a prophetic move, ultimately concluded that more information was needed.[106]

TAC's aggressiveness toward preservation of bio-diversity and CGIAR's hesitation reflected a disagreement over priority more than vision. The CGIAR Board

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in such a way as to avoid political or bureaucratic intervention and obstacles as well as competition for funds and credit for accomplishment." John Harrar to John Pino, memorandum, October 20, 1972, folder 22, box 4, Record Group IV 2A26, Special Collections, Rockefeller Foundation Archives.

[106] John Pino, "Diary of the CGIAR meeting November 1-2, 1972," notes, folder 9, box CG I, Record Group CGIAR, Rockefeller Foundation Archives: 3-4. By 1973, the Rockefeller Foundation staff was putting the blame on TAC's lack of guidance on practical research rather than CGIAR's foot dragging. In handwritten comments in the margin of notes on the IARC directors meeting of February 11-16, 1973, Pino listed three options for TAC: "1. Re-define and clarify role. 2. Re-constitute. 3. Abolish and replace by ad hoc advisory committee constituted as needed." John Pino, "IARC Directors Meeting February 11-16, 1973," handwritten notes in margin, folder 5, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives.

was not entirely convinced by TAC's warnings, nor was it ready to subordinate practices that addressed more urgent needs. Although the CGIAR board readily welcomed study and discussion of environmental issues and the long term need to address them, it did not stray from the philosophy of the Mexican project. People primarily concerned about population size and starvation founded CGIAR and, along with industrial nations wedded to commercial agriculture, controlled its policy decisions and purse strings. By the same token, although the TAC members wanted to see more effort toward collection and preservation, it was in no way opposed to the manner in which collected germplasm should be used. The members of TAC made this plain in their 1973 report to the CGIAR Board. Improved crop production would not come from simply giving farmers better seeds. Increasing yields involved "intensification" of agriculture. The end game was not just full stomachs but economic stability as well: "[A]lthough increasing yields and production of basic staple foods must remain a priority goal, the ultimate objective of agricultural research development is the economic well-being of the people. We must not be so bewitched with the hopes of further spectacular successes of single crops that we fail to recognize that other pathways to growth may exist. In some regions, for ecological, social, or economic reasons, research of a broader nature – even if it appears more complex, may offer the better hope of a solution. Where such an approach seems desirable the TAC and the Consultative Group must grasp the nettle boldly." Technology could be "manipulated" to achieve socio-economic goals as well as higher yields.[107]

John Pino from the Rockefeller Foundation echoed this philosophy in a speech later that year. Pino was well aware of the challenges of bringing modern agriculture to

[107] "TAC priorities for International Support to Agricultural Research in Developing Countries," committee report presented at Sixth CGIAR meeting, July 25 – August 3, 1973, folder 9, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 8.

the developing world. Although he was mindful of the cultural aspects, he was also absolute in the ultimate rightness of both the cause and the method. Although scientists had replaced terms such as 'equation,' 'balance,' and 'ZPG' with the softer 'quality of life,' there was nevertheless a different end game between the developed world and the developing world when it came to such terms: "In the present context, 'quality of life' for two-thirds of the world's people must be construed as meaning, first, assurance of the material conditions of survival." To achieve that goal would "[R]equire intensive application of the very knowledge and techniques the we in the West have sometimes abused, to our disgrace."[108] According to Pino, the cultural problem for agricultural reformists in the third world was not quality of life so much as the intractability of tradition and the very human frailty of pride and ambition. The third world was rigidly stratified between laborers and the intelligentsia. It also suffered from the common element of political power over practical solutions. As a result, according to Pino, researchers faced the challenge of governments that turned over far more quickly than the slow and deliberate machinations of crop breeding. A new political administration from a rival party did not always back agricultural programs that recently displaced rivals conceived and supported. Thus, a careful breeding program could hit a political brick wall in mid-development. Direct experience with this problem accounted for the Rockefeller philosophy of, first, establishing and funding autonomous research agencies that worked with politicians but did not rely on them financially for survival and, second, exciting the local agricultural community with 'spectacular' results in the field.[109] It is

[108] John A. Pino, "Food, Social Development, and the Scientist's Responsibility," speech transcript, October 6, 1973, Pino Speeches and Articles 1968-1974, box I, Record Group IV 2A48, Special Collections, Rockefeller Foundation Archives: 6-7.
[109] Ibid., 21.

here that the attitudes of Pino and the Foundation were revealed in all of their Machiavellian splendor: "Show the farmer that he can make a substantial profit by using the new technology, and he will abandon the venerated ways of his fathers without a backward glance … In case someone is planning to ask me, isn't that manipulation? The answer is yes."[110]

In a second speech the following year, Pino also warned that no amount of agricultural progress could counter unchecked population growth. He was fatalistic on the need for change: "Although it may mean a massive effort to upgrade services and infrastructure, most of the developing countries are going to be obliged to adopt this so-called green-revolution strategy."[111] He was also bullish on the opportunity for private investment and trade, particularly in the areas of food preservation, storage, processing, drying, marketing, transportation, and farm implements, all made possible by the system CGIAR established: "The international institutional network is a ready-made bridge between the needs of low-income countries for capital and technical assistance and the needs of the American investor seeking sound opportunities in agriculture-related fields." Experts would also be needed as middle men with local governments who could "[G]rasp

[110] Ibid., 20-22.

[111] John A. Pino, "International Agricultural Development and its Implications for American Business," speech transcript, May 20, 1974, Pino Speeches and Articles 1974-1979, box 1, Record Group IV 2A48, Special Collections, Pino Papers, Rockefeller Foundation Archives: 9. Pino would continue to pound the podium for the Rockefeller vision established by Borlaug and others. The cardinal objective of the green revolution was, in Pino's mind, increasing food supplies in the face of population growth by helping nations to help themselves. A Marshall Plan-type approach would not work in the developing world because, unlike post-war Europe, it did not have the technical or professional capacity that lacked only for funding. Whereas Europe was recovering, the developing world was creating for the first time. The government response was 'give-away' programs while the markets were reserved for developed countries that had the money and the ability to bid up export prices.

the codes and signals of a different culture so as to interpret the people's meanings and motives, and gauge the extent of their commitment."[112]

Pino reiterated this theme in a statement to CGIAR, reminding it of the need to stay focused on results and free of roadblocks. His statement was a manifesto for modern agriculture on the grounds that there was simply no price too high to pay for feeding hungry people. According to Pino, in 1943 when the Mexico program was established, the Rockefeller Board "[C]ould not have foreseen the establishment of a world system such as we have here today, which has such an amazing degree of informality, agility, and capability to effectively come to grips with the common world condition, and that is the nutrition and feeding of the world's people…We believe the system and we believe in it and we feel confident in its effectiveness…as long as we avoid overbearing bureaucracy and superstructures at all levels … Theories and studies may be fine but people's stomachs will have to feel the satisfaction of food, perhaps at any cost."[113]

Despite agreeing in general with CGIAR and Rockefeller about the benefits of commercial agriculture, the TAC members did not relent on the subject of preservation. In 1973, TAC reiterated to CGIAR the urgent need for action to collect, evaluate, preserve and exchange the world's diminishing reserves of crop genetic materials. This time, the United Nations Environmental Program members stepped up to echo TAC's call. The UNEP presented a report to CGIAR stressing that success in genetic plant research required the use of varied plant materials that crossed national boundaries. The fact that no single country could control all species necessary for productive breeding necessitated international cooperation. The report included a proposal that would foster

[112] Ibid., 12-15.
[113] John A. Pino, statement to CGIAR meeting, October 30, 1974, folder 11, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 125-129.

debate for years to come. The report proposed "an international agreement, treaty or charter to be subscribed to by all countries … built upon the principle that the world's basic genetic resources are the heritage of all mankind; that these invaluable natural resources should be available through legitimate channels for the betterment of all peoples."[114] The underlying objective of the treaty would include "universal availability to bonafide scientists and specialists of the world's primitive and developed genetic resources."[115] Once again, the project's scope was broader than the basic food crops CGIAR supported. The report estimated the cost of collection, study and preservation of plant material at two million dollars with half being dedicated to crops and the remainder split among four other areas: forest and range ($400,000); animals ($300,000); micro-organisms ($200,000) and ecological ($100,000).[116]

The CGIAR board responded by establishing a Subcommittee on Genetic Resources to review the proposal in greater detail.[117] The new subcommittee held its first meeting in October 1973 in Rome. It concluded that CGIAR, in collaboration with the FAO, should create an International Board for Plant Genetic Resources (IBPGR). The board's charge would be to explore, collect, evaluate and conserve species of "major economic importance" and make them available for breeding, with the work to be carried out by a "world wide network of institutions, organizations and programmes."[118]

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[114] "Proposed UNEP Program on Global Genetic Resources," unsigned report presented to the CGIAR Socio-Economic Seminar, July 27-28, 1973, folder 8, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 4.
[115] Ibid., 3.
[116] Ibid., 29.
[117] "Informal Summary of Proceedings of International Centers Week," July 30 - August 3, 1973, folder 8, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 9.
[118] "Draft Report of CGIAR Sub-Committee on Genetic Resources," October 1-2, 1973, folder 6, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives: 1.

The Genetic Resources subcommittee envisioned a fourteen member board with CGIAR electing thirteen of those members, including four seats held by nationals of developing countries and six seats held by scientists. An ex-officio member the FAO appointed would hold the final seat.[119] CGIAR agreed to this proposal and established the board around those parameters.[120]

Although IBPGR membership reflected scientific research and developing nations, the funding came from the industrial world. The sub-committee expected its initial funding of $300,000 to $500,000, far less than the two million the UNDP suggested, to come from Germany, the Netherlands, Sweden and the Rockefeller Foundation with possible future support from the United States and Canada.[121]

The plan to form IBPGR was well on its way by late 1973 and TAC saw within it the tools to promote a broader view of the CGIAR mission to not only feed the world but also guide it in preserving its biodiversity. TAC paired the sense of possibility with a sense of urgency as TAC Chair, Dr. M. S. Swaminathan, warned CGIAR of the urgent need for exploration, collection and long-term storage of primitive cultivars that were fast disappearing in many parts of the world. It was critical that those views be represented in whatever governing body was established to address them.[122] According to notes of John Pino, the FAO "[E]xpressed great satisfaction with the progress which has been made,

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[119] Ibid., 2.
[120] "Summary of Proceedings, CGIAR Meeting," November 1-2, 1973, folder 9, box CG II, Record Group CGIAR, Rockefeller Foundation Archives.
[121] "Draft Report of CGIAR Sub-Committee on Genetic Resources," October 1-2, 1973, folder 6, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives: 2.
[122] "Draft Report of the Sixth Meeting of TAC," September 1973, folder 6, box TAC I, Record Group CGIAR, Rockefeller Foundation Archives, 17-22. Swaminathan was an Indian born geneticist who held multiple positions in the Indian government and chaired CGIAR's International Rice Research Institute in 1988-1989 as well as CGIAR's Technical Advisory Committee. Detailed Profile, Prof. M.S. Swaminathan, Official Website of the Indian Government, http://india.gov.in/govt/rajyasabhampbiodata.php?mpcode=2042 (accessed August 25, 2011)

and assured [CGIAR] of the great interest of the FAO in support of this program."[123] Support and funding, however, were two different things: "[A] number of nations express still some reservation in committing support for this activity until the Board is formed and it is known more precisely how it will function. It was clearly apparent that none of the potential supporters wanted this is activity to become dominated by the FAO, and that they fully expected a rather clear definition of priorities to be established by the Board."[124]

IBPGR Joins the Debate

The IBPGR assumed a low profile at the outset, focusing on nuts and bolts issues such as information storage and retrieval. Collecting seeds was not going to be useful if they were not property catalogued. The IBPGR Chair, Richard Demuth, warned the CGIAR board not to expect headlines from the newly formed group: "[W]e won't have any dramatic breakthroughs to report and we are not likely to have any graphic record of results of our work to portray to you on slides. We are a backstopping operation, in a sense a piece of infrastructure, designed to develop an action program."[125] Four CGIAR members (Germany, the Netherlands, Sweden and the United Kingdom) established a central fund of $225,000 for the IBPGR. The Rockefeller Foundation committed to another $100,000.[126] Neither the money nor IBPGRs timidity lasted for long. After one year of existence, the IBPGR submitted a proposed budget of $729,000 for 1975. It divided the bulk of funds between development of a computer-based records system and

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[123] John Pino, "Summary of CGIAR meeting of November 1-2, 1973," folder 9, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 2.
[124] Ibid., 3.
[125] "Statement of Richard H. Demuth," 1974 International Centers Week Meeting, folder 10, box CG II, Record Group CGIAR, Rockefeller Foundation Archives: 2.
[126] Ibid., 5.

support for germplasm activities at the CGIAR research centers, particularly those that represented special projects for which the centers had no line item in their own budgets.[127]

The IBPGR found its advocacy voice as well. Commenting on the one-year anniversary of the IBPGR, its Chair reiterated TAC's comments regarding the inherent conflict faced by those who sought to feed the world through commercial farming techniques. The very practices the green revolution embraced and CGIAR expanded had the potential to work against long-term preservation goals: "[C]ollecting expeditions must be mounted to save invaluable genetic diversity which is in danger of loss, and loss forever, either as a result of new agricultural practices or changes in land use or in climactic conditions."[128] The simple fact was that expanded planting with uniform crop varieties worked against natural diversity. The IBPGR Chair also emphasized that merely collecting germplasm would not be adequate. Researchers had to use those collections for some productive purpose or they would be "dead gene banks." Key to productive use of the seed collections was free exchange, an issue on which the IBPGR was in lockstep with the United Nations. "It is a basic principal established by the board that any program or institution that we may support should agree that there be a free exchange of information about the germplasm that is collected and a free exchange of materials."[129] Once again, the specter of imminent doom hung over the deliberations, pushing the CGIAR board to act quickly in areas of the most potential benefit. "Funds, trained

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[127] "IBPGR Programme and Budget Proposals for 1975," September 1974, folder 6, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives: 4-5.
[128] "Statement of Richard H. Demuth," International Centers Week, July 28 – August 1, 1975, folder 9, box CG III, Record Group CGIAR, Rockefeller Foundation Archives, Rockefeller Archive Center, Sleepy Hollow, New York: Annex IV, 2.
[129] Ibid., 4.

personnel, indeed time, are all so limited that we feel we must concentrate on priority crops and on priority regions." In other words, the IBPGR pushed the CGIAR board to to act in a way that created the greatest good for the greatest number of people, or what IBPGR Chair Demuth called a "thoroughly pragmatic" approach.[130] In the view of the IBPGR members in 1975, the crops deserving of priority status for collection and preservation were wheat, maize, rice, sorghum, millet and barley. The areas of the globe identified for collecting activities were South and Southeast Asia, the Mediterranean, Ethiopia and central and south America.

Demuth continued to view IBPGR as a support organization with a limited life span: "[O]nce the major gaps in collections of all the major crops have been filled, the program should operate itself … so I hope that in 10 years or so [i.e. by 1985] the International Board would be advising the Consultative Group that its functions have been completed and the system is operating by itself."[131] In a short period of time, the

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[130] Ibid.

[131] Ibid., 6. Four years later, however, IBPGR had extended its goal, hoping optimistically to see self-operating networks for all major crops by 1993. See, "Informal Summary of Proceedings of International Centers Week," February 28, 1979, folder 4, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives: 5. Seed collection is not so simple as possession of seed samples for each plant. Basic ingredients are a germplasm bank, an evaluation and breeding program, and an international testing program. Seeds cannot simply be stored. They must be regenerated to produce fresh seeds and their genetic qualities must be studied and documented. This is a very time consuming task. For example, the International Center for Tropical Agriculture (CIAT) in 1977 noted that it had twelve thousand samples of Phaseolus germplasm (a type of wild bean) but had multiplied only seven thousand of those samples. While storage and evaluation was a "massive undertaking" the CIAT nevertheless expressed desire for more genetic variation so that breeders could incorporate specific characteristics into material for distribution. See, "CGIAR Technical Advisory Committee, Seventeenth Meeting," September 9-10, 1977, Report of the TAC Quinquennial Review Mission to the International Center for Tropical Agriculture (CIAT), folder 16, box TAC II, Record Group CGIAR, Rockefeller Foundation Archives: 42-44. Similarly, over a period of thirty years, from 1946 to 1976, the CIMMYT maize institute had acquired 12,000 distinct accessions within 18,000 samples. Each year a part of the collection was grown for purposes of regeneration. Only 8,000 accessions had been documented and only 3,000 tested in replicated yield trials. On request, the CIMMYT provided free samples to all research organizations. In 1975, there were 75 requests for 5,250 accessions. See, "Report of the TAC Quinquennial Review Mission to the International Maize and Wheat Improvement Center, 1976," folder 13, box TAC II, Record Group CGIAR, Rockefeller Foundation Archives: 60. In existence since 1962, the International Rice Research Institute (IRRI) had collected more than 35,000 accessions of rice by 1975. In 1974-75, IRRI sent 5,600 packages to 229 scientists. Even adequate storage fell prey to funding

IBPGR had supported TAC's call for a broader agenda at CGIAR but had also pushed CGIAR to be just as fast and pragmatic in preserving bio-diveristy as it was in trying to increase the world's food supply. In both cases, failure to act quickly spelled disaster for the planet.

Which Disaster Comes First? The Struggle to Prioritize

Despite the growing chorus of support for long-term preservation of bio-diversity in crops, the key players in CGIAR continued to focus on food production and population control. Failure to address these issues obviated the need to address issues of bio-diversity. The Rockefeller and Ford Foundations worked closely with a growing sense that the window of opportunity was closing fast, even to the point of abandoning philanthropic efforts to feed the world. In a chilling memo, the Ford Foundation described a situation with world hunger and population growth that demanded resolution within a decade or two if it was going to be resolved at all. Failing a fast and aggressive solution, nothing remained but to withdraw and watch the devastation at a distance. Sterling Wortman at Rockefeller forwarded the confidential Ford Foundation memo to John Pino with the handwritten note: "For your own use. Not for further distribution since this is an internal FF document given us in confidence."[132] The document was actually two separate internal memos discussing the level of Ford Foundation support for

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issues. The storage in the IRRI shared a building with electronic and flammable materials that put its irreplaceable collection at risk. See, Ibid., 8-13. Politics played a role as well. Richard Demuth noted in 1978 that a major gap in rice collection was the large stock of samples within the People's Republic of China. Refusal of unfriendly countries such as Turkey, Iraq, Iran, Afghanistan, Pakistan and Syria placed critical and endangered germplasm at risk. See, "Statement of Richard H. Demuth at International Centers Week, November 6, 1978," folder 4, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives. In a meeting with representatives of the Ford Foundation, Hu Hung-fan of the Chinese People's Association for Friendship with Foreign Countries, commented that Americans are by temperament overanxious and want things to move quickly. See, David Finkelstein to John Bresnan, memorandum, October 2, 1975, folder 10, box CG III, Record Group CGIAR, Rockefeller Foundation Archives.

[132] F.F. Hill to Lowell Hardin, memorandum, May 15 1974, folder 6, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives: 1-11.

CGIAR research centers in 1975. One of the documents, a May 15 memorandum from F.F. Hill of Ford to Lowell Hardin of Rockefeller put forth a dour view of the future and the need to push developing countries aggressively: "[T]raditional, low-yield agriculture simply cannot produce the food that is going to be needed. Developing countries must shift to modern, science-based, high-yield agriculture if their people are to be fed … there is no alternative to shifting." Later on: "The main thrust of the international centers program is, of course, to follow the example of advanced countries and help develop varieties of food crops suitable for use in [less developed countries] that are capable of transforming large amounts of fertilizer into food."[133] Changing agricultural techniques in developing nations was a process that required time, as the Rockefeller personnel had learned in Mexico: "Radically changing the character of the plant that is grown (e.g., hybrid corn, dwarf rice) and the package of practices that must go with it if it is to perform as anticipated, and moving the complete new package into the farmers' fields, is something quite different. It is not easy. It takes time, particularly in [less developed countries] where the attitudes and operations of governments and other institutions as well as farmers, must be changed."[134] Set against the sobering predictions of population growth, the race was on: "Like many others, I had been working on the assumption (hope) that with all-out effort on the world food front and favourable weather there might be another 20-30 years in which [less developed countries] would have an opportunity to start reducing birth rates by significant amounts. I am now beginning to wonder (doubt) whether some of the heavily populated, land-scarce [less developed countries] (India,

[133] Ibid., 2-3. Emphasis in original.
[134] Ibid., 4-5.

Bangladesh) have that much time."[135] If the time was not available, there was little point in throwing funding after a lost cause: "If and when this point is reached [10-15 years in the future] there will be little justification in continuing to support international centers whether the population/food race is being won or lost."[136]

The attitude expressed between the Ford and Rockefeller Foundations justified the aggressive nature of agricultural reform at the expense of cultural and environmental preservation. The Rockefeller model premised agricultural assistance on raising the standard of living by generating more income and greater use of birth control. As with intellectual property laws and agricultural policy in the United States from its inception, economic pragmatism dominated in global agricultural philanthropy, albeit for different reasons. In the United States, the goal was to build a robust and economically healthy nation. In the developing world, the goal was to stave off the twin disasters of communism and starvation with the latter caused by a combination of too many people and too little food production. It is no surprise, therefore, that when the actors in this effort came to fully appreciate the true economic value of their seed collections, they struggled mightily with how to administer them. [137]

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[135] Ibid., 3.
[136] Ibid., 10.
[137] While population control was a significant public issue in the 1970s, advocates did not fall into lockstep with the Rockefeller solution. For example, Paul R. Erhlich, Stanford Professor and author of *The Population Bomb* (1968) as well as a co-founder of Zero Population Growth, was a seemingly natural Rockefeller ally on issues of population control. He was, however, also a critic of the green revolution, a fact that stuck in the craw of George Harrar. Quoting Ehrlich's statement, "The standard approach to agricultural research – including that supported by well-known large foundations – is hopelessly flawed," Harrar suggested that the criticism was based on Ehrlich's inability to obtain Rockefeller funding for one of his projects and Erhlich's rationalization of the rejection as a defect on the part of the foundation rather than flaws in his own proposal. In letter to John D. Rockefeller III responding to what must have been an odd combination of harangue and solicitation from Ehrlich, Harrar stated: "I have long felt that he [Ehrlich] has been dogmatic and at times erratic, dramatizing himself and his theories, and indeed has become a propagandist… Evidently, Ehrlich has now become, in his mind, an authority on food production and his letter amply attests to the fact that he is not." John J. Harrar to John D. Rockefeller III, 13 September 1974,

While CGIAR moved forward on the green revolution model with the attitude that it represented the fastest solution to the most pressing issues, a second factor began to work against the long-term seed conservation lobby. After a few years of operation, CGIAR's donors began to demand a better understanding of what their donations were accomplishing. The Ford Foundation staff observed a clear preference among donor nations for identifiable and marketable results that could be used to justify future donations and to generate goodwill. The Ford Foundation saw this attitude as dangerously short sighted. Mounting pressure from donors on the CGIAR research centers to increase their community outreach, perhaps at the expense of research, placed the centers "under considerable pressure to comply."[138] In other words, those who supplied the money wanted to see tangible results to which they could attach their names. Crop yields made for headlines and public interest. Years of quiet research did not. While this mentality threw yet another roadblock in front of collection and preservation activities, it also posed a distraction to basic research. A movement emerged in 1975 to permit donor attendance at board meetings of the research centers, with the clear understanding that certain portions of the meeting would be closed.[139]

In the meantime, TAC continued to push its own agenda, looking more like an autonomous body than an advisory one. In a summary of the October 1975 meeting of

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folder 25, box 4, Record Group IV 2A26, Special Collections, Rockefeller Foundation Archives, Rockefeller Archive Center.

[138] Lowell Hardin to Foundation Committee on International Agricultural Research and Training, memorandum, June 20, 1974, folder 6, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives: 5.

[139] John Pino supported the idea of donor participation. See, John Pino, undated handwritten notes in briefing notebook for centers week, July 28 - August 1, 1975, folder 1, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives. His support, however, did not extend to compromising the research centers' work in the interest of donor satisfaction. At a later meeting of CGIAR, Pino's notes state: "The Canadians representative emphasized the need to retain the quality of informality, integrity of the centers, freedom and flexibility of the members. (A good statement.)" See, John Pino, notes on October 30-31, 1975 meeting of CGIAR, folder 13, box CG III, Record Group CGIAR, Rockefeller Foundation Archives: 1.

CGIAR, TAC Chair Sir John Crawford reported that TAC would henceforth monitor the activities of the International Center for Insect Physiology & Ecology (ICIPE). In his notes, John Pino simply wrote: "Ugh!"[140] Agendas would continue to diverge as the decade of the 1970s waned. In 1977, the FAO forestry department proposed expenditure of $5 million over five years for preservation of forest genetic resources. CGIAR was to provide funding of $870,000. Included in the FAOs justification for forestry research was the desire for controlled production of wood used as cooking fuel, forest cover for watershed and valley crop protection, and even the production of hoe handles to cultivate food, tables on which to eat food and cupboards in which to store it. The FAO summary concluded with a bible verse: "Man shall not live by bread alone."[141] Pino's handwritten notes on the cover memo reflected his concern: "Is this Forestry effort to gain inclusion in the IBPGR an effort to get a 'foot in the door?' The project proposal included as annex

[140] Executive Secretariat to Members of Consultative Group, memorandum, November 26, 1975, folder 10, box CG III, Record Group CGIAR, Rockefeller Foundation Archives: 6-8. Support for TAC, as well as CGIAR itself, was certainly not universal, even with in the halls of its founding philanthropy. In 1976, John Pino solicited comments from Rockefeller staff regarding the research centers and their boards. John J. McKelvey, Associate Director of Agricultural Science returned the memo with handwritten notes, including the following: "1. I think TAC [the Technical Advisory Committee] should be dissolved. The centers already have ample evaluative teams tripping over one another and giving their blessings to the programs. I have never understood the appointment rationale of members to TAC (other than a political rationale) and don't feel that any body such as TAC can even pretend to be omniscient about tropical agricultural research. 2. In the case of ICIPE I believe it important that a good strong center like ICIPE prosper outside the CGIAR system because I am adamantly opposed to a monolithic research structure – i.e. the CGIAR system – which could become bureaucratic and sterile and leave nothing in its wake. ICIPE could stand as a shining example as an institute that doesn't have to [?] and that can be experimental in policy, in organization and creative in research. 3. I think it unfortunate that CGIAR can't be more expansive in its policy – to welcome in its [?] institutes with goals other than production per se but if it did broaden its philosophy and ICIPE could then qualify as an institute member I would still feel ICIPE for the reasons stated above would be better off outside the CGIAR system." John J McKelvey, handwritten notes on Pino memo of April 27, 1976, folder 1, box CG V, Record Group CGIAR, Rockefeller Foundation Archives.

[141] FAO Forestry Department, "Background Note on the Development of the Programme and Activities in the Field of Forest Genetic Resources, attachment to agenda for TAC meeting, January 31 – February 4, 1977, folder 14, box TAC II, Record Group CGIAR, Rockefeller Foundation Archives.

IV suggests this. I would be opposed since it is not within current CGIAR guidelines and we could easily identify other more worthy activities dealing with crops and animals."[142]

By the mid-1970s, CGIAR was starting to show signs of stress from too many agendas and not enough money. In fact, the Rockefeller Foundation had come to the conclusion that funding of its agricultural science programs, the largest component of which was by far the crop research institutes, would be decreased steadily over the remainder of the decade from a then-current $3,050,000 in 1975 to $1,250,000 in 1979, with the lower amount representing salaries of Rockefeller Foundation employees on assignment at the institutes.[143]

In 1975, North American donors to CGIAR met informally with CGIAR to discuss likely contributions for 1976 and on how to achieve budget reductions if necessary.[144] Costs were going up while donations were not. The United States was far in the lead with a monetary commitment to CGIAR of $15.1 million followed by the World Bank at $6.8 million.[145] John Pino's files reflected concerns on the part of the World Bank, however: "While Mr. Cheek was on the phone I asked him what the prospects were for 1975. He said that the requirements seem to have skyrocketed over the current year."[146]

One year later, the Board trimmed the total budget request for the CGIAR research centers from $84.5 million to $79.7 million in the 1977 budget year, the lower

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[142] John Pino, handwritten notes on Executive Secretary to CGIAR members, undated memorandum, folder 14, box TAC II, Record Group CGIAR, Rockefeller Foundation Archives.
[143] John A. Pino to Misc., memorandum, May 12, 1975, folder 2, box CG V, Record Group CGIAR, Rockefeller Foundation Archives: 2.
[144] Michael L. Lejeune to Sterling Wortman, 16 September 1975, folder 14, box CG III, Record Group CGIAR, Rockefeller Foundation Archives.
[145] "CGIAR Allocations, 1976," Summary of CGIAR meeting, October, 1975, folder 10, box CG III, Record Group CGIAR, Rockefeller Foundation Archives: Annex IV.
[146] John Pino to file, memorandum re phone call with Bruce Cheek at World Bank on June 3, 1974, folder 5, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives.

amount still represented a jump from the $63.6 million budget in 1976 and the $47.1 million budget in 1975.[147] Twenty-four donors supported CGIAR in 1977. The largest, by far, remained the United States with a commitment that had grown to $20 million. The smallest was Denmark at $70,000. The Rockefeller Foundation committed $1.6 million.[148] By 1978, estimates for CGIAR funding had risen to $87.6 million. The United States remained the lead donor with a commitment of $21.7 million followed by the World Bank at $8.6 million.[149]

Program expansion and budget woes continued to create conflicts as the decade came to a close. In 1979, TAC proposed the creation of an International Center for Vegetable Research within CGIAR. Pino's handwritten notes suggest a chilly reception: "[The proposal] Was sent back to TAC with comment that the long list of crops proposed could result in unlimited staff expansion. More important reason, however, was the reluctance of many donors to take on the cost of a new center."[150] By 1979, budget concerns had blossomed into territoriality. John Pino's notes on the 1979 CGIAR meeting reflect the growing reality that a program with no limits as to what its talented staff might accomplish was severely limited as to what it could spend. The CGIAR Board agreed "in principal" to the CGIAR research centers' future goals but, according to Pino:

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[147] CGIAR Secretariat, memorandum, folder 2, box CG V, Record Group CGIAR, Rockefeller Foundation Archives: appendix.

[148] "Pledges of CGIAR members for 1977," folder 3, box CG V, Record Group CGIAR, Rockefeller Foundation Archives. The order of contribution was: Unites States $20 million; IBRD $7.5 million; Canada $6.5 million; IDB $5.7 million; Germany $5.6 million; UNDP $3.88 million; United Kingdom $3 million; Sweden $2.3 million; Belgium $2.25 million; Australia $2.12 million; Iran $2 million; Rockefeller Foundation $1.6 million; Ford Foundation $1.5 million; IDRC $1.5 million; Netherlands $1.5 million; Norway $1.5 million; Switzerland $1.05 million; France $530,000; Arab Fund $500,000; UNEP $340,000; New Zealand $100,000; Denmark $70,000; Japan – No specific amount pledged; EEC – No specific amount pledged.

[149] "CGIAR Tentative Estimated 1978 Financial Allocations," January 30, 1978, Informal Summary of Proceedings of CGIAR Meeting of November 16-17, 1977, folder 14, box CG V, Record Group CGIAR, Rockefeller Foundation Archives: Annex IV.

[150] John Pino handwritten note on CGIAR Secretariat, memorandum, March 23, 1979, folder 7, box CG IV, Record Group CGIAR, Rockefeller Foundation Archives.

"A number of delegations, however, raised questions concerning the capability of the donors to continue to meet the expanding needs of the present system, much less the cost of new activities." Only Germany, Switzerland and the United States assured real growth in contributions for 1980, although the US representative from USAID indicated that its CGIAR contribution would simply remove funds from other projects and stressed "…that it was absolutely essential that the growth of the existing centers be curtailed" and that their 1980 budget increases were "far too much." Canada recommended a policy of no real growth going forward. John Pino blamed the tepid support on high inflation and the fact that "[T]he world food problem is no longer in the headlines and the sense of urgency which once existed is no longer felt." He also bemoaned the: "[T]endency for the European donor group to look upon themselves as a separate grouping with their own specific interests separate from those of the North American Group. This tendency toward fragmentation could have serious repercussions on the future of the CGIAR if it continues to develop."[151]

In the midst of CGIAR's money woes in face of the research centers' ambitious agendas, environmental advocates continued to sound the alarm for a fast-approaching day of reckoning. If the urgent calls of TAC and IBPGR for collection and preservation of germplasm were not heard and acted upon in less than a decade, they claimed, it could be too late to save the world's plant gene stock in ten critical zones: the Mediterranean basin, West Africa, Ethiopia, Central Asia, Southwest Asia, South Asia, Southeast Asia, Mexico and Central America, the Andes, and Brazil.[152] The solution was not as simple as collecting and housing seeds in one place. Absolute security necessitated duplicate

[151] John Pino, notes on CGIAR meeting of May 3-4, 1979, folder 7, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives.
[152] Norman Myers, "The Exhausted Earth," *Foreign Policy*, No. 42 (Spring, 1981), 144.

collections and some seeds required specific storage conditions while others demanded constant regeneration.[153]

According to CGIAR's Secretariat, the waning financial support for the organization derived from a combination of economic decline combined with a fading sense of urgency. Generalized panic over unchecked population growth and the specter of mass starvation prompted aggressive support for CGIAR in the early 1970s. By 1980, the issue had lost some of its impact. In addition, economic inflation of the late 1970s caught up to CGIAR by the 1980s. Double digit inflation was cutting into CGIAR budget assumptions that factored in nine percent inflation, a sobering figure in itself but still not adequate. The aggregate CGIAR budget request for 1980 was $125.7 million, an increase of 26% over the 1979 contributions of $100 million.[154] Estimated donations from CGIAR members for 1980 were between $115 and $116 million, causing a deficit of $11.2 million.[155] In mid-July of 1979, the center directors working with TAC trimmed $8.5 million from the 1980 budget, reducing it to $118 million but still leaving an overage of two million dollars compared to 1980 donations.[156] By 1981, CGIAR faced an estimated budget of $124.2 million and funding of $118.8 million, a shortfall of $5.4 million. Projected budgets estimated that CGIAR's 1984 expense would be $184 million. The Secretariat summarized the issue: "Put bluntly, inflation higher than foreseen means that

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[153] "IBPGR Programme and Budget Proposals for 1981 / 82," folder 8, box CG VII, Record Group CGIAR, Rockefeller Foundation Archives: 20. For example, 'orthodox' seeds had to be stored in cold, dry conditions while 'recalcitrant' seeds lost their viability under all known conditions.

[154] CGIAR Secretariat, memorandum, May 2, 1979, folder 5, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives.

[155] CGIAR Secretariat, memorandum, June 8, 1979, folder 6, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives. CGIAR was concerned enough about the budget shortfall that it convened a standby committee to address possible funding shortages for the IARCS in 1980. The committee was not activated, however.

[156] Warren C. Baum to John Pino, 31 July 1979, folder 6, box CG VI, Record Group CGIAR, Rockefeller Foundation Archives.

unless substantial new donors can be found or unless present donors can provide more than our current estimates indicate, the system has no chance to grow in 1981, and some valuable programs may even have to be curtailed."[157]

Ironically, CGIAR found itself searching for money in a rising price economy when it possessed an asset worth a fortune in the private market: its germplasm collections. By late 1980, the potential market value of CGIAR's seed collections had become apparent to several key players in terms of both its worth and its exposure. Equally apparent was the problem of who, exactly, owned the collections. CGIAR and its staff had assembled the collections courtesy of the developing nations that CGIAR had been created to help. In order to maintain financial as well as diplomatic credibility, therefore, CGIAR had to assure that any use of the germplasm inured to the benefit of the supplying nations.

The IBPGR was keenly aware of the delicate nature of CGIAR's relationship with its developing nation partners and the need to maintain credibility. Recommendations put forth by IBPGRs program auditors in 1980 included the following: "In anticipation of foreseeable problems of exchange of plant materials, the Board should explore, in consultation with FAO, the idea of an international legal framework that would secure free access to collections."[158] The auditors report went on in some detail: "A point which is emerging clearly and which panel members have noted on several occasions during their travels, is the growing awareness in developing countries that genetic resources are a kind of wealth, coupled with an understandable unwillingness that they should be

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[157] CGIAR Secretariat, memorandum, June 23, 1980, folder 5, box CG VII, Record Group CGIAR, Rockefeller Foundation Archives.
[158] "Report on TAC Review of IBPGR," International Centers Week, October 27-31, 1980, folder 7, box CG VII, Record Group CGIAR, Rockefeller Foundation Archives: 2.

dispersed to other places without guarantee of return. This is becoming a somewhat delicate issue of which the board is well aware and which the Secretariat treats with sensitivity. Once again, the importance of influence and awareness presents itself. Effective collecting cannot be done without local goodwill. In this connection the great value of FAO's assistance, both influential and practical, can hardly be over-emphasized; collecting missions supported by the IBPGR have benefited very greatly from it and, indeed, many would probably have been impossible without it."[159]

The issue of CGIAR's seed collections and their potential use or abuse came to light just as John Harrar, a founding participant in the Mexico project and a driving force behind CGIAR, stepped down as President of the Rockefeller Foundation. With new leadership at Rockefeller came a new focus that was less involved with the seeds in the field than it was with the people who were growing them. The new emphasis on cultural issues in the developing world would emerge strongly in the 1980's. Harrar corresponded frequently with Norman Borlaug between June and September of 1980. He appeared to be preparing Borlaug for a change in focus, despite Borlaug's apparent lobbying (or at least venting) for fundamental research over 'rhetoric.' On June 19, Harrar waxed philosophically about his and Borlaug's work in terms that almost seem eulogistic: "Although we have never sought credit, I think we can rightly claim that the Rockefeller Foundation team which was first established in Mexico, is largely responsible for the developments in education, research and extension which have occurred there. It is also true that the small beginning grew and flourished and proliferated into many parts of the world. I would hope that all of our former and current staff members are aware of the

[159] Ibid., 21. It was also noted that the board only met once per year and its Executive Committee controlled the program for all practical purposes. Ibid., 23.

magnitude of their individual and collective contributions to the Agricultural Sciences. These have been of inestimable value to production programs throughout much of the world." Harrar also expressed hope, albeit skeptical, that perhaps the Ford Foundation would pick up the slack he anticipated as forthcoming at the Rockefeller Foundation: "I too hope that the Ford Foundation will continue to emphasize agriculture as that organization has an experienced staff and could readily contribute substantially to future efforts. As I read the FF monthly report, I find there is still substantial interest in agriculture but perhaps less so than in the past."[160] This theme continued in a second letter: "[T]he evolving program of the Foundation and changes in the membership of the board tend to emphasize shifts in program areas of concentration … I think that there may well be a tendency to placed more emphasis on the Social Sciences (economics) and the Humanities as major future concerns …We may well be paying for past successes in agriculture and public health as new resources have poured into these areas of critical concern."[161] The final letter seems to be more fatalistic than the first two: "I think there is a warning here that we may have to expect some substantial shift from our previous emphasis on the hard sciences to the social sciences and the humanities. I may be wrong but it seems to me that the present mood of the board and the new President may well be in this direction."[162]

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[160] John J. Harrar to Norman Borlaug, June 19, 1980, folder 34, box 5, Record Group IV 2A26, Special Collections, Rockefeller Foundation Archives.
[161] John J. Harrar to Norman Borlaug, August 12, 1980, folder 34, box 5, Record Group IV 2A26, Special Collections, Rockefeller Foundation Archives.
[162] John J. Harrar to Norman Borlaug, September 19, 1980, folder 34, box 5, Record Group IV 2A26, Special Collections, Rockefeller Foundation Archives.

A New Decade and A New Option

Between 1940 and 1980, the philanthropic efforts of the Rockefeller Foundation, based firmly in an American style of commercial agriculture, blossomed quickly into an international aid association called CGIAR. CGIAR harnessed genuine concerns over population growth and food shortages to recruit and lead a cadre of donors who saw multiple benefits in feeding the world through improved seeds and farming techniques. Predictions of imminent and eventually uncorrectable disaster pushed CGIAR to act aggressively in changing the face of farming in the developing world, despite warnings about ecological degradation and loss of cultural life-styles. Within a decade, however, CGIAR faced a growing chorus of demands from a varied constituency. Environmentalists demanded greater responsibility toward the delicate ecosystem of the southern hemisphere. Donors demanded results that justified their donations. Demographers demanded fast action before it was too late. Sociologists and anthropologists demanded a new awareness of the lives and cultures being disrupted by all the change. Researchers demanded more dollars for critical research in ever-broadening fields. By 1980, CGIAR was an organization in need of leadership and money. It was also an organization in possession of a premier and envied seed collection. In the private sector of the industrial world, the legal norm for seeds had settled on exclusive rights through patents or seed registration laws. Just as CGIAR began to wrestle with the question of where its seed collections fit in terms of the market place and the CGIAR mission, the new decade of the 1980s opened with a significant decision by the United States Supreme Court that opened the door for eventual recognition of intellectual property rights not only of whole plants and seeds, but also living material at

the genetic level. This decision and the subsequent explosion in the field of biotechnology made CGIAR's decisions regarding the proper use of its seed collections more critical and more urgent.

CHAPTER 4. BIG MONEY IN SMALL THINGS: INTELLECTUAL PROPERTY RIGHTS AND D.N.A.

As the diverse interests dedicated to the success of CGIAR worked to change agriculture in the developing world, a pair of California scientists worked to change the biological structure in the genetic world. The discovery of recombinant DNA technology in the1970s created a new set of opportunities and issues in the arena of intellectual property.[1] The wave of excitement generated by rDNA swept over the courts, Congress and Wall Street. Advocates for the new technology captioned it in noble terms, especially its potential for producing new and cheaper medicines and improved foods. The overriding factor, however, was economic. As with patents and agriculture, those with the ability to structure and interpret a legal system for addressing the new technology did so from the perspective of economic potential. The research generating most of the attention focused on the pharmaceutical industry, particularly the potential of improved cancer treatments. Recombinant DNA technology also encompassed plants and seeds because they were components of certain medicines and also because of the possibility of combining plants and non-plant material to create improved food crops.

This brave new world of science, technology and money exploded on the global scene just as the members of CGIAR were beginning to splinter over agendas and money woes. The rDNA breakthrough and subsequent actions by the United States Supreme Court and Congress presented CGIAR with both a challenge and an opportunity. On one hand, the nature of crop improvement became much more complex in terms of expertise and

[1] DNA is an acronym for deoxyribonucleic acid. Hereafter, recombinant DNA is expressed as rDNA.

equipment. Traditional methods of directed plant breeding, in place since the nineteenth century, continued to be a mainstay of CGIAR, but rDNA prompted experiments to combine genetic material that could not be naturally joined via traditional cross breeding. Upstart corporations snatched up the men and women who specialized in these areas, mostly academics at research universities. CGIAR's research centers faced a sobering lack of ability to exploit the new technology in pursuit of its mission. On the other hand, CGIAR remained in custody of seed collections that were growing in value as the genetic wave swept over Wall Street. CGIAR may not have had the expertise to embrace rDNA technology but it certainly had the ingredients. This state of affairs placed CGIAR's board at a cross roads as it wrestled with how to best use and protect its valuable seed collections consistent with its mission. This chapter explores the critical events in the 1970s and early 1980s that exacerbated CGIAR's already difficult situation. These events are critical to understanding the economic pressures brought to bear on CGIAR's decisions.

Recombinant DNA

Recombinant DNA technology, popularly known as 'gene-splicing' in the 1970s, is the controlled joining of DNA from different organisms. All living things exist according to programs encoded in their DNA. Recombinant technology is the process of splicing DNA in order to isolate a specific section of genetic information and then recombining that section of DNA with the DNA of a simple organism such as a bacteria. The objective is isolation and mass production of specific proteins that are, for example, the active ingredients in drugs. For the microbiology community, rDNA technology represented a breakthrough on a scale

similar to nuclear fission in the physics community.[2] The rDNA breakthrough came in March of 1973 when Stanley Cohen from Stanford University and Herbert Boyer from the University of California, San Francisco (UCSF), established a simple process to isolate and amplify any gene or DNA sequence and move it with controlled precision.[3] Boyer revealed his and Cohen's work at a conference in November 1973. His announcement immediately raised concerns over public safety and also started the clock ticking on a one-year deadline to obtain a patent.[4] Stanford University hustled to complete and file a patent application before the deadline tolled in November 1974, after which time the information would become public property. The patent application that Stanford University ultimately filed claimed both the rDNA process and the resulting composition, which was new and living biological material.

Stanford's rush to secure a patent underscored its view that the academic achievement could quickly move into the commercial realm. In 1973, the Boyer-Cohen discovery represented a purely academic achievement. No practical use existed for the process they had created. The potential uses for which the process could conceivably be employed, however, were mind-boggling, a fact not lost on the researchers. In 1976, Boyer joined with venture

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[2] Michael S. Greenfield, "Recombinant DNA Technology: A Science Struggling with the Patent Law," *Stanford Law Review*, vol. 44, no. 5 (May 1992), 1051.

[3] Sally Smith Hughes, "Making Dollars out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology 1974-1980," *Isis*, vol. 92, no. 3 (September 2001), 542.

[4] Ibid., 556. It is interesting to note the parallels between plants and rDNA in terms of public policy. Just as commentators debated the economic value of plants and commercial agriculture versus the culture and heritage of farming, the scientific community debated the economic value of rDNA versus its public safety. The National Academy of Science responded to the announcement of the rDNA breakthrough by forming a committee on rDNA safety. In 1974, the committee called for a voluntary moratorium on rDNA research until the risks could be assessed and procedural guidelines established. A Stanford University biologist chaired the committee. Boyer and Cohen supported its conclusions. In fact, they were both signatories to a letter calling for the moratorium, although Boyer had already begun to share the rDNA plasmid with other researchers if they agreed to follow his self-styled safety precautions. Ibid., 554. Eventually, economic considerations dominated.

capitalist Robert Swanson to form a new company called Genentech, which quickly advanced rDNA research to the threshold of economic viability.[5]

Stanford's patent application and Boyer's participation in creation of a for-profit company soon fostered intense debate and conflict over issues of fairness, propriety and professional academic standards. The debate was strikingly similar to the debate over ownership of improved plants in which base breeding lines came from landraces improved by generations of farmers through their keen eye for selection. For example, Genentech made great strides in recombining the human gene containing genetic information for the synthesis of interferon, a natural antiviral protein. Touted as an effective tool for battling cancer, interferon's market value for a mass producer was estimated in 1980 to be worth three billion dollars by 1987. The materials used by Genentech, however, came to it through a long and complicated process of public and academic research that had begun with the voluntary acquiescence of a human donor. In other words, Genetech had 'finished' the work that had been begun with public funding and made the final stage possible. This long and convoluted process would have been of little import in the academic world so long as the myriad contributing parties had received proper acknowledgement for their respective contributions. Genentech, however, was in possession of a valuable commercial product at the end of the

[5] Nicholas Wade, "Gene Splicing Company Wows Wall Street." *Science,* vol. 210 no. 4469 (October 31, 1980), 506. The entire process of commercializing rDNA technology was fraught with turf battles, egos and acrimonious debate over the propriety of Stanford's patent application and Boyer's business venture. Stanford and Boyer were treading on sacred ground. The scientific community was largely founded on the sharing of information for purposes of evaluation, validation and extension of knowledge. Any accomplishment in the field was usually the result of extensive collaboration among scientists. The academic scientific community actively critiqued, scrutinized and, ultimately, collectively owned new knowledge. The reward to the scientific researcher was peer recognition and esteem derived via publication. Attribution to all contributors was common in published results. Recombinant DNA threatened to overturn this hallowed process.

day, which put the notion of giving credit in an economic light.[6] Prior to the Genentech breakthrough, informal sharing between researchers had been routine. The interferon cells played a major role in the value of Genentech's initial public offering, which would be enhanced by the Supreme Court's later ruling on ownership of living material.[7] Potential investors in Genentech would not have been interested in seeing a laundry list of academics with the ability to claim credit for the creation of interferon cells. The Genentech accomplishments quickly dampened the ethical debate over rDNA in favor of great excitement over its commercial possibilities. In 1978 the National Institutes of Health revised it guidelines and eased restrictions on rDNA experiments. All bills introduced in Congress to

[6] Nicholas Wade, "University and Drug Firm Battle Over Billion-Dollar Gene," *Science*, 26 September 1980, 1492-1494. Genentech successfully cloned the gene under a contract with pharmaceutical company Hoffmann-LaRoche. A dispute arose regarding where and how Roche Laboratories, a research lab funded by but considered independent from Hoffmann-LaRoche Pharmaceutical Company, obtained the gene that Genentech successfully cloned. The University of California claimed that Roche made unauthorized use of material developed by two UCSF researchers. The attorney for the university claimed that a private company was subverting for profit an academic relationship defined by a free and easy exchange of materials. If that was not adequate ammunition for a fight, the disputed genes that UCSF claimed to own had been extracted from the bone marrow of a cancer patient in 1977. The UCSF medical school had nurtured and grown the donated genes in a test tube, a significant feat in itself. The medical school had then sent a sample of the cell line to a scientist at the National Cancer Institute (NCI) who discovered that the cells were producing interferon. Although not a surprising revelation, it was news to the UCSF researcher and he shared it with a colleague at the Roche Institute of Molecular Biology who was interested in interferon research. The Roche researcher contacted the NCI and requested samples from the UCSF cells. The NCI passed the samples to the Roche lab after a conversation between the NCI researcher and the UCSF researcher that would later be the subject of conflicting interpretations. The Roche lab took the cell line and, with Genentech's help, converted it into a super producer of interferon. The Roche lab never specifically asked for permission to clone the cells and, having done so, then filed for patents on the clones even though multiple parties could claim responsibility for contributing the cells, nurturing them and discovering their properties. Ibid.

[7] Ibid. Despite this blow-up, Genentech continued to work closely with UCSF. The biotech start-up shared laboratory space and employees with the university. In one case, a noticeable overlap was observed between Genentech's development of a growth hormone and published results from university staff. In that case, Genentech paid the university $350,000 in June 1980 to resolve the matter. There is no mention of exactly what the payment was intended to represent (damages, costs, royalties, etc). Given the potential market value of a growth hormone, it was likely a negotiated settlement to reimburse UCSF for its expenses, possibly reflecting the value of UCSFs work relative to the amount if investment yet to be made in order to bring the product to market. See, "Investors Dream of Genes," *Time*, 20 October 1980, 72.

regulate rDNA technology died in one of the largest lobbying campaigns on a technical issue in the history of Congress.[8]

Old Laws and New Science

When the dust settled over regulation of rDNA safety, Genentech and its peers were poised to become giants in the emerging field of commercial biotechnology. A number of issues remained outstanding, however. Foremost among them was whether a patent applicant could secure rights not only to the rDNA process, but also the materials it produced. The shortcomings of the patent law became increasingly apparent. The law required applicants to present an invention that was a new and useful process, machine, manufacture, or composition of matter. The invention had to be novel and could not be obvious when compared with the prior art. It also had to be described in full, clear and concise terms such that any person skilled in the same art could make and use the same invention.

Recombinant DNA technology was certainly novel and was not represented in any prior art. Cohen and Boyer's work had been made possible by discovery of an enzyme called 'restriction endonucleases,' which could cut DNA in specific places, and another enzyme called 'DNA ligases,' which could join pieces of DNA together to make a single longer piece. These discoveries led to the invention of the process to create rDNA, by which researchers could create new biological material.[9] The patent standards clearly prohibited patent protection for discovery of the naturally occurring enzymes just as they clearly

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[8] Sally Smith Hughes, "Making Dollars out of DNA," 566-68. The effort to stop regulation of rDNA experimentation cannot be attributed exclusively to the private sector. The scientific community was an active participant as well. While it clearly stood to gain immensely from employment / business opportunities in this new commercial field, it was also, no doubt, becoming increasingly confident in its ability to use genetic material in a safe and responsible manner.

[9] Li Westerlund, *Biotech Patents: Equivalence and Exclusions under European and U.S. Patent Law* (New York: Kluwer Law International, 2002), 8.

allowed patent protection for the new process. The Patent Office readily granted process patents for the rDNA process. The thornier issue was the resulting proteins. Were they truly new and useful and could their use be adequately described such that the public received its end of the patent bargain?[10]

On top of these procedural problems was the fundamental question of whether the protein produced by the recombinant process was truly new. There was no question that the process of natural isolation of a desired strand of DNA was very inefficient and could not produce a therapeutic amount of the desired protein. The recombinant process solved this problem and was therefore eligible for patent protection. The proteins it produced, however, were identical to the same proteins that occurred in nature. That, after all, was the objective - to mass-produce a valuable protein identical to its naturally occurring counterpart. This begged the question: Should patent protection be available for a protein that was not in any way 'new?' The purpose of rDNA technology was to create a protein identical to a natural protein. The core value embraced by the patent law was to reward something completely new. For example, proteins derived from blood plasma and proteins created through

[10] The problem was that biotechnology was being judged against standards drafted primarily to accommodate mechanical inventions. The patent law is most efficient in the area of mechanics, where function precedes structure. For example, an engineer observes a field of hay being cut with scythes and bundled by hand. He sees the need for a machine to pick and bundle the hay for easy transport and storage. He designs a machine that will perform the needed functions of cutting, combining and binding. When the machine is ready, he applies for the patent. Biotechnology is counter to this model. The scientist derives a new compound from a known compound and then experiments with it in order to discover what practical use it might have. In other words, structure precedes function. The scientist has his new invention before he knows what it can do. These types of discoveries require considerable time and resources. Manipulation of genetic materials took years and millions of dollars before its potential uses were fully understood. This is one reason why most of the research took place at university research facilities. The patent law was not well suited to the scientific model. It was founded on economic reward for the inventor. If two inventors were working in the same area, the first one to file a valid application was granted the patent. Thus, the law encouraged a patent application at the earliest stage in the development of the invention. This was fine when the item at issue was a hay baler. For the biological researcher however, it meant having to secure a patent before the claim was fully understood. It also meant less ability to amend the patent application as new information was discovered. Another problem was the mandatory description. How did one describe a new protein in a way that could enable reproduction? See, Westerlund, *Biotech Patents,* 10.

recombinant technology were identical in composition and, more important, had identical blood-clotting characteristics. The recombinant protein did not do anything new, nor was it intended to. It was valuable precisely because it was identical. This presented the biotechnology industry with a conundrum. It had to argue similarity before the Food and Drug Administration, convincing it that recombinant products were identical to their naturally occurring counterparts, in order to obtain approval for their sale to the public. In nearly the same breath, it had to argue dissimilarity before the Patent Office, convincing it that the recombinant protein was something new in order to qualify for a patent. Under the law as it was interpreted in the 1970s, the inventor could easily patent a process to produce the proteins but could not patent the proteins themselves because they were not new.[11] As long as Genentech had patent protection on the only process for creating recombinant proteins, its investment was safe and its profits were assured. Competitors, however, had already achieved the same result through a different, albeit less efficient, process. As soon as someone else could create the same protein through a more efficient method, and publication of the Boyer-Cohen research had certainly laid the groundwork for doing so, Genentech was threatened with loss of its most valuable asset.[12] Given the time and money required to produce recombinant proteins and the fact that the market value lay as much in the proteins as the process, the situation was untenable for the marketplace.

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[11] *Application of Bergy*, 563 F.2d 1031, 1033-34 (C.C.P.A. 1977).

[12] Two other options were available to protect the invention: legal trade secrecy and actual secrecy. Actual secrecy is as simple as it sounds. Do not let anyone know how you do what you do. This is not ideal for machines since they can be reverse engineered. It is exceedingly difficult with microorganisms since they are easily stolen and propagate rapidly. Secrecy also frustrates scientific norms of publication. Trade secrecy is a state law concept and requires that the owner of the secret maintain and document certain standards of confidentiality in order to claim the right. See, Rebecca S. Eisenberg, "Proprietary Rights and the Norms of Science in Biotechnology Research," *Yale Law Journal*, vol. 97, no. 2 (December 1987), 190-195.

Because of the uncertainty over ownership of the resulting product, Stanford University amended its patent application to drop the end product and seek rights only to the process.[13] Stanford, Genentech and all of the others with expertise in the science needed a fresh reading of the Patent statute in light of this new science. This task fell to the 1980 term of the Burger Court. The road leading to its landmark decision would not involve rDNA technology, however. It would begin with an oil spill and a General Electric researcher named Ananda Chakrabarty.

[13] Sally Smith Hughes, "Making Dollars out of DNA," 563.

The Case of *Diamond v. Chakrabarty*

The case of *Diamond v. Chakrabarty* reinforced the traditional American view that patent laws existed to promote economic advancement. The 1980 decision by the United States Supreme Court arrived at a time when the United States was struggling to find its economic footing in a global economy where technology represented the future. The decision ushered in a series of actions by Congress and the newly elected Reagan administration that solidified intellectual property rights in a private for-profit model. These actions resonated in the halls of CGIAR as it wrestled with the issue of its seed stores.

Biochemist Ananda Chakrabarty was educated in Calcutta and taught at the University of Illinois, Urbana. He joined the environmental division of General Electric in 1971 and conducted groundbreaking research in the science of cleaning up oil spills including a new form of bacteria that Chakrabarty had created in the laboratory. His research resulted in a patent application that included a claim for the new form of bacteria.[1] The patent examiners approved Chakrabarty's process claims but denied the claim for the new microorganism on the grounds that it was living material and thus not within any class of patentable subject matter. The resulting appeals climbed from the

[1] Nathaniel Sheppard, Jr. "Developer of a New Life Form: Ananda Mohan Chakrabarty," *The New York Times*, 18 June 1980, 22 (A). Chakrabarty did not work with rDNA technology. His methodology employed cross-breeding and fusing of bacterial strains. Stanford University and Genentech were making the rDNA headlines and fanning the fires of economic potential. The common denominator in their work, however, was that in addition to inventing new processes, they were creating via those processes new and potentially valuable living material. As Chakrabarty's case was moving up the appeal ladder, the United States Patent and Trademark Office was accumulating a growing stack of patent applications in the field of biotechnology. The Patent Office adopted the policy that product patents for new living material should not be issued for any of the mounting applications but elected to hold the applications in suspense rather than rejecting them. This maneuver allowed the applicants to preserve their claims and have benefit of their filing dates should one of the cases make it to the United States Supreme Court and result in a new precedent.

Board of Patent Appeals to the Court of Customs and Patent Appeals, where Chakrabarty was the victor. Therefore, when the case ultimately came before the United States Supreme Court, it was on appeal by the Patent Office seeking to reverse the lower court ruling in favor of patentability of the new microorganism. Various denials and appeals propelled the case of *Diamond v. Chakrabarty* to the United States Supreme Court where it was argued on March 17, 1980 and decided on June 16, 1980.[2]

The legal history of *Diamond v. Chakrabarty* began with an earlier case, *Application of Bergy*, decided by the Court of Customs and Patent Appeals. The Court combined *Bergy* and *Chakrabarty* into one case due to similar facts and timing but *Chakrabarty* was appealed to and heard by the United States Supreme Court. Both cases must be reviewed in order to understand the evolution of the law in this area.

In 1977, a five-judge Court of Customs and Patent Appeals decided the case of *Application of Bergy*.[3] The Court's 3-2 decision presaged the one-vote majority that would also characterize *Chakrabarty*. Malcom Bergy and two colleagues had developed a new process for preparing an antibiotic known as lincomycin by using a newly discovered microorganism called streptomyces vellosus. The microorganism was found in nature but Bergy had purified it for use in the new process. The microorganism allowed Bergy to accomplish two new things. First, he was able to prepare lincomycin at temperatures ranging from 18 to 45 degrees celcius; second, he was able to prepare licomycin without concomitant production of a byproduct known as lincomycin B. Overall, the new process greatly increased the efficiency of lincomycin recovery.[4]

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[2] *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). The name 'Diamond' appears in the case caption by virtue of being Director of the United States Patent and Trademark Office at the time.
[3] *Application of Bergy*, 563 F.2d 1031 (C.C.P.A. 1977).
[4] Ibid., 1032.

Bergy applied for five patents, four on the process for recovering lyncomycin and a fifth for the newly discovered microorganism streptomyces vellosus. Three microbiologists at Upjohn Research Laboratory supported the fifth application with affidavits stating that streptomyces vellosus did not exist as a biologically pure culture in nature and asserting that the applicant had manufactured the substance.[5] The patent examiner approved the four process applications but rejected the fifth application based solely on the fact that it was a claim on a product of nature and therefore not patentable subject matter under Section 101 of the patent law. In support of his decision, the patent examiner cited three previous appellate decisions: *Application of Mancy; Guaranty Trust Co. of New York v. Union Solvents Corporation* and *Funk Brothers v. Kalo, Co.*[6] All three cases contained support for the general rule that a naturally occurring bacteria or a property of that bacteria was not eligible for patent protection.[7]

Guaranty Trust Co. of New York v. Union Solvents Corporation was a pioneering patent case in the field of natural product patents and microbiology.[8] Charles Weizmann was a scientist who discovered a previously unknown species of bacteria. He used the bacteria to create a new process for the fermentation of starch from potatoes for the

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[5] *Application of Bergy* , 1033. Bergy's affiliations are not made clear in the opinion, nor does the opinion explain why an arm of Upjohn, a large pharmaceutical company, was involved. It can be assumed, however, that Bergy and Upjohn had some type of legal relationship and mutual economic interest in the research.

[6] *Application of Mancy*, 499 F.2d 1289 (C.C.P.A. 1974); *Guaranty Trust Co. of New York v. Union Solvents Corporation*, 54 F.2d 400; *aff'd* 61 F.2d 1041 (D. Del. 1932); *Funk Brothers v. Kalo, Co.*, 333 US 127 (1948).

[7] In *Guaranty Trust*, a naturally occurring but previously unknown bacteria was used in a patentable process. In *Funk Brothers*, the discovery and commercial application of the fact that certain bacteria had non-inhibiting properties was ruled not adequate to warrant a patent.

[8] *Guaranty Trust Co. of New York v. Union Solvents Corporation*, 54 F.2d 400 (D. Del. 1931). Note that this was not a United Sates Supreme Court case. It was decided by a federal district court of appeals in Delaware, the first level of appeal after the trial court level, and affirmed without comment by the United States Court of Appeals for the Third Circuit. 61 F.2d 1041 (3rd Cir 1932). The next appeal would have been to the United States Supreme Court, which was not pursued in this case. These cases have precedential value but are not binding. There are twelve federal circuit courts of appeal and, prior to 1982, there was a Court of Customs and Patent Appeals. They can issue contrary opinions on the same subject.

production of acetone and butyl alcohol.[9] Producing the materials by fermentation was not remarkable, but Weizmann had invented a new process to isolate a particular bacteria and then use that bacteria to produce commercial quantities of acetone and butyl alcohol. In 1916, Weizmann applied for a patent for "improvements in the bacterial fermentation of carbohydrates and in bacterial cultures for the same."[10] The Patent Office approved the application in 1918 but withheld it from publication for reasons of national security. Weizmann licensed the process to a commercial manufacturer, which brought a lawsuit for patent infringement in 1930 when Union Solvents Corporation began commercial production of the same materials. Among the numerous defenses to the claim of patent infringement that Union Solvents offered was that Weizmann had been awarded a patent for something not eligible for patent protection: the life process of a living organism. The Federal Appeals Court for the District of Delaware countered by stating that Weizmann's patent had not been awarded for the new bacteria *per se*, but rather for the process in which the new bacteria were employed, which the Court called "the exercise of inventive genius."[11] The Weizmann process allowed for production of commercial quantities of butyl alcohol, which was a good substitute for amyl alcohol. At that time, amyl alcohol was obtained as a byproduct in the production of spirits, a process prohibition threatened. Thus, Weizmann had discovered a new bacteria and employed it in a process of his own invention. He was rewarded for the process that he invented but not for the bacteria that he discovered.

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[9] Acetone was a solvent used in the manufacture of film, gas containers and artificial silk. It was also a key component in cordite, an explosive used during World War I. Butyl Alcohol was a solvent used in the manufacture of lacquers used in finishing automobiles and furniture. Ibid., 401.
[10] Ibid.
[11] Ibid., 403.

Compare the result in *Guaranty Trust* with the 1948 in the case of *Funk Brothers Seed Company v. Kalo Inoculant Company*.[12] Both companies in the case were involved in the packaging and selling of plant inoculants. The process sellers of plant inoculants used was to select the strongest strains of bacteria that enhanced plant growth and health, produce them in a laboratory and then package them in liquid or powder form for sale to the public. The inoculants were highly specialized because specific strains of bacteria were useful only for specific plants. Therefore, the inoculants had to be packaged and sold separately for each type of plant. It was common knowledge at the time that bacteria of the genus Rhizobium enabled plants to take nitrogen from the air, fix it in the plant and convert it to organic nitrogenous compounds. There were six species of Rhizobium and each species had distinct strains that varied in efficiency. A scientist named Bond discovered that certain strains of Rhizobium did not inhibit each other when mixed together. With this knowledge, he was able to combine the strains and market a single product suitable for multiple plants. This would have greatly decreased the cost of packaging and marketing plant inoculants. Bond applied for and was granted a patent for the new mixed-plant inoculant. When his employer sought to enforce the patent against its competitors, they too challenged the validity of the patent. The United States Supreme Court ruled that Bond's efforts were not eligible for patent protection. Bond had done nothing to the bacteria in question. He had simply discovered their respective properties and used this knowledge to mix them together in a way that enhanced their commercial value. The Court first noted that a patent could not have been awarded for the bacteria, stating that "patents cannot issue for the discovery of the phenomena of nature. The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals,

[12] *Funk Brothers Seed Company v. Kalo Inoculant Company*, 333 U.S. 127 (1948).

are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomena of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end."[13]

In support of its analysis, the Court cited the 1887 decision in the Alexander Graham Bell telephone patent case in which the Court noted that electricity was a force of nature Bell employed in his invention.[14] If left to itself however, electricity would not do what Bell needed for it to do. Bell's invention was a process to control a force of nature to make it accomplish the purpose needed. In other words, Bell employed a force of nature in a new and practical use. Comparing Bell's achievement to what Bond had done, the Court concluded that the mere aggregation of biological species fell short of invention. Bond had discovered no new bacteria, had not caused the known bacteria to do anything other than what they had always done and had not improved their function. He had simply made a commercial advance in packaging. Unfortunately for Bond, the most impressive part of his work, his discovery of the principles of the bacteria, was not within a category of patentable subject matter. In the opinion of the Court, Bond had demonstrated skill and insight, but not invention.

Mancy was a 1974 case in which the applicants sought a patent for a process for producing the antibiotic daunorubicin through cultivation of a specific strain of the microorganism streptomyces bifurcus, which was found in and isolated from a soil sample taken in France. Streptomyces bifurcus was a known antibiotic, as was the

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[13] *Funk Brothers v. Kalo*, 130.
[14] *Dolbear v. American Bell Telephone Company*, 126 US 1, 532-33 (1887).

process for producing it via aerobic cultivation of strains of streptomyces. The applicants had simply found a brand new strain of the antibiotic to apply the same process. The patent examiner rejected the process application on the basis of obviousness.[15] The applicants argued that they had found and isolated a novel strain of the microorganism and that it was not at all obvious that this strain could be used in the process because most strains did not produce such results. In other words, the strain they found and used in their process was not known in the prior art. The Court of Customs and Patent Appeals held that the applicant's process was not *prima facie* obvious.[16] One skilled in the art would not find it obvious to do what appellants did with the materials they discovered. The Court also noted that the applicant had made no claim on the new strain of streptomyces bifurcus but: "would, we presume (without deciding), be unable to obtain such a claim because the strain, while new in the sense that it is not shown by any art of record, is, as we understand it, a 'product of nature'."[17]

Citing the holdings in *Application of Mancy, Guaranty Trust,* and *Funk Brothers*, the patent examiner reviewing the Bergy application concluded that Bergy's newly discovered microorganism could be employed in a patentable process but could not be the subject of a patent because it was a product of nature. Bergy appealed the ruling, claiming that his process employed a biologically pure form of the microorganism streptomyces vellosus. Bergy conceded that the microorganism existed in nature but claimed that it had to be isolated and purified in order for it to be of use in the process for

[15] Obviousness is the third standard in Section 103 of the patent law.
[16] The United States Court of Cusotms and Patent Appeals was originally established in 1909 as a five-judge federal court of appeals to help with customs cases. In 1929, its jurisdiction was extended to patent and trademark cases. It was abolished in 1982 when its jurisdiction was transferred to the newly created U.S. Court of Appeals for the Federal Circuit. United States Government Federal Judiciary History, available at www.fjc.gov/history/home.nsf/page/patent_bdy.
[17] *Application of Mancy*, 1294.

recovering lyncomycin. In other words, Bergy claimed that he had 'manufactured' the purified form of streptomyces vellosus for purposes of Section 101 of the patent law.

The Board of Patent Appeals reviewed Bergy's appeal and affirmed the examiner's rejection of Bergy's fifth application for the new microorganism.[18] The Board, however, completely ignored the examiner's stated basis for rejecting the application (*i.e.*, that it was for a product of nature.) Instead, the Board ruled that claim five of the Bergy application was for a living organism. The Board also ruled that, given the absence of any precedent, a strict construction of Section 101 of the patent law precluded a patent on a living organism because it was not within the scope of any Section 101 category.[19] The Board of Patent Appeals distinguished between products of nature and living things. Products of nature could include inanimate materials such as minerals and chemicals that were not living. The Board essentially carved a subset, consisting of living things, out of the larger category of products of nature. The Board concluded that the subset of living things was not eligible for patent protection under any circumstances. Thus, living material was not in any Section 101 category of patentable subject matter.

It was at that point that the Plant Patent Act of 1930 became central to the issue of patents on living material. In support of its decision, the Board of Patent Appeals cited *In re Arzberger*, a 1940 decision from the Court of Customs and Patent Appeals.[20] The Arzberger application for a patent on a species of bacteria had been filed under the Plant

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[18] This is a board within the United States Patent and Trademark Office. It is made up of the Director of the PTO, the Commissioner for Trademarks and the administrative patent judges within the office who are appointed by the Director. Upon written appeal of an applicant, the Board reviews adverse decisions of patent examiners. See, *U.S. Code* 35 (2000) § 6.
[19] *Application of Bergy*, 1033-34.
[20] *In re Arzberger*, 112 F.2d 834 (C.C.P.A. 1940).

Patent Act. The applicant argued that standards of botany and bacteriology stated that bacteria were properly classified as plants. While the Court in *Arzberger* conceded that this was true, it rejected the application on the grounds that Congress did not intend the Plant Patent Act to apply to bacteria but only to plants in the layman's sense of the word. The Court cited the legislative history of the Plant Patent Act, which identified asexual reproduction as grafting, budding, cuttings, layering, division, and the like, but not by seed.[21]

Based on the holding in *Arzberger*, the Board of Patent Appeals reasoned that the Plant Patent Act of 1930 represented the one and only instance where Congress had determined to extend patent-type protection to living things. In so doing, Congress had clearly limited the extension of patent protection to asexually produced plants and had further defined what it viewed as asexual reproduction. Therefore, the only type of patent available to a living thing was a plant patent. Bacteria explicitly did not qualify as a plant under the Plant Patent Act. Accordingly, the fifth component of the Bergy application was neither sanctioned by Section 101 of the patent law by virtue of being for a living thing nor by the Plant Patent Act by virtue of being for a bacteria. In support of its ruling, the Board of Patent Appeals noted that Bergy's argument for an expansive reading of the meaning of 'manufacture' in Section 101 to include isolated and purified bacteria could arguably open up the patent laws to cross-bred animals, such as honeybees, which did not occur naturally but the breeder 'manufactured.' The Court also noted that the interpretation Bergy urged would take plants that the Plant Patent Act excluded and make them patentable under Section 101, a result that Congress did not intend.

[21] Ibid., 837.

The Patent Office and its Board of Patent Appeals made a clear statement on the limits of the patent law as it applied to living things. The realm of patentable living things was identified, defined and limited by the Plant Patent Act of 1930. If one did not have an asexually produced plant, one did not have an option to patent a living thing.

Bergy appealed to the United States Court of Customs and Patent Appeals. It was during the appellate arguments that the groundwork was laid for the eventual declaration by the United States Supreme Court that living material was in the category of patentable subject matter. The Solicitor General, arguing before the Court of Customs and Patent Appeals on behalf of the PTO, cited a 1975 case, *Application of Merat*, relating to a patent application for chicken breeding.[22] In *Merat*, the applicant had discovered a dwarfism gene in chickens and, through careful breeding, had produced dwarf hens that laid normal sized eggs but consumed less food. The applicant applied for patents on the breeding process and on the dwarf hens. The patent examiner rejected all claims under Section 101 on the grounds that animal breeding was not a process eligible for patent protection and that a thing occurring in nature (in this case, a chicken) was not a 'manufacture' for purposes of Section 101. The Board of Patent Appeals agreed and noted that if Section 101 recognized animal breeding as patentable then plant breeding would certainly be allowed as well and there would have been no need for a specific plant patent statute. The Board of Patent Appeals also rejected the application for failure to comply with the Section 112 claim requirement. The applicant had failed to state with adequate specificity exactly what he was claiming as his invention. The Court of Customs

[22] *Application of Merat*, 519 F.2d 1390 (C.C.P.A. 1975).

and Patent Appeals affirmed the rejection based on Section 112 and did not address the Section 101 basis for rejection.

In considering these facts in connection with the *Bergy* appeal, the Court of Customs and Patent Appeals first noted that the microorganism streptomyces vellosus in the Bergy application was clearly not a product of nature because the material was in a biologically pure form as a result of human intervention. Therefore, the patent examiner's rejection based on the product of nature exemption was fatally flawed from the start. In fact, the Court speculated that the Board of Patent Appeals was well aware of this fatal flaw in the patent examiner's logic and therefore went looking for a better reason to reject the claim, ultimately settling on the 'living material' argument.[23]

The opinion of the three-judge majority stated that there was clear legal precedent for patenting a purified product of nature, which is precisely what Bergy had argued. The Court cited two cases for its position: *Merck v. Olin Mathieson Chemical Corporation* and *Parke-Davis v. Mulford.*[24] Having established a basis for allowing a patent on purified products of nature, the Court saw one remaining issue: Was a purified product of nature, otherwise patentable under Section 101 of the patent law, disqualified because it also happened to be alive? For three of the five judges, the answer was 'No'. The Court appears to have been mindful of the warning the Board of Patent Appeals issued about the potential consequences of opening the patent door too wide to living things. The majority took pains to note that it was not deciding if living things *in general* qualified under Section 101 of the Patent law, but only whether microorganisms did. Other

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[23] *Application of Bergy*,1035.
[24] *Merck v. Olin Mathieson Chemical Corporation*, 253 F.2d 156 (4th Cir 1958). This case involved the patent awarded for pure vitamin B-12; *Parke-Davis*, *v. Mulford Co.*, 189 F. 95 (SDNY 1911); aff'd 196 F. 496 (2nd. Cir. 1912) was a case permitting a patent on isolated and purified adrenaline.

questions involving living things would have to be decided on a case-by case basis. Thus, the Court clearly attempted to rule on favor of Bergy without establishing a broad new policy on living material and, in fact, was consciously avoiding it.

The majority opinion also attempted to address the arguments running contrary to its holding. In doing so, it suggested a more expansive reading of previous holdings. The majority opinion first noted that it was well established that processes employing living organisms were nonetheless eligible for patents. In fact, the PTO examiner had approved Bergy's four process applications utilizing streptomyces vellosus. From this fact, the majority opinion concluded that if living material was a permissible component of a process claim, it should therefore not be barred from a product claim. This position seemed to expand a long held precedent that a new and useful process could be the subject of a patent but that a product of nature within that process could not. The Court dismissed fears of patents on crossbred animals as "far-fetched" but did not carry the analysis any further than to state that the larger issue was not before the Court.[25] The Court suggested that microbiology was more akin to a chemical reaction than a complex animal. Clearly the Court was attempting to discount the fears about crossbred animals by drawing a distinction between bees and bacteria. In doing so, however, the Court also opened the door to the possibility of patent eligibility based on different levels of life forms. As to the intent of Congress, the Court stated that the Plant Patent Act of 1930 was silent on the question of patentability of microorganisms and that "the collective mind of Congress was not turned in that direction" when it passed the Plant Patent Act.[26] In sum, it was a paper-thin ruling in terms of the vote (3-2) and the substance of the holding.

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[25] *Application of Bergy*, 1038.
[26] Ibid., 1039.

The two dissenting judges focused on the intent of Congress as evidenced by the structure of the patent law. They reasoned that if Congress intended Section 101 of the patent law to be broadly construed to allow for patents on living things, then plants would have been patentable under Section 101 and there never would have been need for Congress to enact the Plant Patent Act. By enacting the Plant Patent Act, Congress demonstrated its intent to extended patent protection for living material only to plants. They cited the legislative history of the Plant Patent Act, saying that it was intended to remove discrimination between plant developers and industrial inventors. That discrimination was an inability to patent plants. The dissenting opinion also challenged the majority's attempt to equate living organisms with chemical compositions such as reactants, reagents and catalysts, claiming that 'living' was fundamentally different from 'inanimate.' In addition, the dissenting justices challenged the notion that using a microorganism in a patentable process logically compelled that the organism itself was patentable. Ultimately, the dissenting justices concluded that whether it was in the public interest to allow patents on microorganisms was a question for Congress and not the courts.[27]

Chakrabarty in the Lower Courts

The *Chakrabarty* case followed closely on the heels of *Bergy*. It presented the Court with nearly identical facts, including a claim for both a new process and a new bacterium. Chakrabarty's area of research was oil spills. Oil spills could be degraded with certain bacteria that act to break oil down into simpler components suitable as food for aquatic life. Numerous forms of bacteria were required to break down the various

[27] Ibid., 1041-1042. "We should fill the statutes with judge-made law only under the gravest and most impelling circumstances."

components of oil. Unfortunately, the different bacteria strains tended to inhibit each other's growth when mixed together and thus compromised their efficiency. Ananda Chakrabarty determined that the information necessary for degradation of oil was carried in only a part of the bacterial cell - by plasmids in DNA separate from the bacterial cell's main chromosome. He developed a method for removing the specific degradative information from four different bacteria and inserting them into a single bacterium. He then combined the new bacterium with a buoyant material so that it would float when applied to oil spills. He applied for three patents: one for the process to create a single bacterium with the properties of several existing bacteria; a second for the resulting new bacterium itself; and a third for the process to mix the bacterium with the buoyant carrying material.[28]

The Chakrabarty application ran the identical gauntlet as the Bergy application. The patent examiner accepted the two process claims but denied the claim for the new bacterium, this time on the grounds that living material was not statutory subject matter under Section 101. The examiners had apparently discarded the 'product of nature' rationale and adopted the reasoning the Board of Patent Appeals set out in *Bergy*. The same Board of Patent Appeals heard Chakrabarty's appeal and upheld the patent examiner's ruling. Chakrabarty appealed to the Court of Customs and Patent Appeals, which followed its decision in *Bergy* by reversing the Board's opinion by the same three

[28] Peter B. Maggs, "New Life for Patents: Chakrabarty and Rohm & Haas Co.," *Supreme Court Review*, vol. 1980 (1980), 58.

to two vote and holding that a new bacterium could be considered a 'manufacture' under Section 101.[29]

The same two judges dissented in the *Chakrabarty* case, but offered a more refined analysis than the one in *Bergy*. The two dissenting judges argued that one could not view a thing as both a product of nature and a product of man. They conceded that there was a middle ground: a modified product of nature. Such modification did not establish patentability until the object's essential nature was substantially altered, however.[30] In support of their position, they cited the Supreme Court's 1930 decision in *American Fruit Growers, Inc. v. Brogdex Co.*[31] In that case, the patent applicants had discovered that Borax was an ideal compound for fighting blue mold on citrus plants, although the reasons were not entirely understood. Borax was a well known substance and all one had to do was dilute it in water and use the water to wash the fruit. The Supreme Court ruled that this was not an invention because the fruit was still fruit before

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[29] *Application of Chakrabarty*, 571 F.2d 40 (C.C.P.A. 1978). Note that the Chakrabarty patent application was actually reviewed by the PTO before the Bergy application. However, Chakrabarty requested reconsideration by the patent office examiner, while Bergy elected to appeal the patent office decision to the next level, the Board of Patent Appeals. Thus, the patent examiner must have ruled on the Chakrabarty application first, presumably rejecting the claim for the new bacteria as a product of nature, and then ruled on the Bergy application on the same grounds. The Chakrabarty application stayed in the patent office for reconsideration while the Bergy application went to the Board of Patent Appeals. By the time the Chakrabarty application came up for reconsideration, the Board of Patent Appeals had ruled on the Bergy appeal and established the new criteria that living material was ineligible under Section 101. It is likely that the patent examiner was waiting for some guidance on the Bergy appeal before reconsidering Chakrabarty. At any rate, when the Chakrabarty application was reconsidered, it was rejected on the new grounds. Bergy was first before the Court of Customs and Patent Appeals in 1977, followed by Chakrabarty in 1978. The Court of Customs and Patent Appeals elected to combine the two cases into one when the United States Supreme Court remanded *Bergy* back to the Court of Customs and Patent Appeals while the same court still had *Chakrabarty* on its docket. It issued its new opinion on both cases in 1979. Interestingly, Chakrabarty's petition for reconsideration before the original patent examiner put forth a compelling argument that the intention of Congress in passing the Plant Patent Act of 1930 was to address the fact that plants could not be described in the patent specification required under Section 112 of the patent law. Chakrabarty argued that the Plant Patent Act represented no expression of any kind by Congress on the subject of patentability of living materials. This argument was not addressed or commented on in any way but would later form the basis of the holding in *Ex Parte Hibberd*, 227 USPQ 443 (Bd. Pat. App. 1985) discussed below.

[30] Ibid., 45-47.

[31] *American Fruit Growers, Inc. v. Brogdex Co.*, 283 US 1 (1930).

and after washing. It was simply better protected against disease. The applicant had not invented, isolated or purified the fruit or the borax.[32] The dissenting justices in *Chakrabarty* argued that, in similar fashion, Chakrabarty had taken an organism that was suitable for digesting oil and had grafted onto it an extra plasmid, thus making it even better at digesting oil. He had not, however, changed the organism's essential nature. Therefore, the rule the Supreme Court established in *American Fruit Growers* should apply. Moreover, the dissenting justices cautioned that the nature of Chakrabarty's work with oil spills and its potential for society should not be a factor in determining the intent of Congress. It was better left to Congress to determine if Chakrabarty's breakthrough warranted a change in the law.

As to the argument that the Plant Patent Act was enacted simply to get around the problem of adequately describing the invention, the dissenting justices claimed that such an argument made sense only if plants were *already* patentable subject matter under Section 101 but difficult to patent because they were ill-suited to the description requirement. If the only problem in 1930 had been the description requirement then Congress need only have amended that particular section of the law in order to ease the description requirement when the patent application was for a plant. Instead, Congress enacted an entirely new law with a new description section.

Bergy Remanded

While the Court of Customs and Patent Appeals was applying its *Bergy* logic to the *Chakrabarty* facts, the Patent Office appealed the decision in *Bergy* to the United

[32] See also, *Hartranft v. Wiegmann*, 121 US 609 (1887). This was not a patent case but it offered the same rationale. It held that the application of labor to an article, by hand or mechanism, did not make it a manufactured article. Thus, polished seashells were still seashells in the same sense that ginned cotton was still cotton. One did not 'manufacture' cotton by ginning it.

States Supreme Court. The Supreme Court did not issue an opinion. Instead, it vacated the ruling of the Court of Customs and Patent Appeals and remanded the case for further consideration in light of the Supreme Court's recent holding in *Parker v. Flook*, which had been decided four days before *Bergy*.[33] In light of this directive, the Court of Customs and Patent Appeals voluntarily vacated its similar ruling in *Chakrabarty* and engaged in a new review of both applications.

The case that prompted the United States Supreme Court to vacate the *Bergy* ruling was the patent case of *Parker v. Flook*, decided on June 22, 1978, by a vote of six to three.[34] The *Parker* case did not present the Supreme Court with a patent application on living material but rather a patent on a law of nature in the form of a mathematical formula. In *Parker*, a patent was sought for a unique mathematical formula used in setting alarm limits for catalytic converters. A previous Supreme Court case, *Gottschalk v. Benson* had established the general rule that a unique mathematical formula could only be discovered, not patented.[35] The difference between *Benson* and *Parker* was that Benson had applied for a patent on a mathematical formula *per se.* In *Parker*, the patent was sought only for a single useful application of a mathematical formula. In other words, Benson had sought licensing rights to all uses of a formula in all situations, whereas Parker sought rights to a formula only when used in a process to calculate alarm limits in catalytic converters. Nevertheless, the Supreme Court upheld the rule in *Benson* and affirmed the decision to deny Parker's patent application. The Court held that setting alarm limits for catalytic converters was not new or unique and it could be accomplished in other ways. The only thing novel about Parker's new process was the mathematical

[33] *In re Bergy*, 438 U.S. 902 (1978).
[34] *Parker v. Flook*, 437 U.S. 584 (1978).
[35] *Gottschalk v. Benson*, 409 U.S. 63 (1972).

formula used to achieve the same result and mathematical formulas were not patentable subject matter under Section 101 of the patent law.

Parker had argued that he was not seeking exclusive rights to the mathematical formula, but only for a single application of the formula. The Supreme Court found Parker's position to be an argument of form over substance. For example, one could not patent the Pythagorean theorem on the grounds that the patent was limited to instances where the theorem was used to solve surveying problems.[36] The Court conceded that a process was not rendered ineligible for a patent simply because it utilized a law of nature or an algorithm. In order to obtain a patent, however, the process *itself* had to be new and useful, not just the algorithm within the process. New math formulas were discoveries, but not the kind of discovery that public policy sought to protect. In a statement that would later be cited against it, the Supreme Court said that it must proceed cautiously when asked to extend patent protection to areas not foreseen by Congress when it enacted the law.[37]

The three dissenting justices in the *Parker* case opined that Parker had presented facts far different than Benson. The issue in *Parker* was whether a process patent application lost its eligibility because one step in the process was not patentable. The dissenters accused the majority of importing a standard of novelty and inventiveness into Section 101 of the patent law, which should be concerned only with patentable subject

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[36] *Parker v. Flook*, 590. Interestingly, the Court also expressed concern over the impact of a contrary decision on the emerging computer software industry, which relied heavily on mathematics in writing new software. In dicta, the court noted that it made no comment on the patentability of computer programming. That was a job for Congress. Like the recombinant DNA industry, the computer industry was bursting with economic potential and the court was clearly mindful of the possibility of disrupting the new industry. Ibid., 595.

[37] Ibid., 596.

matter. The process claim might be defeated on numerous grounds, but Section 101 was not one of them.

With the *Parker* opinion freshly in hand, the Court of Customs and Patent Appeals combined the Bergy and Chakrabarty applications and undertook a fresh review. Upon reconsideration, the Court reached the same conclusion - that a purified product of nature otherwise patentable under Section 101 of the patent law was not disqualified from eligibility because it was alive. This time, the vote was 4-1 vote.[38] In its new opinion, the Court of Customs and Patent Appeals indicated that it would wipe the slate clean and start over with its analysis. The result was an excellent tutorial on the application of the United States patent law.

First, the Court noted that there were no standards for patentability in the United States Constitution, but simply authorization for Congress to act if it so desired. Second, the major revision of the Patent Act in 1952 organized the criteria for patentability into three sections:

Section 101 – patentable subject matter.

Section 102 – novelty (so as not to take from the public something it already owns).

Section 103 – non-obviousness (so as not to take from the public something it could potentially enjoy through application of knowledge it already had.)

The Court characterized this structure as three doors through which an applicant had to pass in order to obtain a patent. To get through the first door, one had to have a process, machine, manufacture, composition of matter or some improvement thereon. To

[38] *Application of Bergy: Application of Chakrabarty*, 596 F.2d 952 (C.C.P.A. 1979).

get through the second door, it had to be something new. To get through the third door, it had to be non-obvious when compared to the prior art.

The Court of Customs and Patent Appeals expressed some frustration at the United States Supreme Court for confusing the three sections in its analysis in *Parker*. Unlike Sections 102 and 103, Section 101 was not a standard. It was simply a list of eligible categories of things that a person could try to patent if he could comply with the conditions for patentability in Sections 102 and 103. The Court of Customs and Patent Appeals feared that the United States Supreme Court, as well as the parties filing appellate briefs, had used language and precedent relating to patentability when examining issues of eligibility. [39]

Referring to the Bergy application, the Court stated that the nature of the patent law was to stimulate the creation of new technologies. Therefore, one should not argue that living material was *per se* excluded under Section 101 simply because Congress did not contemplate it when the statutory language was drafted. The goal of the patent law was to encourage the creation of new things that no one previously contemplated. The fact that no one had contemplated them is what made them patentable in the first place. Therefore, if Bergy had invented something truly new and useful, he should not be denied a patent simply because the thing he invented happened to be alive.

The Court noted that the Section 101 phrase 'any new' had been in the statute since its inception in 1793.[40] The Court then observed that the list of things never contemplated by Congress in 1793 was nearly endless. In *Bergy* and *Chakrabarty*, the

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[39] Ibid., 959. The Court of Customs and Patent Appeals, apparently felt some frustration at the higher court's pronouncements, stating: " . . . we find in *Flook* an unfortunate and apparently unconscious, though clear, commingling of distinct statutory provisions which are conceptually unrelated." Ibid.
[40] Ibid., 973.

thing being contemplated was molecular biology.[41] The Court offered no comment on whether living material could pass the tests set out in Sections 102 or 103 of the patent law. Thus the case before the Court was decidedly not about patentability of living material, but about whether living material is in a category of things eligible for consideration. Clearly, with this reasoning, the Court was framing the conflict between the logical and practical goal of the patent law to stimulate new and useful things, and a long standing societal assumption that life processes were simply off limits in commercial enterprises.

As for the Plant Patent Act, the Court concluded that the law should not stand as a congressional drawing of a strict boundary on the patentability of living things. The Court concluded that it was special interest legislation introduced at the behest of plant breeders. Moreover, one could not imply the intent of the 1874 Congress that enacted the original version of the modern Patent Act, from the actions of the 1930 Congress that enacted the Plant Patent Act. The Plant Patent Act dealt specifically with plants and was not intended as a position statement on living things. In addition, the motivation behind the Plant Patent Act was to spur growth in an agricultural industry that had been badly hurt by the Great Depression. It was also to help amateur plant breeders by extending patent protection into a non-industrial area. Finally it was enacted to avoid the previous judicial position that plants were things of nature and thus not subject to patent protection. The Court also noted that Louis Pasteur obtained a patent on yeast in 1873.[42]

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[41] Ibid., 974. The court tipped its hand somewhat by citing favorably from the amicus brief filed by Genentech, which observed that bacterial organisms are capable of producing human hormones, thus opening the door for drugs to treat diseases previously untreatable. This fact alone, while relevant to the Section 102 question of novelty, should have been irrelevant to the court's Section 101 analysis of patentable subject matter and yet it was mentioned, as if to justify the court's action.

[42] Ibid., 985. The court cited to a 1966 research paper that listed multiple instances where the PTO had awarded patents on things such as bacteria, yeast and virus vaccines between 1933 and 1963. The court

Judge Baldwin, who had previously dissented, voted with the majority but wrote his own concurring opinion. He modified his former dissent based on the Supreme Court's holding in *Parker*. He stated that *Parker* established a rule that one could not patent a mathematical principle because a mathematical principle was a fundamental truth. The rule for *Bergy* and *Chakrabarty* should therefore be: What is the basic principle that makes their invention valuable and are they trying to preclude others from using that basic principle? He concluded that Bergy and Chakrabarty were not seeking to patent a basic principal in nature because the things they were using did not occur in nature. Thus, they relied on nature but did not try to patent it. The remaining vote, Judge Miller, continued to dissent. He stated that, if there is a basis for doubt over the intent of Congress, the Court should await a clear signal from Congress.

In sum, the three opinions were disjointed, non-harmonious and cried out for resolution. More importantly, the majority opinion essentially threw down a gauntlet before the Supreme Court. Without saying it bluntly, the majority appeared to be questioning whether the clear language of a statute should yield to a Judeo-Christian tenant that any life function is within the exclusive province of nature or a creator. The opinion of the Court of Customs and Patent Appeals challenged the Supreme Court to square the American values of economic reward for creativity and sacredness of life. The limits of science and technology had allowed these two values to exist in harmony but advancements were bringing them into conflict. The Supreme Court ultimately

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concluded that it could hardly be viewed as expanding the patent law in light of the existence of those patents. The long and unchallenged existence of these patents could be no more complex than a patent examiner who did not appreciate (or perhaps did not agree with) the nuance of living vs. inanimate. This, combined with the fact that these patents were apparently never challenged in court, probably allowed them to lay dormant over the years. The Supreme Court gave these facts passing mention as well but they did not play a significant role in the opinion. Ibid., 985, n. 116.

sidestepped the opportunity, elected instead to offer a very narrow ruling but one that cracked open the patent door.

The United States Supreme Court settled the issue in narrow legal terms by a five to four margin. The majority ruled that a live human-made organism was patentable subject matter under Section 101 of the Patent Act. The Court reasoned that the use of the word 'any' in Section 101 of the patent law was to be given a broad reading, up to and including living material. In fact, the majority concluded that the issue presented was not properly captioned as one of living vs. inanimate material. Rather, *Chakrabarty* presented an issue of product of nature vs. human invention.[43] The Supreme Court ruled that a bacterium was in the category of patentable subject matter because it was the product of human invention. Thus, the issue of living or inanimate did not require analysis. The majority opinion rejected the argument that the Plant Patent Act of 1930 represented a statement by Congress on the patentability of living material. The Court stated that prior to 1930 the Patent Office viewed plants as products of nature based on rulings that dated back to 1889 when it rejected a claim for fibers found in pine needles.[44] Also problematic for the Patent Office was the fact that plants were simply not amenable to the description requirements in the patent law. The Plant Patent Act of 1930 addressed both issues. The majority dismissed reference to a 1930 letter from U.S. Secretary of Agriculture, Henry Hyde, who stated that the Plant Patent Act was needed because patent laws were at present understood to control only inanimate nature.[45] Instead, they emphasized the House and Senate Committee Reports, which justified the 1930 law on the grounds that a new plant resulting from breeding was unique, isolated and not producable or repeatable

[43] Ibid., 308, 313.
[44] Ibid., 311.
[45] Ibid., 312.

by nature. Moreover, the Court stated that the object of the patent system was to bring new technology into the public domain and thus have a positive impact on both society and the economy "by way of increased employment and better lives for our citizens."[46]

The majority opinion declined to offer any guidance on the larger issue of patenting living material. The majority specifically noted that its ruling addressed only the question of whether living material was eligible for patent protection. As to the other gatekeepers in the patent law, such as the requirement that patents be novel and not obvious based on prior art, the Court made no comment. The Court, in essence, directed the Patent Office not to rule living material per se ineligible, but left the Director's discretion intact to determine if living material could pass muster against the remaining patent qualification.[47]

The four dissenting justices argued that Congress had specifically addressed animate invention in the Plant Patent Act of 1930 and the Plant Variety Protection Act of 1970 and had drawn a very clear line on the subject. The existence of the two acts clearly demonstrated to the justices that living organisms were not contemplated as patentable subject matter in the patent law. Otherwise, the Plant Patent Act and the Plant Variety Protection Act would never have been necessary. The dissenting justices concluded that the majority opinion extended patent subject matter to living material while Congress had clearly excluded it.[48]

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[46] Ibid., 307.
[47] Ibid., n.5. For example, it would have been plausible to decline living material on the grounds that it was not novel under Section 102 of the patent law.
[48] Ibid., 322. The dissenting opinion should not be interpreted as opposition to patentability of living material any more than the majority opinion favored it. The dissenters simply asserted that the decision on such an emotional and fundamental issue was more properly made by Congress than by the court. Similarly, the majority stressed the right of Congress to immediately pass legislation prohibiting patents on living material if it so chose. See, Ibid., 318.

Chakrabarty and the Burger Court

The Court's ruling in Chakrabarty represented a significant repositioning of living material as an economic asset consistent with the general philosophy of patent law, which rewarded utility and originality and did not concern itself with social policy. The Supreme Court deferred to Congress and the Patent Office to place any additional limitations on patents for living material, an opportunity neither entity elected to exploit. Thus, the Justices of the Court's 1980 term made the critical decision, whether indented or not. The circumstances of the timing greatly favored the philosophy that living material could be the subject of patents.

The President nominates United States Supreme Court justices subject to Senate approval. Since the justices receive a lifetime appointment, there is no guarantee that a sitting President will have the opportunity to name a justice to the Supreme Court. If this opportunity presents itself, however, the President can select a jurist whose track record of votes and opinions matches the President's political philosophy. Research shows that ninety percent of Supreme Court justices share the political party of the appointing president and that courts tend to follow the philosophy of the dominant political party.[49] Therefore, the political philosophy within the Executive Branch of government can be carried over to the Judicial Branch when it has the opportunity to make a Supreme Court appointment, although this is not always the case. For example, President Eisenhower nominated Earl Warren, a former Republican governor of California, as Chief Justice of the United States in 1953. One hallmark of this era was the Warren Court's landmark

[49] John B. Gates, *The Supreme Court and Partisan Realignment* (Westview Press, 1992), 12.

decisions on civil rights and personal liberties, particularly school segregation and criminal procedure.[50]

Richard Nixon was elected President in 1968.[51] Between the election of Richard Nixon and the 1980 decision in *Diamond v. Chakrabarty*, Republican presidents made five appointments to the Supreme Court. President Nixon alone made four appointments in four years. This was a key event in redefining the United States Supreme Court and its philosophy.[52] In the space of thirty months, the political profile of the Court transformed from one dominated by six liberal justices to one comprised of three liberal, two moderate and four conservative justices.[53]

The make-up of the United States Supreme Court at the time of its 1980 decision in *Diamond v. Chakrabarty* was as follows:[54]

NAME	TERM	PARTY	APPOINTED BY
Burger, C.J.	69-86	R	Nixon

[50] *The Burger Court: Political and Judicial Profiles,* ed. Charles M Lamb and Stephen C. Halpern (Urbana: University of Illinois Press, 1991), 2.
[51] Ibid., 3.
[52] Ibid., 6.
[53] Ibid., 18
[54] Ibid. The transition of the Supreme Court from a fundamentally liberal to a fundamentally conservative body was set in motion when Chief Justice Earl Warren submitted his resignation to Lyndon Johnson prior to the 1968 presidential election. Commentators assumed that Johnson would nominate sitting justice Abe Fortas for Chief Justice and then nominate another liberal justice to fill Fortas' vacant seat. Fortas was a close friend and advisor to Lyndon Johnson. Bob Woodward and Scott Armstrong, *The Brethren: Inside the Supreme Court* (New York: Simon and Schuster, 1979), 16. This friendship, combined with the eleventh-hour nature of the nomination, subjected Johnson to a barrage of criticism and allegations of cronyism. Fortas ultimately withdrew his name from consideration. He was soon under new scrutiny when *Life* magazine reported that he had accepted an annual lifetime retainer of $20,000 from a private foundation whose founder was subsequently indicted for SEC violations in 1966. Fortas additionally resigned his Supreme Court seat under threat of prosecution. Ibid, 18-20. Thus, instead of inheriting a liberally packed court, incoming President Richard Nixon, who had run against the Warren Court nearly as much as he had run against Hubert Humphrey, inherited a Supreme Court with two empty seats. Ibid, 10. Nixon filled those seats with Warren Burger (replacing Earl Warren in 1969) and Harry Blackmun, a childhood friend of Burger's (replacing Abe Fortas in 1969). Nixon filled two additional vacancies with Lewis Powell (replacing Hugo Black in 1972) and William Rehnquist (replacing John Marshall Harlan in 1972). The trend continued with Gerald Ford, who appointed John Paul Stevens (replacing William O. Douglas in 1975). Ibid.

Stewart	58-81	R	Eisenhower
Blackmun	70-94	R	Nixon
Rehnquist	72-04	R	Nixon
Stevens	75-	R	Ford
Brennan	56-90	D	Eisenhower
White	62-93	D	Kennedy
Marshall	67-91	D	Johnson
Powell	72-87	D	Nixon

Burger authored the majority opinion, joined by Stewart, Blackmun, Rehnquist and Stevens. Republican presidents nominated all five. Brennan wrote the dissenting opinion, joined by White, Marshall and Powell. Democrat presidents nominated all four The fact that three of the four dissenting justices (Brennen, White and Marshall) were alumni of the Warren Court suggests that the decision may well have gone against Chakrabarty if the Warren Court had heard the case.

Warren Burger was a lifelong moderate Republican. President Eisenhower nominated him for the United States Court of Appeals in 1955.[55] His body of work made clear that he was an ardent critic of the Warren Court, especially in the area of criminal jurisprudence. While Burger proved to be extremely conservative in his opinions on the Court, one essayist described him as neither a philosopher nor a deep thinker. His Supreme Court opinions were workmanlike, short on constitutional theory and long on fine points required to dispose of cases.[56]

Legal commentators fully expected that the Burger Court would undo much of what the Warren Court had established. This complete overhaul never came to pass however. Burger turned out to be a micro-manager who annoyed and offended his

[55] Bob Woodward and Scott Armstrong, *The Brethren: Inside the Supreme Court* (New York: Simon and Schuster, 1979), 10.
[56] Charles M. Lamb, "Chief Justice Warren E. Burger: A Conservative Chief for Conservative Times," in *The Burger Court*, ed. Lamb and Halpern, 158.

colleagues on the bench. The other justices never coalesced under his leadership as the Warren Court justices had under Felix Frankfurter and John Marshall Harlan.[57] Justices Blackmun and Stevens proved to be moderate and independent while Lewis Powell was somewhat unpredictable. As a result, there were not five dependable conservative votes on the bench during the Burger era.[58]

The Burger Court was a court of constantly shifting coalitions that offered little lasting guidance for courts, legislators or the public.[59] Out of fifty major rulings in the Supreme Court's 1980 term, thirty-four (including *Chakrabarty*) were decided by one vote, compared with nine one-vote majorities in the final term of the Warren Court (1968-69).[60] Many scholars assigned the relative blandness of the Burger Court to the quality of its justices. There were four 'polar' justices on the Court: Burger and Rehnquist on the right and Brennan and Marshall on the left. The remainder of the Court was centrist and unpredictable.[61] One cannot say that the Court that produced *Roe v. Wade* was completely void of activism but essayists argue that it was a rootless activism. Even *Roe v. Wade* was an exercise in finding a compromise between a woman's right to avoid an unwanted pregnancy and the state's rights to protect life and health of the mother and the fetus.[62] This, ultimately, was the legacy of the Burger Court. It consistently avoided legitimizing or discrediting basic ideas.[63] It dealt with cases on an ad

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[57] Bennet H. Beach, "Nine Minds of its Own: At Term's End, the Burger Court Still Defies All Labels," *Time*, 21 July 1980, 75-76.
[58] *The Burger Court*, ed. Lamb and Halpern, 10.
[59] Ibid.
[60] David F. Pike, "Blurred Signals from the Supreme Court," *U.S. News and World Report*, 21 July 1980, 60.
[61] Bernard Schwartz, *The Ascent of Pragmatism: The Burger Court in Action* (Reading: Addison-Wesley Publishing Company, Inc., 1990), 400 – 401.
[62] Ibid., 410.
[63] Vincent Blasi, "The Rootless Activism of the burger Court," in *The Burger Court: The Counter-revolution That Wasn't*, ed. Vincent Blasi (New Haven: Yale University Press, 1983), 216.

hoc basis, inspired less by moral vision than by pragmatism. Fundamental value choices were more often avoided than made. As result, the Burger Court tended to craft practical compromises rather than statements of moral force.[64]

Chakrabarty stands as a clear example that the Burger Court did not have the personnel, leadership or cohesiveness to develop and pursue any ideological agenda as to the proper place of living material within the patent law.[65] *Chakrabarty* is a careful, narrow and practical compromise. The Court took no stand on the fundamental question of who should be allowed to own living material. It does not explore the idea of what it means to be 'alive' and how this should be woven into the nation's diverse values and interests. The Court simply stated that one section of the patent law could not be a barrier to an application that happened to involve biological material. It is a pragmatic decision based on individual facts and not on any rigid philosophy.

It appears that recombinant DNA and similar technologies were both beneficiaries and victims of the Burger Court. The argument in favor of patentability Chakrabarty presented was well suited not only to the Burger Court in general, but to the Burger Court as it existed in 1980. Although the Burger Court was more than willing to test the legality of regulatory actions by government agencies, which were somewhat more hallowed prior to 1969, it decided few regulation cases that had any effect beyond the specific agency and the specific statute at issue.[66] There is a longstanding legal theory that agencies are expected to be given deference in their interpretation of the statutes under

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[64] Ibid., 212.
[65] Ibid., 413.
[66] Alan B. Morrison, "Close Reins on the Bureaucracy: Overseeing Administrative Agencies," in The Burger Years: Rights and Wrongs in the Supreme Court 1969-1986, ed. Herman Schwartz (New York: Viking, 1987), 192.

which they operate.[67] The underlying assumption is that the statutes are technical and the agency that enforces them is the most experienced and qualified in interpreting them. Prior to 1984, the Burger Court appeared to believe that court interpretation of statutes should prevail over agency interpretation. After 1984, the Court ruled that agency interpretations should stand if they were reasonable and if Congress had not spoken explicitly on the issue.[68] In this sense, Chakrabarty was a beneficiary of good timing in that his case came before the Court at a time when it was less deferential to agency decisions.

In addition, the Chakrabarty issues came before a court that valued economic practicality. The Warren Court had generally embraced an expansive view of anti-trust policy. It believed that the anti-trust laws existed to protect small businesses and to foster competition. The Burger Court, by comparison, was disdainful of competitive equality and wedded to the concept of economic efficiency.[69] Whereas the Warren Court was inclined to label a business practice per se illegal, regardless of economic effect, the Burger Court embraced a rule-of-reason philosophy that allowed a practice to be defended based on its economic impact.[70] The Burger Court similarly gave narrow readings to consumer protection aspects of the federal securities laws.[71] While neither an anti-trust case nor a securities case, the Chakrabarty patent and others waiting in line clearly presented massive economic potential and Chakrabarty could only have benefited by having his case heard before a court that valued economic and business efficiency.

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[67] Ibid., 196.
[68] Ibid., 197.
[69] Jerry S. Cohen and Herbert E. Milstein, "The Burger Court and Business," 208.
[70] Ibid., 209.
[71] Ibid., 215.

This is reflected in the language of the decision.[72]Balancing the benefits to the industry was the failure of the Burger Court to make a definitive statement regarding a profound issue: The proper place of living matter in American economic policy. While the Supreme Court's ruling in *Chakrabarty* was a watershed event for patent law, the ruling itself was very careful and limited.[73]

The press following the 1980 term of the Supreme Court illustrated the frustration and confusion with its seeming timidity. *Newsweek* complained that the Supreme Court contented itself with a piecemeal approach, trying to publish narrow judicial decisions, not philosophical tracts.[74] There was no guidance on controversial issues.[75] Other commentators suggested that the Court was simply trying to hide that fact that it was confused on matters of constitutional interpretation so it simply avoided them. It replaced broad examination of moral standards with narrow agreements based on highly detailed judgments about particular situations. When each case seemed to turn on what the justices thought was appropriate for that particular fact situation, little that was said by the Court in one decision bound it in the next. The Court tried so hard to avoid meddling in people's affairs that it left the people without benchmarks.[76] This is evident in *Chakrabarty*. Rather than offer a sweeping treatise on the patentability of life, the Burger

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[72] Quoting from its opinion in *Kewanee Oil Co. v. Bicron Corp.* the court said: "[The object of the patent system is foster productive effort that] will have a positive effect on society through the introduction of new products and processes of manufacture into the economy and the emanations by way of increased employment and better lives for our citizens." *Diamond v. Chakrabarty*, 307.

[73] The fact that Burger assigned the *Chakrabarty* opinion to himself suggests that he thought it an important opinion. Nearly all of the general historiography on the Burger court that was reviewed for this thesis ignores *Chakrabarty*. In fact, no book was found that listed *Chakrabarty* among the court's landmark decisions with the exception of a volume of cases selected by Burger himself. Unfortunately, that volume simply re-prints the case with no commentary from Burger. See, *Significant Supreme Court Opinions of Chief Justice Warren E. Burger*, ed. Warren Burger (Manila: The Philippine Bar Association, 1984). Nevertheless, *Chakrabarty* can easily be viewed as illustrative of the overall pattern of the Burger court.

[74] Diane Camper, "The High Court's Grand Finale," *Newsweek*, 14 July 1980, 22-25.

[75] Ibid.

[76] Rupert F. Nagel, "A Plague of Judges: The Burger Court's Secret plan for America," *The Washington Monthly,* vol. 12, no.9 (November 1980), 20-24.

Court simply removed one of several potential impediments in the patent law, leaving the others firmly in place. As for those, the Court offered no guidance. Nevertheless, the entire patent apparatus was opened up to biological material and it readily succumbed to the momentum. *Chakrabarty* came before the right court at the right time and the result tipped the scale just enough for momentum to take over.

The Impact of the *Chakrabarty* Ruling

The original application for the Chakrabarty patents had been filed in 1972 and had been wending its way through the appeals system for eight years. During that time, the Patent Office had adopted a policy of denying applications for patents of living material but holding the applications in suspense so that the applicants could maintain their filing dates if the United States Supreme Court should ultimately rule in their favor. As a result of this policy, the Patent Office had been accumulating a significant stack of patent applications in the field of biotechnology. Despite the Court's deferral to the Patent Office regarding its power to throw up more roadblocks, the Patent Office apparently decided in the wake of *Chakrabarty* not to pursue the issue any further. The Patent Office promptly released one hundred and fourteen pending patent applications including the rDNA applications of Stanford University and Genentech.[77] Congress similarly declined to step in and moderate the Court's decision. In fact, it jumped squarely on the economic development bandwagon and passed laws to enhance the impact of *Chakrabarty*.

Genentech hailed the Supreme Court decision as assuring the country's technological future. Critics claimed that the Supreme Court had transformed Aldous

[77] Harold M. Schmeck, Jr., "U.S. to Process 100 Applications For Patents on Living Organisms," *The New York Times*, 18 June 1980, 22(A).

Huxley's *Brave New World* from science fiction to reality.[78] Commentators were mixed on whether the true value of the research lay in the process patents or the product patents. A spokesperson for investment banker E. F. Hutton noted that the "sheer psychology" of the assurance of patent protection for all phases of genetic research, including the resulting bacteria, would be an important step in moving laboratory advances into the commercial arena.[79]

On the strength of *Chakrabarty*, biotech corporations enjoyed a new standing that clearly enhanced their value beyond the precautionary investments of industry giants. Genentech responded to *Chakrabarty* with an initial public offering (IPO) on October 14, 1980. The founders of Genentech, Robert Swanson and Herbert Boyer, had each put up five hundred dollars in seed capital in January 1976. Between its founding and the initial public offering, Genentech's track record amounted to $700,000 in losses and no marketable products. Twenty minutes after the markets opened on October 14, 1980, Boyer and Swanson had each earned $82 million dollars. Genentech stock opened at $35 dollars per share, hit $89 dollars per share and closed at $71.25. At the closing bell, Genentech's market value was $529 million dollars.[80] Market analysts called Genentech's IPO the most striking price explosion in the past ten years. After one week of heavy trading, the stock stabilized at $56 per share. At its peak, Genentech had a market value of $650 million dollars, the same as Chrysler and about one third the size of Monsanto. Even when its stock had settled down to $56 per share, Genentech had a larger

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[78] Linda Greenhouse, "Science May Patent New Forms of Life, Justices Rule, 5 to 4," *The New York Times*, 17 June 1980, 1(A).
[79] Anthony J. Parisi, "Gene Engineering Industry Hails Court Ruling as Spur to Growth," *The New York Times*, 17 June 1980, 16 (D).
[80] Nicholas Wade, "Gene Splicing Company Wows Wall Street," *Science*, 31 October 31, 1980, 506-507.

market value than American Airlines.[81] Recombinant DNA emerged as one of the hottest investment fields of the 1980's. Venture capitalists scoured college campuses for scientific brainpower. The world's best molecular biologists resided at university research labs and most of them had ties to private companies by 1980.[82] Seven companies were working in the field of recombinant DNA at the time. The big pharmaceutical and chemical companies expanded their in-house research and partnered with or purchased interest in those companies.[83]

Critics continued to question the public safety of rDNA technology. For example, they argued, the *absence* of the Chakrabarty microorganism in nature contributed to the ability of oil to lubricate moving parts. Was it wise, then, to introduce into nature a bacterium that degraded oil's most useful function?[84] Commentators also offered broader critiques of the ethical and moral implications of the Court's decision. Writing for the *New York Times* the week after the *Chakrabarty* decision, Harold Morowitz, professor of molecular biophysics and biochemistry at Yale, bemoaned the casual manner in which the Court had acted on an issue of such gravity. He believed that the nation as a whole would have been much better off considering the deep philosophical implications of what the Court had done. The Court, in his opinion, had brushed aside thousands of years of awe and respect for life that dated to pre-biblical times. He believed that the Court had not made a narrow decision on patent law. Rather, it had altered the view of humanity

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[81] "Spliced Genes Make Splash on Market," *Science News*, 25 October 1980, 261.
[82] Harold M. Schmeck, "Justices; Ruling Recognizes Gains In the Manipulation of Life Forms," *The New York Times*, 17 June 1980, 16 (D).
[83] Gene Bylinsky, "DNA Can Build Companies, Too," *Fortune*, 16 June 1980, 144-154. For example, sixty percent of Cetus Corporation of Berkeley was owned by Standard Oil and the National Distillers and Chemical Corporation. Genentech was half owned by Monsanto, Emerson Electric and Lubrizol. Biogen was sixteen percent owned by Schering-Plough and twenty four percent owned by International Nickel. See, Parisi, "Gene Engineering Industry Hails Court Ruling," 16 (D).
[84] Susan Walton, "Supreme Court Decision Gives New Life to Old Issues," *BioScience*, vol. 30, no. 9, (September 1980), 573-575.

and done so in a way that cut off a grand philosophical debate by making it the law of the land that living material was for sale.[85]

The upsurge in commercialization dampened such questions. University research in the area of biotechnology suddenly achieved a new value. Its accomplishments, however, were partly the result of billions of dollars of public funding dating back to the Public Health Act of 1944.[86] Chakrabarty and his like represented the final steps in a long series of developments which had been facilitated at taxpayer expense. The public suddenly faced the prospect of buying the fruits of research it had funded since mid century. Five years after *Chakrabarty*, the Court of Patent Appeals held in *Ex Parte Hibberd* that there was no conflict between the Plant Patent Act, the plant Variety Protection Act and the original patent statute.[87] Thus, the Patent Office could award a traditional patent to a new plant variety. This ruling essentially converted the patent law and the plant laws into options with different application requirements and different protections. Researchers could choose which route they wanted to take rather than be directed a specific route based on the nature of the material. The ruling in *Hibberd* dramatically expanded the potential for commercial use of plants.

Congress Jumps on the Economic Bandwagon

A few months after the Supreme Court's decision in *Diamond v. Chakrabarty*, Congress took a significant step in expanding the commercial potential of rDNA technology for universities, where much of the research was still taking place. In doing so, Congress combined three powerful factors into one economic machine: private

[85] Harold J. Morowitz, "Reducing Life to Physics," *The New York Times,* 23 June 1980, 23 (A).
[86] Susan Walton, "Supreme Court Decision Gives New Life to Old Issues," *BioScience*, vol. 30, no. 9, (September 1980), 573-575.
[87] *Ex Parte Hibberd*, 227 USPQ 443 (Bd. Pat. App. 1985).

business, the university research laboratory and public money.[88] Congress passed the Bayh-Dole Act on December 12, 1980.[89] The new law gave small businesses and non-profit organizations the right to hold patents on inventions created with the help of federally funded research, creating a significant new incentive for universities and small businesses to engage in practical and commercially useful research. The Act allowed the government contractor, the funding agency and the inventor an opportunity to seek patent protection before a government-funded discovery could be given over to the public. A small business or non-profit could notify the government of its election to retain title to an invention made possible in whole or part with federal funds.[90] The federal funding agency was then given a nonexclusive, nontransferable, irrevocable, paid up license to

[88] During and following the Second World War, the United States engaged in vast federal funding of research which gave rise to the issue of how best to deal with government funded and owned inventions. In 1945, President Roosevelt's National Patent Planning Commission recommended that the government make its inventions available to anyone for commercial use with the proviso that government agencies would have authority to grant exclusive licenses as warranted by individual circumstances. As for inventions by government funded contractors, the Commission generally recommended against full government ownership except where national security was at issue. The Attorney General offered a counter position in 1947, recommending that the government hold full title to all inventions of government employees and contractors. If nonexclusive licensing did not provide enough incentive for the private market, the government should finance the development and marketing of government-owned patents rather than granting an exclusive license to a private third party. This, of course, would have resulted in a sort of nationalization of emerging technologies and placed the government in the position of a public vendor of goods. Presidents Kennedy, Nixon and Carter all struggled with how to handle commercially viable property owned by the government. In 1963, President Kennedy issued a memorandum to government agency heads, authorizing them to grant exclusive licenses on government-owned patents if they deemed it necessary in order to call forth adequate private risk capital to bring an invention to the point of practical application. This apparently did not result in the shelves being cleared of inventions. A 1968 report advised that utilization of government-funded patents was 23.8% when the government-funded contractor was allowed to hold title to its invention and 13.3% when it was not. In 1971, President Nixon issued a second memorandum that clarified the authority of government agencies to grant exclusive licenses and also to revoke previously granted non-exclusive licenses in order to grant exclusive licenses. The Nixon memorandum was promulgated into federal regulations in 1973. Both Ralph Nader and the Department of Justice challenged the regulations on the grounds that there was no legislative authority to support the action. The courts dismissed the lawsuits on procedural grounds, leaving the issue unresolved. In 1978, President Carter recommended that commercial rights to government-funded research be transferred to the private sector through title or exclusive license, subject to retention of a non-exclusive license by the government. This was close to the ultimate resolution embodied in the Bayh-Dole Act. See, Rebecca S. Eisenberg, "Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research," *Virginia Law Review,* no. 8 (November 1996), 1672-1689.

[89] Pub.L. 96-517, codified at *U.S. Code*, 35 (2000) §§ 200-212.

[90] *U.S. Code*, 35 (2000) § 202(a).

practice the invention worldwide.[91] As a result, rather than the government holding the patent and granting licenses on request, the outside entity held the patent and granted one license to the government (which it presumably never used) and another to its licensee of choice. The sponsors of the Bayh-Dole Act purported to be addressing a problem of government inactivity.[92] The problem, the sponsors expressed, was that the government owned the patent rights to 28,000 inventions that had come as the result of publicly funded research but could not afford to develop and market the inventions and would not grant an exclusive license to private developers. Thus, only four percent of the twenty-eight thousand inventions had been successfully marketed. Supporters described the new law as being in the best tradition of free enterprise.[93] They claimed that even after an invention was complete, the development and marketing costs posed the same issues and required the same incentives. In other words, they were suggesting that the patent process had two distinct phases before the public could benefit from the invention. First, the thing had to be invented. Second, and just as critical, the inventor had to have some incentive to invest in post-invention commercial development. It was in this second phase that the government lacked the resources to be effective. As a result, government-owned patents were collecting dust.[94] Opponents to the bill argued that the remaining ninety six percent

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[91] *U.S. Code*, 35 (2000) § 202(c)(4).
[92] 96th Congress, 2nd Sess., *US Cong. & Adm. News*, vol. 5, (1980), 6460-61.
[93] 96th Congress, 2nd Sess., *Congressional Record* vol. 126, pt. 2 (5 February 1980), 1796. Forty members of Congress signed on as co-sponsors and the bill ultimately passed on a 91-4 vote. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 7 (23 April 1980), 8746. The bill was amended in the House and passed on a voice vote. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 22 (17 November 1980), 29901. The Senate made further amendments and the final form of the bill was accepted by the House. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 23 (1 December 1980), 31394.
[94] According to Harry H. Stine, CEO of Stine Seed Company, the public sector, particularly the research universities, simply do not pose a competitive threat to the private seed industry. Universities work 'on the edges' of mainstream seed production, specializing in unique plants for unique needs. They cannot compete with private seed companies because their processes are simply too slow. Even if they obtain a patent, it has questionable value because by the time the seed is finished, it is out of date. Stine, based on its world-wide breeding program, is able to produce a new generation of plant every ninety days, which allows it to

of the twenty eight thousand inventions were sitting on the shelf because they were junk, desired by no one in the private market place. They argued that if the government owned a patent, it should be given to anyone and everyone and they should then compete. Public taxation for private gain, they argued, was wrong. The Act created an outcry over the public's right to benefit from the fruits of publicly funded research. They argued that the public should not pay twice for the same invention and that the law ran contrary basic patent philosophy of creating an incentive for inventors and investors to fund their own research.[95]

A second law, the Stevenson-Wydler Technology Innovation Act of 1980, made technology transfer an integral part of the research and development responsibilities of federal laboratories and their employees.[96] It obligated the head of each federal executive department to transfer to the newly formed National Technical Information Service unclassified scientific, technical and engineering information from federally funded research for dissemination to the private sector, academia, state and local governments and other federal agencies.[97] If the technology resulted in a patent, the royalties were to be shared with the federal agency and individual inventor within that agency. This helped to get government created research into the hands of academic and private researchers to hopefully improve and extend.

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focus on small incremental gains. These observations underscore the importance of financial resources in breeding success, especially after the biotechnology revolution. Author interview, Harry H. Stine, 12 July 2011.

[95] 96th Congress, 2nd Sess., *US Cong. & Adm. News*, vol. 5 (1980), 6511-12. Forty members of Congress signed on as co-sponsors and the bill ultimately passed on a 91-4 vote. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 7 (23 April 1980), 8746. The bill was amended in the House and passed on a voice vote. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 22 (17 November 1980), 29901. The Senate made further amendments and the final form of the bill was accepted by the House. 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 23 (1 December 1980), 31394.

[96] 96th Congress, 2nd Sess. *Congressional Record* vol. 126, pt. 19 (8 September 1980), 24568, codified at *U.S. Code* 15 (2000) § 3701 et. seq.

[97] *U.S. Code* 15 (2000) § 3704b-2.

Working in tandem, these two laws acted to push government funding and government created technology out to the private sector. The law did not create a new right to private sector patents from government-funded research; it simplified and realigned the process. Instead of the government controlling the patent and the inventor standing in line for a license along with anyone else who had only to request one, the inventor now held the patent and granted one license to the government, which, although it held certain 'march-in' rights under exceptional circumstances, would not likely be a competitor.[98]

In November 1980, Ronald Reagan was elected President of the United States over one-term incumbent Jimmy Carter. Reagan campaigned on a platform of removing government control from the business sector an allowing prosperity to spread via the free market. In 1983, President Reagan significantly enhanced the power of the Bayh-Dole Act by directing the heads of executive departments and agencies to extend the more generous title provisions given to small business and nonprofits to all government contractors, including large businesses, so that they too could own patents on inventions made possible through government funded research.[99]

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[98] *U.S. Code* 35 (2000) § 203.

[99] Rebecca S. Eisenberg, "Public Research and Private Development," 1665. One of Reagan's primary goals was to restructure the U.S. economy around the private marketplace. *Looking Back on the Reagan Presidency* , ed. Larry Berman (Baltimore: The Johns Hopkins University Press, 1990), 124-125. Advancement in technology played a major role in Reagan economic policy. Budget requests for federal funding of basic research were well above the rate of inflation for first three years of the Reagan Presidency. Reagan also freed the research community to select its own projects in cooperation with private industry and the demands of the market place. Reagan's philosophy was to reduce federal support for science in favor of private money motivated by profitability. Under Reagan economic policy, federal money was to be channeled to areas that would help make private industry more competitive in the global marketplace. Reagan's science advisor, George Keyworth, made clear that science money was not an entitlement. See, David Dickson, *The New Politics of Science* (New York: Pantheon Books, 1984), 14-16 and 39. It would be given where it could help foster United States leadership in the international marketplace. Private sector needs and profit would dictate the application of results. The mandates of Reagan Economic policy and the incentives of the Bayh-Dole Act combined to shift the academic science community focus from pure knowledge to the bottom line. Reagan policy moved academics and industry

CGIAR Responds to the New Paradigm

The events set in motion by Cohen and Boyer rippled through the scientific and agricultural community. The new process for combining genetic material held much promise for drugs, food and investors. The subsequent legal and policy decisions by the courts, Patent Office, Congress and Executive Branch served to reinforce traditional economic view of intellectual property and plants. Both served to enhance the value of the new technology. Patents helped spur investment and growth in research and plants offered new opportunity in the form of specific traits found in genetic sequences. As CGIAR continued to collect and preserve seeds for use in improving agricultural yields in developing countries, it was simultaneously amassing an asset that was growing in value every time biotechnology took step forward and the courts and lawmakers reacted positively. These events left CGIAR with new options for addressing its financial woes heading into the decade of the 1980s. The events also underscored the importance of CGIAR becoming much more attuned to intellectual property issues and developing a policy that, at the very least, protected its seed collections and ideally enhanced their value while remaining loyal to the CGIAR mission.

Despite existence of the Plant Patent Act (1930), UPOV (1961) and the Plant Variety Protection Act (1970), new developments in biotechnology, combined with economic concerns, appear to have forced the issue onto CGIAR's radar in 1980. Like

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closer together. Private funding of university research rose ninety three percent from 1980 to 1984. Federal funding increased thirty one percent but shifted largely toward defense. Rebecca S. Eisenberg, "Proprietary Rights and the Norms of Science in Biotechnology Research," *The Yale Law Journal,* vol. 97, no. 2 (December 1987), 178, n 2. By 1990, University held patents had increased by over ten times their 1980 number, from 150 to 1600. Biotechnology professors were in such demand that nearly all of them held consulting contracts with private firms. In the fledgling industry with few marketable products, one quality of interest to investors was the expertise of its scientists and its ability to aggressively pursue patents. Sally Smith Hughes, "Making Dollars out of DNA: The First Major Patent in Biotechnology and the Commercialization of Molecular Biology 1974-1980," *Isis*, vol. 92, no. 3 (September 2001), 570-572.

Henry Wallace in the late 1920s, CGIAR had gone about its business with little apparent concern for intellectual property issues through most of its early existence. By 1980, however, TAC was well aware of the potential opportunities and issues created by advancements in recombinant technology. CGIAR's history from 1980 through the end of the twentieth century reflects a new emphasis on intellectual property issues and the events summarized in this chapter appear to have a contributing factor.

The TAC board added a new agenda item to its 1980 meeting: plant breeders' rights. After a preliminary discussion with the research center directors, all parties concluded that plant breeders' rights schemes had not yet created major problems for the CGIAR research centers' international breeding programs. Such schemes embodied a potential impact on freedom of distribution and use of improved genetic material the research centers produced. The issue placed CGIAR into a delicate balancing act. CGIAR needed to preserve its traditional procedures in order to keep the seed collections in circulation while, at the same time, preventing outside parties from acquiring and securing intellectual property rights on its creations. Moreover, CGIAR needed to accomplish its goals in a way that did not foster distrust among its developing world partners or suggest incompetence to its industrial world donors. In short, CGIAR needed to establish and enforce procedures for handling seeds in an intellectual property environment.[100]

Already some of the CGIAR research center directors had felt the need to clarify patent issues before cooperating with outside institutions.[101] TAC feared that private

[100] Food and Agriculture Organization of the United Nations, "Draft Report of the Twenty-Fourth Meeting of the Technical Advisory Committee," 1980: 5-6, http://www.cgiar.org/corecollection/docs/cg8010f.pdf (Accessed November 30, 2010).
[101] Ibid., 65.

multi-national companies would appropriate, patent and restrict genetic seed lines developed by others and placed in cooperative testing programs prior to release. In other words, someone would eventually secure a patent or a plant registration certificate on genetic material derived from material that CGIAR made freely available without such protection.[102] It was even conceivable that a CGIAR scientist could do that same thing. The issue before TAC in 1980, therefore, was: Should the CGIAR research centers develop patent policies for their genetic creations and should their personnel be subject to contracts prohibiting them from seeking patents on their own creations achieved while employed by the research center? A second issue involved the developing countries that supplied the materials in questions. If those countries concluded that CGIAR was not a responsible custodian of their freely donated natural resources, they could jump on the intellectual property bandwagon and proclaim their indigenous plant material, the lifeblood of CGIAR's research, as an economic asset. If CGIAR attempted to advise its developing country partners on if and how to enact appropriate intellectual property legislation, it would begin to look like a political operative, something that was anathema to the Rockefeller and Ford philosophy of avoiding bureaucracy and staying focused on science.

If those issues were not adequate to create controversy, the research centers raised the additional issue of intellectual property protection as a contributing factor in genetic erosion and the potential culpability of the CGIAR system for enabling it. TAC's initial response was that CGIAR in no way contributed to genetic erosion on the grounds that CGIAR acted responsibly in its distribution of improved plants that incorporated non-indigenous genetic material into a local eco-system, thus increasing rather than eroding

[102] Ibid., 64-65.

the genetic profile of a given area.[103]

In the hope of sorting out the myriad issues, TAC solicited and received a consultant's report in early 1981. The report's authors first addressed the conservation issue, stating that wartime food shortages and post war starvation fears had spurred demand for more productive farming systems. Agriculture at that time was about generating more food, to the exclusion of other considerations. As breeders became more focused on specific traits that would provide higher yields of food crops, they utilized a narrower band of special high-yield characteristics to establish uniform base breeding lines, enhanced through chemicals, fertilizers, herbicides, and irrigation. Those plant lines contributed to loss of genetic diversity because the breeders abandoned older breeding lines and wild landraces. In short, breeders could not be relied upon to preserve genetic diversity as doing so was not their primary focus.[104] The consultants warned TAC that conservation and commercial interests did not go hand in hand. Breeding responded to short term commercial interests of demand and profit; conservation focused on long term ecological stability. While conservation goals certainly inured to the benefit of the private sector in the long run, responsibility fell to the public sector for their implementation.[105] These conflicting interests carried the potential to pit conservationists against those who viewed intellectual property rights as a tool for economic growth in developing countries.

Both sides, however, required ecological diversity in order to achieve their goals. Primitive or wild plant material had to be collected where it grew naturally. If a country refused to freely share its materials, the result could be extinction as uniformity in crop

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[103] Ibid., 63-64.
[104] Ewert Aberg, "Consultant Report on the relationship between plant breeding, germplasm collection and plant breeders rights," January 1981, http://www.cgiar.org/corecollection/docs/tc8103i.pdf (Accessed November 30, 2010), 10-11.
[105] Ibid., 13.

varieties expanded and claimed more farmland. Some countries could assert a sovereign claim over such materials and refuse to give it away. The result could again be extinction, which could harm the entire planet if the wild landraces possessed a vital characteristic. In a sense, then, breeders and the conservationists both needed to arrive at the same place, albeit for different reasons.[106] The report concluded that responsibility for conservation fell to the public dole. Breeders developed multiple plant lines and then preserved the valuable ones. They could not be expected to take on the responsibility and cost of conserving plant lines of no value in order to help prevent genetic erosion or because some other breeder might some day need them.[107]

On the question of economic rights in plant material, the author observed that the CGIAR research centers normally provided breeding lines to developing nations, which then further bred the lines for their own specific needs and goals. From this fact, the author concluded that the lines coming out of the research centers were probably not stable enough to qualify for intellectual property protection. Moreover, none of the developing countries that received the lines had intellectual property laws. A casual approach had evolved from these facts. For example, the Mexico research center, CIMMYT, suggested to its partners that its private property rights in its own breeding lines should simply be respected and that governments should voluntarily refuse to register any CIMMYT developed materials. CIMMYT believed that "responsible and honest" companies would respect its wishes.[108]

There were other considerations, however. A developing nation could become westernized and join UPOV, or a private breeder could manage to obtain and secure

[106] Ibid., 26.
[107] Ibid., 27.
[108] Ibid.

intellectual property rights on CGIAR material in another jurisdiction. The author was keenly aware that donors funded the CGIAR research centers and speculated on the result of CGIAR's failure to secure royalties it might have a legal right to demand. Would dereliction at that level cause donors to re-think their commitment to CGIAR?[109]

With the consultant's report in hand, TAC addressed three basic issues, all of which posed potential risk to CGIAR. First, as farmers replaced local varieties with new cultivars, did genetic erosion occur? Second, what were the ramifications of registering a new cultivar under a local law? Third, if a country had no laws on plant breeders rights, were CGIAR materials fair game for the private sector?

Research Center protocol permitted recipient countries to name and release varieties developed from materials originating at CGIAR facilities and improved with public money. Local naming had the benefit of making new varieties more acceptable for use. Since the varieties were freely available and not registered under any law, however, they could be appropriated by commercial interests and used for profit in other jurisdictions regardless of the fact that they originated through public funds from multiple sources and were intended to be the property of the world community.[110]

The research centers professed two goals: conservation and plant improvement. In both cases, they needed raw materials from the developing countries with which they partnered. To date, that had been a free, two-way exchange: raw material from the developing nation to the research centers in exchange for improved breeding lines ready for finishing from the research centers to developing nations. Under the new paradigm of breeders' rights, the research centers were conflicted. They relied on developing

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[109] Ibid., 27-28.
[110] "Twenty-Fifth Meeting of the Technical Advisory Committee," 24 February-3 March 1981, http://www.cgiar.org/corecollection/docs/tsop0381.pdf (Accessed December 2, 2010), 46.

countries for their plant genetic resources. If they began registering improved varieties under breeders' laws they might alienate the developing countries. Even if the research centers registered their varieties for defensive reasons and collected no royalties, they still asserted a public declaration of ownership and control. Developing countries could no longer name their own varieties, for example. If the research centers claimed no royalties, however, the large donors might blanche at the idea of CGIAR foregoing all those potential profits while still coming to them for financing. Clearly aware that it was treading on potentially dangerous ground, TAC committed to a very transparent process that would bring in all the major stakeholders. TAC's goal was to produce a consensus policy statement that would satisfy both the research centers and the CGIAR Board.[111]

The stakeholders reviewed a second whitepaper in 1982. Developing country dependence on CGIAR had become greater than originally anticipated. Developing country partners could not conduct the adaptive research necessary to finish CGIAR's basic work on behalf of an entire region of the globe. As a result, CGIAR had been forced to allocate resources to adaptive research as well. The authors suggested that ownership of improved plant materials should pass to the recipient developing countries. Ideally they would finish the plants and establish something eligible for registration. Since the raw materials originated with the developing nations, and since donors funded the CGIAR research centers, it seemed that ownership was simply one more benefit given to the developing countries along with improved plant material. Although its improved varieties were not stable enough for registration, CGIAR could still release them under material transfer agreements that required the recipients to share royalties for any registered finished lines resulting from the CGIAR material. Ultimately, however, the

[111] Ibid., 6.

authors suggested that CGIAR simply use the forum of public opinion to discourage abuse of CGIAR materials. They also suggested that pursuing legal rights would be too time consuming and expensive for the CGIAR research centers and would divert them from their job of maintaining varieties.[112]

For their part, the developing nations faced a much greater burden than simply writing and enacting intellectual property laws. Such laws necessitated a governmental and scientific infrastructure capable of implementing, administering and enforcing the law. Citizens of developing nations with the requisite knowledge to administer intellectual property laws were the same people needed in local breeding programs. They could not perform both jobs. Ultimately, the report concluded that food was more important than legal rights, stating that CGIAR's research centers should continue as before and that plant breeders should not be held responsible for maintaining genetic diversity, which was a job for the public sector.[113]

Based on the reports and discussions, TAC reached a number of observations, conclusions and recommendations. TAC asserted the economic value of CGIAR's work, stating that breeding programs were vital not only to agriculture but also to entire national

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[112] M. Heuver, J.J. Hardon, and K.A. Fikkert, "Plant Breeders Rights and International Agriculture Research Centres: A Discussion Paper," August, 1982, http://www.cgiar.org/corecollection/docs/cg8211b.pdf (Accessed December 2, 2010). The fact that CGIAR was contemplating material transfer agreements in the early 1980's does not suggest that it was behind the curve. In the private soybean market, for example, sharing of seeds was common into the 1980's despite the fact that soybeans are self pollinating and therefore eligible for patents since 1930. Stine Seed in Adel, Iowa was one of the first dealers to introduce contractual restrictions on soybeans in the 1980's, the same decade that it obtained the first soybean patent. Restriction agreements on bags became effective upon opening, much like the modern-day shrink wrap agreements on computer software. One reason for this seemingly odd failure to take advantage of legal rights, according to Stine, is that saving and re-planting self-pollinating seeds is not so simple as holding them back and putting them in the ground the following year. Seeds must be conditioned, cleaned and treated to maintain their desired level of productivity, work that individual farmers can not afford or have no interest in doing. The simplest solution was to buy new seed each year. Author interview, Warren Stine, 12 July 2011.

[113] "TAC Workshop on Plant Breeders Rights and the IARCs," October 1982 http://www.cgiar.org/corecollection/docs/tacbreed.pdf (Accessed December 7, 2010), 13-14.

economies of both developed and developing countries. Breeding programs: "… are of vital importance to agriculture and the whole national economy both in developed and developing countries." [114] Since semi-finished varieties from CGIAR research centers could be appropriated, finished and registered by third parties, it was essential that the research centers publicize information on varieties entering international distribution networks so that users and registration offices would know their origin.

The independent nature of the CGIAR research centeres emerged within the report as well. TAC noted that the centers had "an open-door policy as regards germplasm exchange" and although they would have the legal right to seek registration "they do not wish to seek any exclusive rights" preferring instead to "promote the widest use of this improved material for the benefit of all developing countries."[115] The research center philosophy provided for earlier and faster movement of material. Since intellectual property rights did not exist in the developing world, there was no evidence regarding the impact of such laws on the research centers' preferred strategy. However, "considerable fear was expressed" that parties with limited involvement in the development of new varieties could prematurely gain unauthorized possession of materials in advanced stages of development and testing and apply for and obtain exclusive rights to them. These concerns "may place serious limitations on the willingness of plant breeders to exchange and expose their promising lines."[116] This point was especially true in light of the fact that the research centers routinely made their material available free of charge to the public sector in both developing and developed countries. This practice represented "the

[114] "TAC Workshop on Plant Breeders' Rights and the IARCs, January, 26-28, 1982," http://www.cgiar.org/corecollection/docs/cg8211b.pdf (Accessed December 2, 2010), 1-6.
[115] Ibid.
[116] Ibid.

major risk of appropriation of the IARCs material by third parties for commercial profit."[117] The solution was to publish research center data as a means of protecting varieties from registration by a downstream entity.[118]

In addition, "considerable fear was expressed" regarding the establishment of plant breeders' rights laws in developing countries, particularly as to the law's possible effect on the movement of semi-finished varieties. This could entail the "involvement of parties with limited involvement in the development of new varieties gaining access to material in advance stages of development and testing and gaining rights to them. This could limit the willingness of breeders to exchange their promising lines for testing."[119] A party in a nation with plant breeders rights could exploit the situation by appropriating the CGIAR material and "with slight changes" register it under plant breeders rights laws.[120]

The TAC committee report was a hodgepodge of concerns that was heavy on issues and light on solutions. By 1982, CGIAR had come face to face with a changing world that did not operate under the simpler paradigms that had allowed the Rockefeller program to flourish in Mexico and serve as its own blueprint. Science and laws had changed or been reinterpreted to put CGIAR in need of demonstrating responsibility and trust before a diverse and skeptical audience. As the twentieth century came to a close, CGIAR continued to fight for its vision.

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[117] "TAC Workshop on Plant Breeders Rights and the IARCs," October 1982, http://www.cgiar.org/corecollection/docs/tacbreed.pdf (Accessed December 7, 2010) : 2-3.
[118] Ibid., 3.
[119] Ibid., 4.
[120] Ibid., 12.

CHAPTER 5. AN ECONOMIC COMPROMISE

In the years following the United States Supreme Court decision in *Diamond v. Chakrabarty*, Americans again embraced the economic potential of biotechnology from Congress to academia to Wall Street. Genetic traits in plants and seeds took on an enhanced role in both agriculture and pharmaceuticals. The Patent Office, having received permission from the Supreme Court to clear the patent road of obstacles relating to living material, allowed economic players to lock in exclusive rights to smaller and smaller components of nature. True to the long-standing economic philosophy of patent law, the new order helped to coax out significant capital investment for research and development. The wisdom in the earth began to funnel down into corporate organizational charts as giant corporations staked their claims in the new and lucrative field. The ripples from this new dynamic spread throughout the world and were large enough to rock some boats at CGIAR, which had neither the money nor the resources to keep pace in the world of biotechnology.

By the mid-1980's, biotechnology and patent policy had ushered in full patent protection to open pollinated plants as well as smaller portions of living material such as traits preserved within bacteria. Unlike the seed registration system established in the Plant Variety Protection Act of 1970, patents came with no exceptions for research or individual farmers wishing to preserve and/or sell seeds for re-planting. As a result, technology offered the means to identify smaller and smaller portions of living material and discover their utility in sufficient detail to warrant full patent protection. Three dynamics resulted from these advancements. First, the economic value of unique plant traits rose, as did the value of seed collections where those traits might be found. Second,

the need to secure legal rights in whole plants lessened as the ability to isolate and transfer traits in a laboratory setting increased. Traditional breeding became simply one method of transfer. Third, CGIAR reached a pivotal moment in its short history. It was behind the curve of the new technology due to lack of resources, both financial and intellectual. One of its most valuable resources, its seed collections, existed under a questionable legal structure that threatened to neuter CGIAR's ability to establish or enforce legal claims it might have had to its breeding work. It also used methods of seed sharing that were outdated by commercial standards, but which nicely complemented its unique system of barter with the developing world: free germplasm in exchange for improved plant varieties. The CGIAR leaders realized that adoption of the industrial model of ownership could make it a viable player in commercial markets and allow it to turn its seeds into income producing assets. Given CGIAR's willingness to freely share seeds, the industrial model could also help prevent the disastrous loss of its assets to third parties that might take unprotected germplasm and convert it to patented products. The very same action, however, could alienate its skeptical partners in the developing world who could easily interpret the move as a self-serving grab for profit. This conflict exposed the structural weakness in CGIAR's system of management. The CGIAR board was unable to lead on this critical issue and was instead reduced to mediating the often conflicting interests of its various constituencies.

The final blow came in the 1990s with the Convention on Biodiversity and later the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), which included the Trade Related Aspects of Intellectual Property agreement (TRIPS) signed in 1994 as

part of the Marrakesh Agreement establishing the World Trade Organization.[1] These agreements essentially completed a decades long effort to push the developing world into an industrial model of agriculture that had begun with the Rockefeller Foundation and continued with CGIAR itself. When the developed world forced the developing world to establish intellectual property regimes as a prerequisite of participation in a broad array of trade opportunities, CGIAR relented and did the same.

The combination of technology, patent law and trade policy forced CGIAR to make difficult decisions as to its structure, mission and seed collections. It ultimately embraced, or perhaps conceded to, an essentially economic solution, thus bowing to the will of forces beyond its ability to challenge or outlast. The concession was not, however, to a new paradigm but rather to a more extreme gradation of the existing paradigm. The Rockefeller Foundation, World Bank and donor nations all desired to teach developing country farmers how to produce crops in an industrial model. In their view, the solution to world hunger and overpopulation lay in improved standards of living. The future belonged to farmers with the money and resources to adopt the entire package of inputs that represented modern agriculture. Farmers who refused or lacked the resources to change would simply find something else to do, presumably wage labor in the expanding economy.

This chapter traces the long and tortuous path traveled by CGIAR in its efforts to balance diverse goals and constituencies in a manner that preserved its relevance in world agriculture as the twenty-first century loomed. Although the CGIAR mission, at its heart, embraced a distinctly western philosophy of helping people by making them wealthier, it

[1] See, World Trade Organization, text of Agreement on Trade Related Aspects of Intellectual Property Rights, http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm (accessed November 14, 2011).

also strove to preserve a model of free exchange and shared benefits. CGIAR's small but significant step toward the patent model was also a small but significant step away from the common heritage model. Moreover, the move served to muffle one of the few voices for common heritage that had the status and resources to be heard over the din of market oriented capitalism coming from the other side. CGIAR's move left the twenty first century agricultural world more unified in economic philosophy and procedures than ever before.

CGIAR's Fight to Remain Relevant and Unified

CGIAR faced two issues in the 1980's that threatened to harm its standing as plant breeder dedicated to improving agriculture in the developing world. The first issue was whether CGIAR should utilize intellectual property laws to protect, if not improve, its position. The second issue was the lack of resources necessary to make full use of the new biotechnology in breeding operations.

If CGIAR had an ally in the fight to preserve free sharing of germplasm, it was the United Nations, an active and interested participant in the CGIAR program and a sponsor of numerous programs dedicated to the developing world. Faced with a growing wave of commercial biotechnology that threatened to identify and privatize the most valuable genetic material within the world's cache of germplasm, the U.N.'s Food and Agriculture Organization (FAO) sought to counter punch in 1983 with the International Undertaking on Plant Genetic Resources (the Undertaking). The Undertaking represented an aggressive effort to establish a common heritage view not only of raw plant material but of improved plant material as well. Its first article stated that the document was based on the "universally accepted principle that plant genetic resources are a heritage of mankind

and consequently should be made available without restriction."[2] The fifth article aggressively called for the free international flow of all germplasm at no cost, including advanced materials in the hands of private breeders. Desired material in the hands of developing nations or advanced material in the hands of industrial nations should be made available upon request "free of charge, on the basis of mutual exchange or mutually agreed terms," implying that developing nations should be able to request improved plant material from any other nation so long as it similarly offered up its raw material as well.[3] Not surprisingly, the resolution vote split along economic lines. The United States and twelve other industrialized nations voted 'no' on the Undertaking against seventy-seven 'yes' votes.[4] Given the increasingly attractive opportunities for cooperation between the USDA, research universities and private industry, it is not surprising that the United States and other industrialized nations feared the consequences of participation in an Undertaking that might mandate transfer of improved material in public hands. Such a mandate could serve to drive the private industry away from the public sector.

The Undertaking was an ideological victory. CGIAR had long supported a convention based on a free-sharing model.[5] Unfortunately, the convention did nothing to alleviate real-world issues that CGIAR faced. The twelve 'no' votes came from the same countries that housed the academic and private business peers with which CGIAR needed to partner if it was going to keep its research at the cutting edge of the new technology.

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[2] Gerald Moore and Witold Tymowski, *Explanatory Guide to the International Treaty on Plant Genetic Resources for Food and Agriculture* (Switzerland and Cambridge: International Union for Conservation of Nature and Nature's Resources, 2005): 7.
[3] Ibid.
[4] See, Jack Ralph Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000* (Cambridge: Cambridge University Press, 1988), 172-174.
[5] Technical Advisory Committee, "Report of the Second External Program and Management Review of the International Board of Plant Genetic Resources," April 1985: 65. http://www.cgiar.org/corecollection/docs/ibpepm86.pdf (Accessed December 9, 2010.)

Those peers, representing both human talent and money, were becoming increasingly economics-minded in outlook and practice. They did not embrace the ideals of common heritage and free sharing as expressed by CGIAR and the FAO. CGIAR's seat at the same table with these institutions came courtesy of its enviable seed collections. Without a clear and enforceable intellectual property strategy, however, CGIAR was like a rabbit discussing dinner with a fox.

The reality of CGIAR's predicament and the need to address it soon became clear to CGIAR's auditors. The issues identified through the external review report underscored the difficulty CGIAR faced in adapting to the industrial model of intellectual property rights in germplasm. In January and February of 1985 an external review of CGIAR's International Board of Plant Genetic Resources (IBPGR) brought intellectual property issues back into the spotlight. The examiners dedicated one portion of the review to legal constraints on the free flow of germplasm. The reviewers noted that developing nations could legally restrict the exchange of plant genetic resources through export restrictions. Those restrictions could be based on crops deemed commercially important or based on a list of nations branded as politically favored or disfavored.[6] The review panel (anticipating the GATT and TRIPS agreements) envisioned a day when bilateral agreements would force reluctant nations to put their germplasm into global commerce as condition of participating in global trade. If this vision came to pass, they warned, CGIAR and its research centers could be shunted to the margins since CGIAR was not sovereign and could not operate in an environment in which it had to purchase raw germplasm or pay royalties for access to specific traits. Even worse than being relegated to second-class status as a plant breeder, CGIAR could lose assets it already

[6] Ibid., 62.

possessed. The review panel strongly recommended that IBPGR strengthen its legal standing in relation to CGIAR's seeds so outside parties could not deter CGIAR in its philanthropic mission by patenting CGIAR seeds. The reviewers stressed that they had not conceived their recommendations with a view toward generating profits for CGIAR, but rather as a defensive strategy to accommodate CGIAR's free flow of germplasm while negating the potential assertion of proprietary claims from a downstream user. To that end, the review panel recommended that IBPGR strengthen the language in is letters of agreement with seed recipients to assure that transferred material remained freely available to any professionally qualified institution. At the time of the report, such a commitment arguably existed but was documented in the form of a footnote in a grant application form incorporated by reference into the letter of agreement.[7] In other words, the CGIAR Research Centers had twice removed from their key document the language most critical to protecting the integrity of the system of free sharing of germplasm. The language was most likely ignored or unknown by parties receiving germplasm and unenforced or unmonitored by the CGIAR research centers.

The review panel saw an additional upside to CGIAR's participation in the world of patents. Laws creating plant breeders' rights gave private breeders an incentive to create new commercial varieties potentially useful to CGIAR. The CGIAR research centers could conceivably employ patented commercial varieties in their work and still give away the results to developing countries that did not have intellectual property laws and would

[7] Ibid. On the issue of genetic diversity, the review panel was fatalistic and saw no justification for groups such as CGIAR to claim the moral high ground. Plant breeders' rights legislation indeed acted as a catalyst for breeding systems likely to foster greater uniformity. The products of commercial breeders "may more readily and thoughtlessly displace traditional cultivars. It is very hard, however, to find persuasive reasons for such a great difference between a commercial system and a public one; the public system also creates strong incentives to develop new lines." Ibid., 64.

not be viewed by the private sector as a lucrative market.

A closely related but more complex issue, and the one that had to be resolved in order for CGIAR to become more effective in protecting its germplasm, was the legal identity of the IBPGR. The review panel cited the lack of legal standing as one catalyst for the FAO Undertaking. The panel noted that CGIAR had created IBPGR and CGIAR was, in turn, "an informal group of donor governments, international organizations, private foundations, and representatives of regional groups of developing nations."[8] Since CGIAR had no legal personality or structure, it was non-existent in the eyes of the law. Therefore, any letter of agreement to which CGAIR was a signatory begged the question of CGIAR's standing to enforce its rights. Given that the IBPGR and indeed CGIAR, the brainchildren of a collection of independent and benevolent actors, were so self-consciously apolitical, the entire CGIAR structure essentially neutered itself in terms of exercising or enforcing legal rights.[9]

Not oblivious to the issue, IBPGR had secured an opinion letter in 1983, which concluded that IBPGR had an international legal personality that would permit it to enforce its rights in a court or international tribunal. The rationale for this conclusion was the ability of states to create organizations with legal personality by international treaty, national legal incorporation or "by less formal agreement between states as expressed, for example, when assembled in a conference."[10] The fact that there was an issue at all and that it had to be resolved by an opinion letter clearly suggested that the IBPGR did not actively operate as a legal entity, but rather a cooperative association of entities. Any attempt, therefore, to exercise intellectual property rights could further cloud the issue

[8] Ibid., 65-66.
[9] Ibid.
[10] Ibid.

rather than bring closure.

Amazingly, after pointing out the dangers in CGIAR's legal structure, the review panel retreated behind the failed FAO strategy expressed in its Undertaking. Rather than recommending to CGIAR that it establish viable legal status, the panel suggested instead that CGIAR prod the rest of the world to join in creating an environment of free exchange. The panel recommended that "governments responsible for a genetic resources collection commit themselves to the FAO that they are holding the material as part of an International Genebank under the auspices of FAO, and will make material in the base collection available to FAO."[11] The IBPGR balked at the possibility of serving two masters and harming its reputation in the process. While the IBPGR agreed to "maintain and strengthen its cooperative links with FAO," it made clear that it could not "operate both under the authority of the CGIAR ... and also under the monitoring of the Commission insofar as this implies any form of control."[12] IBPGR believed its public profile was, and should remain, one of autonomy and technical expertise, which made it trustworthy to donors and certain countries.

CGIAR was so layered in hierarchy that fast and pragmatic policy from a centralized source was extremely difficult to achieve. Given the disparate interests that made CGIAR possible and the critical need for cooperative effort, CGIAR struggled to move quickly in a changing world, as evidenced by the years needed even to get such issues on the agenda. Plants had become a hot economic property and therefore a hot political property. CGIAR, by comparison, remained a technical and non-political organization, just as the Rockefeller Foundation had tried to be in Mexico. As such, it

[11] Ibid., 66-67.
[12] Ibid.

clung to the simplest and most bureaucracy-free method of operation: free sharing.

In 1988, after eight years of wrangling, the CGIAR board attempted to placate the external reviewers while remaining loyal to its vision of free sharing. CGIAR publicly reiterated its basic long-term objectives and established yet another committee to advise the previously established committee on intellectual property developments. In a new policy statement, CGIAR vowed it would continue to support work on plant genetic resources "to ensure that the diversity of gemplasm is safely maintained and made available for use in programs of research and crop improvement for the long term benefit of all people."[13] The board also established a task force composed of donor, TAC and research center representatives, "to follow the broader political and legal issues connected with biotechnology and to bring these to the attention of TAC and the CGIAR."[14] The short policy statement, which TAC assembled over a period of two years and the CGIAR board accepted, reflected a growing realization that an organization such as CGIAR could no longer operate within the narrow confines of pure research. Like it or not, CGIAR had become a factor in a complex web of economic development, commerce and political power that reached beyond developing world farmers. Although TAC stressed that it intended "not to break any new ground" with the policy statement, the CGIAR board welcomed it as meeting "a great need in defining the CGIAR position for audiences outside of the Group which were concerned more with the political than the technical aspects of the question."[15] If the CGIAR board's position was not clear enough, the meeting minutes made it even clearer: "Several speakers emphasized the commitment in

[13] Consultative Group on International Agricultural Research, "Summary of Proceedings and Conclusions, Annual International Centers Week Meeting," October 31 – November 4, 1988: 18. http://www.cgiar.org/corecollection/docs/csop1188.pdf (accessed December 13, 2010).
[14] Ibid.
[15] Ibid.

the paper to consider germplasm not as private property but as held in trust for future generations of research workers worldwide."[16]

The policy statement reflected an attempt to remind the various parties looking upon CGIAR as a seed laden power broker that it had no desire to be anything more than an extension of the Rockefeller philosophy that brought higher yielding corn to Mexico in the 1940's. The board acknowledged, however, that success in its stated objectives depended at least partially on developments in the political arena. The response did not meet with uniform approval from the board. Meeting minutes describe an unidentified contingent within the board that wished to "monitor developments in legislation concerning intellectual property rights in the products of biotechnology, and the implications for crop improvement in the [CGIAR] system and the free exchange of germplasm." Although the task force emerged out of these concerns, the meeting minutes described intellectual property as a topic "not specifically addressed or addressed less completely than some members would have wished."[17]

The second problem CGIAR faced was its lack of expertise and money necessary to use biotechnology to to its fullest potential. Before the emergence of biotechnology, CGIAR had been an expert in the field of breeding and simply wanted to assure free sharing of materials. It was very much a peer organization in the public and private plant breeding community. With the advent of biotechnology, however, CGIAR fell one major step behind the cutting edge. Biotechnology had not only pushed CGIAR's seeds into a commercial arena, it had similarly pushed the supply of human capital in the same direction.

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[16] Ibid.
[17] Ibid., 19.

Biotechnology drastically altered the manner and nature of plant breeding, which threatened to severely limit the ability of traditional breeders such as CGIAR to produce high quality plant varieties. Without the money and expertise needed, CGIAR faced an insurmountable handicap. In the year 2000, for example, researchers reported that the time and cost to develop a typical seed ready to be introduced into commercial agriculture was twelve to fifteen years and twenty to fifty million dollars.[18] Joseph B. Saluri, Vice-President and legal counsel for Stine Seed Company, estimated the cost in 2011 to get a transgenic soybean trait to the market at approximately two hundred million dollars.[19] The new process that biotechnology made possible carried its own unique challenges. Getting a trait to express in a plant was no longer a matter of cross-breeding plant varieties over multiple-generations, a significant challenge in itself but one at which the traditional breeders excelled. Biotechnology offered the potential for using transgenic traits, which were genes from different species transferred into seeds.[20] One unique gene insertion into a plant, known as an 'event,' had to be done thousands of times in the hope of obtaining a 'lead event,' which was a seed that not only expressed the desired trait, but did so without harming any of the other desirable qualities already present in the seed. The process was neither fast nor simple. Stine Seed, for example, created ten million lines of soybeans in order to produce one thousand usable lines worth keeping in the long term, a success rate of 0.01% from which it had to recoup all costs.[21]

The new call for action came not from external reviewers, but from within.

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[18] Kerry Ten Kate and Sarah A. Laird, "Biodiversity and Business: Coming to Terms with the 'Grand Bargain'," *International Affairs* (Royal Institute of International Affairs 1944-), Vol. 76, No. 2, (Apr., 2000), 249.
[19] Author interview with Joseph B. Saluri, 12 July 2011.
[20] Ibid.
[21] Ibid.

CGIAR's research centers stepped up in the early 1990s to advocate for greater action on the part of CGIAR to acquire the people and money needed to remain relevant and to protect the CGIAR seed collections in some way other than proclaiming a general policy that they be freely shared. The research centers had been discussing potential benefits and threats from biotechnology since 1984 when the International Rice Research Institute hosted a seminar on the topic. The research centers hosted a second workshop in late 1990 entitled: "Consequences of Intellectual Property Rights for IARCs." Representatives of the research centers, American universities and the private sector attended the workshop.[22] The report issued after the meeting contained a more urgent tone than the CGIAR board's 1988 policy statement. Biotechnology, the research centers claimed, offered a significant step forward in plant research but the human talent in the new field was found almost exclusively in the private sector and the university. According to the center directors: "Biotechnologies which have the potential to accelerate progress in the resolution of agricultural problems within the mandates of the IARCs are developing rapidly. It is important for the IARCs to become acquainted with these biotechnologies and use them when appropriate."[23] Familiarity with and use of biotechnology required bodies and dollars. "A critical mass of trained successful personnel and the relevant facilities are necessary to the long term exploitation of biotech. Unless necessary human and financial resources needs be met, the resources of Centers and their clients could be stretched to a point where effectiveness is severely impeded."[24]

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[22] "Technical Advisory Committee Report of the Fifty-Fourth Meeting," July 1991: 45. http://www.cgiar.org/corecollection/docs/cg9110b.pdf (Accessed December 17, 2010).
[23] "Biotechnology in the International Agricultural Research Centers of the Consultative Group on International Agriculture Research - A Statement by Center Directors," May, 1990: 1. http://www.cgiar.org/corecollection/docs/cg9005i.pdf (accessed December 13, 2010).
[24] Ibid., 3.

The location of this need was clear: "The private sector is a very important component of the biotechnology community. Its importance lies in the level of investment made in research and development, in its contribution to technology transfer, and in product synthesis and distribution."[25]

Like the external reviewers, the research centers also expressed concern about protection of the seeds they so desperately needed in order to continue their work. Although the research center directors were wholly against a private sector model of ownership for the CGIAR germplasm, they recognized the need to become much more adept at navigating the same waters as the private sector in order to maintain effectiveness and even relevance in the field of crop improvement:

> It is accepted that the legal protection of inventions and intellectual property are part of the practice of biotechnology … There is a clear need for information and expert guidance within the CGIAR on patents and intellectual property issues in order to aid decision making within Centers … Such guidance would also help the Centers to take advantage of potential benefits such as the promotion of collaborative arrangements, the facilitation of access to technologies and the generation of revenue by the [Research Centers] and their clients.[26]

The report suggested that the research centers wanted to continue working with the private sector as a true peer organization that could extract fair value for its assets, which, in this case, meant leveraging its seed collections to obtain access to biotechnology. Despite their collective desire to better understand the ins and outs of intellectual property so as to take advantage of opportunities and protect its assets, the research centers did not wish to use it as a financial tool. The research center directors stressed to CGIAR that its position on gene patenting "needed to be clarified as a matter of urgency." They observed that routine patenting of genetic materials could lead to

[25] Ibid., 5.
[26] Ibid., 9.

multiple conflicts in the traditional exchange of material between research labs and would more likely hinder than promote the enhancement of genetic resources. The benefits of patenting living material were, in the view of the research centers, highly questionable and they advocated for drafting and publication by CGIAR of a statement that its research centers would not seek to patent genes and did not consider patenting to be a potential source of income.[27] In many ways, the research centers, like the CGIAR board wanted to have it both ways. They wanted to operate under the new order but did not wish to immerse themselves in it. They wanted to study it further and ponder its intricacies but they were studying a train as it was pulling out of the station.

By 1991, every stakeholder in CGIAR had come to understand and appreciate the importance of CGIAR's germplasm. Along with this realization came a greater appreciation of the diverse agendas represented by the various constituencies that made CGIAR possible. They began to eye each other with concern and uncertainty, like a group that had freely shared a car for decades only to discover that the trunk was full of gold. The questions of who exactly owned the car, an issue of little concern previously, suddenly became one in urgent need of resolution. The concern was not simply the financial potential of CGIAR's seeds and how that money might be utilized, but a sobering fear that their value, along with the relationships they helped to forge, might simply disappear through inaction or mismanagement.

TAC illustrated this concern by observing that CGIAR was not the only potential player in the intellectual property game. The enhanced status of germplasm could potentially result in an enhanced bargaining position for developing countries as well. If

[27] "Minutes of the IARC Centre Directors Meeting," October 25-26, 1991: 9. http://www.cgiar.org/corecollection/docs/cdmn0291.pdf (accessed December 13, 2010).

CGIAR continued to plod along while fretting over its relationship with developing countries, those same countries might join the industrial world in leaving CGIAR behind. The key lay in seed banks. Maintaining germplasm stores required considerable time and money, making it historically difficult if not impossible for the national agricultural research systems in developing countries to maintain their own seed banks. The new financial potential for germplasm in the bio-tech age, however, made government investment in seed banks both attractive and justifiable. Pursuing such a strategy had the potential to put distance between the developing countries and CGIAR. Instead of donating germplasm to CGIAR, developing nations could claim sovereignty over their landraces and use them as for-profit assets in international trade. CGIAR had, after all, dedicated itself to pushing the developing world into an industrial model. It could not very well cry foul if those countries embraced the idea more extensively than CGIAR thought likely. CGIAR, through its plant genetic resources board, faced the new challenge of justifying its continued worth to the developing world. In other words: "IBPGR needed to earn a 'leadership' position in the global plant genetic resources community in order to become effective as a catalytic institution."[28] The economic chickens were coming home to roost.

'Leadership' was an amorphous concept, however. TAC, ever loyal to the Rockefeller legacy, did not envision IBPGR as a policy making body, but neither could it be a source of technical expertise without more money and staff. TAC's solution was as tepid as its two-years-in-the-making policy statement. It recommended that the IBPGR become something of a gadfly to the private sector. TAC encouraged the IBPGR to use

[28] "Technical Advisory Committee Report of the Fifty-Fourth Meeting," July 1991: 38. http://www.cgiar.org/corecollection/docs/cg9110b.pdf (Accessed December 17, 2010).

the public forum to become an educator on issues of access to germplasm and conservation of bio-diversity.[29] Like the CGIAR policy statement of 1988 and the external audit report of 1985, TAC labeled the issue as critical but then recommended a public relations type response. Some TAC committee members, however, appeared to be growing impatient with the level of caution reflected in the recommendations, likely doubting that the industrial seed complex dedicated significant time to reading CGIAR press clippings. Dr. James Ryan, Deputy Director of the Australian Center for Agricultural Research in Canberra, voiced an "urgent need to protect the processes, results and products generated by the [research centers]." In order to do this, "TAC would need to come to grips with the issue as part of its ongoing review of CGIAR priorities and strategies."[30] Even those who supported the CGIAR position wanted to see more aggressiveness. Dr. Michael Arnold of Cambridge, apparently not satisfied with the CGIAR policy statement of 1988, encouraged the CGIAR to stop taking a "passive view" of the issue and "make known its firm support for the free exchange of germplasm."[31]

Despite being in the middle of a policy tug-of-war, CGIAR did not have the luxury of simply dictating policy. The board had to mediate a diverse group of interests. The informal but complex hierarchy of CGIAR presented a three-tier structure of relationships. The CGIAR board sat at the top. It allocated donor monies to the research centers. Although it did not dictate the research centers' research priorities, it certainly consulted on them by reviewing budgets and pushing funds to acceptable projects. Next came the research centers, each with its own board of directors. Then came the developing nations with their natural resources and publicly funded national agricultural

[29] Ibid., 43-44.
[30] Ibid., 45.
[31] Ibid., 46.

research systems. The NARS worked directly with the CGIAR research centers to finish and distribute to farmers the improved plant material developed from raw germplasm. The NARS also worked to develop local expertise in the art and science of crop improvement. The NARS and the research centers enjoyed a close and trusting working relationship, more so than either had with the CGIAR board. Finally came the donors, private and public, that funded the collective work of CGIAR. Any strategy involving the germplasm, intellectual property rights and biotechnology would have to address and satisfy all of these constituent groups.

External reviewers conduct a new audit of IBPGR in 1991. The report once again beat the drum for a solution or at least a plan for managing CGIAR's germplasm. The reviewer's report summarized three important consequences of the biotechnology boom, all of which had become more apparent over the years and had a potential impact on CGIAR. First, sources for material that could potentially improve plants had expanded significantly. The recombinant DNA process had broken down natural breeding barriers. The ability of researchers to insert genes by the process of recombination meant that an entire new range of organisms was potentially available to CGIAR researchers but also, therefore, in need of conservation. Second, as developing countries adopted plant breeders' rights laws or other forms of intellectual property protection, CGIAR would have to more clearly define its policies. Third, the entire new landscape of intellectual property law for plants would necessarily cut back on the free flow of germplasm and other genetic material.[32] The reviewer's report, according to the CGIAR board summary, warned that: "[W]ith the development of modern biotechnology is an increased emphasis

[32] "Report of the Third External Review of the International Board for Plant Genetic Resources," October 1991: 22. http://www.cgiar.org/corecollection/docs/ibper91.pdf (Accessed December 21, 2010). Specific countries mentioned were Botswana, Zambia, Ethiopia, Brazil and China.

on intellectual property in both the developed and the developing worlds. It appears likely that a number of developing nations, including certain of the host nations of CGIAR institutions, will adopt plant breeders' rights (PBR) protection by sometime in this decade."[33]

Ironically, CGIAR had maintained steadfast loyalty to a common heritage and free sharing policy under the assumption that developing nations would be distrustful of anything less. CGIAR's official policy was that seed donations from developing nations were not tagged with a point-of-origin designation for economic or political purposes. According to the CGIAR policy statement: "Collections assembled as a result of international collaboration should not become the property of any single nation, but should be held in trust for the use of present and future generations of research workers in all countries throughout the world."[34] At that time CGIAR held over 460,000 accessions that it made freely available to the developing countries it served.[35] Thus, CGIAR policy held that germplasm, once donated to CGIAR, was no longer 'owned' by the donating country. By 1991, it seemed, those same countries had become skeptical of contributing germplasm to a community pool. The report noted that developing nations were beginning to realize the increased value of their germplasm and some had responded by embargoing some industrial crops while others rejected the CGIAR principle of free

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[33] CGIAR Secretariat, "Summary of CGIAR Mid-Term Meeting," June 1991, in "Report of the Third External Review of the International Board for Plant Genetic Resources," October 1991: v. http://www.cgiar.org/corecollection/docs/ibper91.pdf (Accessed December 21, 2010). The report also: "included cautions against IBPGR becoming too involved with the policy side of intellectual property rights rather than providing technical and scientific capacity." Ibid. The report is captioned as the third review. The initial review is discussed in this chapter. No documentation was found to suggest that the second review dealt with intellectual property issues.

[34] "CGIAR Programme on Plant Genetic Resources: Some System-Wide Issues," September, 1991: 14. http://www.cgiar.org/corecollection/docs/tc9110b.pdf (accessed December 17, 2010).

[35] Ibid., 6.

exchange.[36] Additionally, the developing countries had begun to wonder about the status of their donated seed should one of the research centers close its doors. CGIAR faced the possibility of a donor nation asserting a claim for return of its donated material if a research center were to shut down, a contingency for which it had no policy or legal analysis.

Finally, the external reviewers' report warned that the landscape in which CGIAR operated and tried to maintain harmony was going to became much more complicated when the broader forces behind international trade policy pushed the developing world into an intellectual property paradigm as a pre-requisite to participation. The reviewers warned CGIAR that the expected completion of the General Agreeement on Tariffs and Trade (GATT) "will almost certainly include a Trade Related Intellectual Property Rights (TRIPS) Code. Such a Code would be binding on all parties to the new GATT agreements - which would probably include nearly all nations, developing or developed."[37] TRIPS would place a significant burden on developing countries by requiring them to develop, implement and administer intellectual property laws as a condition to being a GATT participant. CGIAR and its ancestors had pushed the developing world toward an industrial model of agriculture; biotechnology pushed a little harder and trade policy was about to finish the job.

The report concluded with a mild scolding of CGIAR and its affiliates for having something of a head-in-the-sand attitude: "IBPGR and its Board initially reacted very slowly to these changes, considering other organizations and groups taking an interest in

[36] "Report of the Third External Review of the International Board for Plant Genetic Resources," 22. Specific countries mentioned were Botswana, Zambia, Ethiopia, Brazil and China.
[37] "Report of the Third External Review of the International Board for Plant Genetic Resources," 21.

plant genetic resources as trespassers in their territory … IBPGR misjudged the signs of the time, which any internationally financed organization does at its peril."[38]

Seeds Held in Trust

CGIAR's policy that it held donated seeds in trust for the benefit of the world carried with it some basic responsibilities that it had not explored in great detail. Until the 1980's it appears that CGIAR's concept of seeds held in trust served primarily as justification for free sharing. Common heritage assumed that seed was freely available and that its users would extend the same courtesy to others. In that sense, CGIAR was like a seed library that provided centralization and management of inventory intended to circulate among users. The new focus on germplasm and its value forced CGIAR to explore the trust concept from more of a legal viewpoint. If CGIAR truly was a trustee of the seeds, as opposed to a custodian, it had certain fiduciary responsibilities beyond warehousing.

CGIAR had to address two critical questions. First, what entity (if any) actually possessed legal rights in the CGIAR germplasm? Technically, the developing countries had donated the germplasm to specific CGIAR research centers best suited to help them in developing improved varieties. The parties understood that the donated material was held in trust for the benefit of the entire world. It appeared, therefore, that the research centers owned, or at least controlled, the disposition of the seeds, albeit in a fiduciary capacity. If a CGIAR research center ceased to operate, should CGIAR facilitate return of its seeds to the donor countries or should it transfer them to another, and likely less suitable, research center? Second, and more troubling, if the research center was indeed a

[38] Ibid., 71.

fiduciary of the seeds it received and if third parties could obtain and patent specific seed traits, did the research center have a fiduciary obligation to secure its own intellectual property rights in order to retain that value within the CGIAR organization?

The CGIAR board commissioned a whitepaper to examine the issues. The paper, completed in late 1991, explored the idea of applying legal trust theories to CGIAR's operations. It offered a theory that justified use of intellectual property rights consistent with the CGIAR mission. Trustees routinely worked to protect, manage and, ideally, enhance the value of trust assets, not for themselves but for the trust beneficiary. If a trust asset was income producing, CGIAR should view the income as an additional trust asset held under the same conditions as the original seeds. The problem, however, was that a trust should distribute income to the beneficiary. In the case of CGIAR, the trust beneficiary was any developing nation trying to improve its agricultural production. Or was it? The analysis introduced the possibility of individual farmers as the proper beneficiaries, warning against any seed policy that might "be exercised to the detriment of the developing nation farmer."[39] This observation served to underscore the complicated nature of agricultural aid. Not all farmers benefited from CGIAR's efforts. Those most likely to benefit were the ones able to finance larger and more complex farming operations and take on the risk of new crops. Others did not possess the resources necessary to change and some risked losing their small and inefficient farms all together. Ironically, it was these very farmers who helped select and preserve landraces over many generations. Their 'reward' was a more robust economy that would hopefully offer them regular wage labor. In one sense the western idea of the trust was a

[39] Wolfgang E. Siebeck and John H. Barton, "The Legal Status of CGIAR Germplasm Collections and Related Issues," December 31, 1991: 53-54. http://www.cgiar.org/corecollection/docs/tc9203b.pdf (accessed December 20, 2010).

harmonious pairing with the western methods of farming. The idea of parsing up and distributing royalties from patented plants to such an amorphous population was not appetizing to CGIAR, however, Neither was the idea of redirecting profits into new facilities and more researchers. CGIAR could certainly argue that the latter option was in the long-term interest of the developing world but the clear and immediate beneficiary would be CGIAR itself.

Another complicating factor arose. The most likely CGIAR asset to be protected as intellectual property were the improved breeding lines, which had been created through the long and difficult work of the research center staff. According to the CGIAR whitepaper: "The advanced material reflects an intellectual input separate from that of the unimproved sources. Such material is clearly the Center's asset: the Center has full rights to patent or dispose of it (save as those rights are affected by a particular grant or contract)."

The authors ultimately proposed implementation by CGIAR of a model material transfer agreement that provided for the grant by CGIAR of exclusive or non-exclusive licenses to patented material sought to be used in a for-profit manner by commercial entities.[40] The report embraced the idea that CGIAR should not become a victim of its own policy of free sharing and should place conditions on those who would seek to profit from CGIAR's largess. The authors of the white paper did not instill confidence in their recommendation. In fact, they acknowledged that they were inventing as they went and looked to the FAO for guidance: "We recognize that we are on un-trodden ground. The

[40] Ibid., 53-54. The document provided, among other things, that no recipient of CGIAR germplasm could use it for profit-making or commercial purposes absent negotiation of an an exclusive or non-exclusive license. Any patent income should be "… transparently used for the benefit of the global research community in the interest of developing countries. It would undercut the trust concept if the profits were used to reduce donor nation support for the international agricultural research system." Ibid.

application of this body of law to international genetic resources (or other similar resources) has not previously been attempted. Hence, we attempt to interpret the concept as well as possible and with the help of the Undertaking."[41]

In the meantime, the research center directors had formed their own ad hoc Committee on Intellectual Property Rights, a sign in itself that the research centers were determined to exercise some independent judgment on these critical questions. The committee submitted its own report in late 1991 and TAC discussed it at its March 1992 meeting. The research center report conceded that CGIAR was going to have to adhere to basic principles of intellectual property in order to fulfill its mission, but it was firmly opposed to the option of reinvesting profits, fearing that potential profit might then become a criteria in research strategy and decisions.[42] The funding organizations also weighed in, making it clear that they would not support any CGIAR policy that permitted intellectual property protection for living organisms. The research center committee quickly revised its draft to make this clear.[43] CGIAR's Committee of Board Chairpersons acknowledged the gravity of the issue but did little more than encourage the down-stream entities to continue in trying to resolve it. It described intellectual property rights as "an extremely complex and sensitive issue which is overridingly important to the future development of the CGIAR system" and instructed both the research centers and TAC to give the issue "high priority."[44] The comment was a strange mixture of urgency and passivity, reflecting the loose organization of the CGIAR system. The CGIAR board

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[41] Ibid., 17.
[42] "Report of the Fifty-Sixth Meeting of the Technical Advisory Committee," March 1992: 28. http://www.cgiar.org/corecollection/docs/tc9203a.pdf (accessed December 17, 2010).
[43] "Draft Report of the Fifty-Eighth Meeting of the Technical Advisory Committee," August 1992: 7. http://www.cgiar.org/corecollection/docs/cg9210c.pdf (accessed December 17, 2010.)
[44] "Summary of Proceedings and Decisions, International Centers Week," 1992: 3. http://www.cgiar.org/corecollection/docs/csop1192.pdf (accessed December 17, 2010).

appears to have known that it could not dictate policy on this issue, perhaps due to a lack of expertise but more likely due to a lack of power. Any solution was going to have to be a bottom-up undertaking through which the research centers put the solution on the table along with their endorsement. The fact that the research centers themselves were autonomous further diluted the chances of their speaking with a single voice. CGIAR's structure had allowed for considerable flexibility and ease of management in the early years. Like the Rockefeller team in Mexico, research centers built relationships and solved problems locally. The higher one went in the system, the more one encountered names and titles designed to lend prestige and credibility to CGIAR's mission. Their main focus was to secure and marshal funds from donors and then allocate them to worthy projects. The biotechnology boom presented CGIAR with an opportunity and a threat. How to manage its seed assets called for a type of leadership that the CGIAR system was not designed to provide. Unlike a for-profit company, CGIAR could not simply perform a cost-benefit analysis and issue a board decision. It had to hold together a coalition and also adhere to a philosophy that favored common heritage over profit potential. As a result, it struggled to build consensus, while its peers moved forward and began to narrow the options.

The Convention on Biodiversity

One peer group that had by this time seen the reality of the new order of things was the United Nations, which was preparing to revisit the strict common heritage position expressed in the Undertaking. The U.N.'s assertion in the 1983 Undertaking that raw and improved germplasm was the common heritage of humankind had landed with a thud at the feet of the industrial world. Nine years later, the U.N. set out on a more capitalist-

oriented approach designed to help developing nations become economic players in the biotechnology game. The United Nations Conference on Environment and Development (UNCED), also known as Earth Summit, convened in Rio de Janeiro in 1992. The meeting produced the International Convention on Biodiversity (CBD). The CBD was unique in that it focused on resources wholly within the borders of sovereign nations. Traditional subjects of international agreements were global resources that nations shared such as airspace, the ozone layer or bodies of water. Biological diversity, such as plants that provided reliable food crops, was found within sovereign borders but shared one critical characteristic of global resources: it was vital for the care and even survival of the entire population.[45] Thus, an argument could be made that the global community should manage and protect valuable landraces housed in sovereign nations, which should also share the cost and responsibility of maintaining them. As one commentator put it, when it came to biotechnology the north had the technology but the south had the bio.[46]

Earth Summit represented a perfect opportunity for the common heritage lobby. Food, like air and water, was basic to human survival. The problem was that the oceans and the skies were fixed and self-perpetuating. The only thing mankind had to do was to keep from damaging them and try to repair what damage may have already been done. Plant life, however, could not feed the modern population simply by being left alone. It had to be domesticated and managed and, ideally, improved. Doing so was costly but the private seed industry was happy to take on the challenge, along with the public universities and the private philanthropies. As the money and talent gravitated to the

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[45] Timothy Swanson, "Why Is There a Biodiversity Convention? The International Interest in Centralized Development Planning," *International Affairs*, vol. 75, no. 2 (April 1999), 308.
[46] Simone Bilderbeek, "Biodiversity as Political Game," *Politics and the Life Sciences*, vol. 12, no. 2 (August 1993), 266.

private industry, the remaining entities had to choose between idealism and pragmatism. Membership in the common heritage camp dwindled as a result, as reflected by the CBD.

Participating nations signed the CBD in 1992 and it became effective in 1993. The CBD abandoned the common heritage language of the Undertaking and expressed the goal of mutual sharing in a more transaction-oriented mode. The shift was subtle but clear. Instead of simply sharing germplasm in a mutually agreeable fashion, the parties could bargain for specific terms on a transaction-by-transaction basis. The stated objectives of the convention remained idealistic. They included conservation of biological diversity, sustainable use of components of biological diversity, fair and equitable sharing of benefits arising out of the use of genetic resources, and appropriate transfer of relevant technology. The means for attaining the objectives, however, shifted from common heritage to fair compensation. The CBD achieved its vision of equality by focusing on ownership of private property, specifically national sovereignty over individual plants and animals as tangible goods in commerce. In its Article 15, the CBD stated that genetic resources were subject to the sovereignty of individual states and that collection of those resources required prior informed consent.[47] The CBD further stipulated that there should be a quid pro quo in the acquisition of germplasm. In exchange for germplasm, some technology should be transferred from the country acquiring the germplasm to the country providing the germplasm.[48] As with most international conventions, including the FAO Undertaking that preceded it, the CBD was little more than a set of aspirational goals that the signatories agreed to work on to the

[47] Convention on Biodiversity, Art 15, Sec 7, available at http://www.cbd.int/convention/text (accessed March 15, 2011).
[48] Paul Gepts, "Who Owns Biodiversity, and How Should the Owners Be Compensated?" *Plant Physiology*, vol. 134, no. 4 (April 2004), 1297.

extent they were appropriate under local conditions and, of course, to the extent of availability of funding provided from the industrial world.[49]

Just as the FAO took on a difficult task in arguing for common heritage of all plant resources, the U.N. took on a difficult task in trying to equate bio-diversity with human survival. The pro-diversity lobby veered into dangerous waters by making the moral case for the right of species to exist. For critics and opponents, the CBD became an easy target - a glorified effort to create global park rangers. The industrial countries preferred the hard economic reality of the GATT treaty.[50] The United States, for example, refused to sign the CBD while supporting the patent-type system established in the TRIPS portion of GATT. Underdeveloped countries did not have the economy nor industry to take full advantage of the northern patent systems, but those systems were nevertheless forced on them as a condition to the myriad other benefits of being a GATT participant.[51] The retreat of the U.N. as represented in Article 15 of the CDB, combined with the TRIPs agreement in GATT, effectively ended the common heritage argument put forth in the Undertaking.

CGIAR remained a firm supporter of the U.N. philosophy, including its resignation to a more commercial approach to plant and seed management and notable movement toward operating more fully under such a paradigm. In 1992, TAC recommended an update statement of principles tailored to the CBD, which at that time had not yet been finalized: "There was broad consensus that [CGIAR] should ensure consistency between its future policy and the articles of the convention once it was agreed."[52] CGIAR's

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[49] Bilderbeek, "Biodiversity as Political Game," 267.
[50] Ibid., 265.
[51] Ibid., 269.
[52] Report of the Fifty-Sixth Meeting of the Technical Advisory Committee, March 1992: 28.

updated Statement of Principles regarding intellectual property was stronger and more comprehensive than anything it had produced to date. It reflected the resignation of the CBD that germplasm was going to be an item of commerce in the global marketplace, but also determination that CGIAR would be a careful economic steward of its seed collections. The draft document of the updated principles included a clear statement of support for research center patents under specific circumstances. It continued to assert that research center genebanks were held in trust for the world community with unrestricted availability. While acknowledging the existence of plant breeders' rights and farmers' rights, it viewed naturally occurring genes as common property not subject to intellectual property protection by CGIAR research centers. The research centers could consider seeking intellectual property protection for novel biotechnological techniques, processes and other inventions they developed if such protection was deemed necessary in order for developing country partners to have access to those technologies. Intellectual property protection was not, however, to be used as a mechanism to generate capital even if designated for investment in additional research. Any profits were to be used to further the conservation and use of genetic resources in developing countries.[53] Ideally, the CGIAR board had preferred to use publication as the means of placing and keeping its assets in the pubic domain but ultimately endorsed intellectual property protection "after a specific judgment that such protection would assist in bringing the benefits of research to developing nation farmers."[54] It is notable that the policy statement left the patenting

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http://www.cgiar.org/corecollection/docs/tc9203a.pdf (Accessed December 17, 2010).

[53] CGIAR Secretariat to CGIAR Donors, memorandum, "Suggested Principles for a Future CGIAR policy on Intellectual Property Rights," November 7, 1991: 1-2.
http://www.cgiar.org/corecollection/docs/cg9205f.pdf (accessed December 20, 2010).

[54] CGIAR Secretariat, "CGIAR Discussion Document On Intellectual Property, Biosafety and Plant Genetic Resources," April 9, 1992: 5.
http://www.cgiar.org/corecollection/docs/cg9205f.pdf (accessed December 20, 2010).

decision to the research center, which would clearly be within their technical prerogative, but was also likely a decision they had every intention of making on their own. In fact, nothing in the policy statement strayed from the basic positions advocated by the research centers.

Although it maintained its policy of unrestricted availability of germplasm, CGIAR made clear that unrestricted access did not mean unrestricted use. Specifically, CGIAR sought to shut off the potential loss of its own asset to a third party that might claim a proprietary right. CGIAR also sought to mimic the CBD by recognizing the sovereign rights of developing nations in their indigenous germplasm. The CGIAR policy stated that any provision of germplasm to non-governmental organizations (NGO's) would be accompanied by material transfer agreements that would ensure "that any useful genes discovered in the material could not be withheld from the country from which the material originated, nor could the [research] Centres be prevented from using-the material, or specific genes derived from it, for the benefit of developing countries."[55] In other words, CGIAR sought to retain for itself and its donors and unrestricted license to use anything of value developed from its shared germplasm.

CGIAR also sought to encourage its developing world partners to enter commercial markets with CGIAR products. If a CGIAR research center provided a country with advanced lines that the country then converted to finished lines, those countries would be free to release the finished varieties themselves or license them to the private sector. This would be done in such a way and through a series of agreements that effectively prevented the private company from imposing any restrictions on the further use of the same material by either the transferring country or the CGIAR research center. As for the

[55] Ibid., 1-2.

more modern process of isolating, modifying and inserting non-plant genes into plants, the CGIAR conceded that it was not a player in such technology and so would have to "recognize certain patent rights in industrial countries and, in some cases, to pursue such patents themselves … to ensure that the most beneficial advanced technologies and their products would be made available to developing nations at as low a cost as possible."[56]

The revised CGIAR policy statement, combined with the CBD, represented an acknowledgement that CGIAR was operating in a venue that demanded intellectual property procedures. The new policy was a responsible effort by CGIAR to demonstrate its worthiness to hold developing world assets. It was also a noble effort to keep the ideal of free sharing alive to the extent possible by attaching conditions that assured continued pursuit of philanthropic research. Most critically, however, the new policy reiterated the long held view that CGIAR accomplished its goal of improving lives in the developing world by making it wealthier. CGIAR authorized and encouraged the developing world to get into the seed markets by licensing their finished varieties to the private sector. The CBD similarly proclaimed sovereign control over raw germplasm, which should not be taken without some type of compensation. In essence, the ideal of free sharing became an intermediate step in a process that eventually generated profit. But for whom? CGIAR seemed to settle on the notion that it was being true to its mission as long as funneled profits from intellectual property to developing nations rather than itself. It was not particularly discerning as to how those profits eventually dispersed. This fact aroused advocates for individual farmers who were concerned that CGIAR was ignoring the most deserving and needful beneficiaries.

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[56] Ibid., 4.

The FAO Trust Revisited

Having acknowledged the need to operate within a commercial and intellectual property paradigm and setting out policies for doing so, CGIAR still faced the problem of enforcement. A patent, after all, was nothing more than a set of property rights. If CGIAR was willing to use patents as a strategic tool to further its mission, some entity with legal standing would have to emerge in order to create, administer and enforce those rights as needed. The need for CGIAR to resolve the issue became all the more urgent with TRIPS looming on the horizon. Once again, the concept of seeds held in trust emerged as a possible solution. In 1993, TAC reported to CGIAR that the research centre directors were working with the FAO on the logistics for placing their base germplasm collections under the legal umbrella of the International Undertaking on Plant Genetic Resources.[57] Upon hearing of the report and status, CGIAR placed the issue on the agenda for the upcoming meeting of the research centers "at the request of several donors" and also appointed an Oversight Committee consisting of individual representatives of donor countries that would "define issues sharply and speed up their resolution."[58]

The new CGIAR draft principles in circulation, as well as the possibility of using the FAO's legal identity to protect the CGIAR seed collections, presented an opportunity for a broad array of CGIAR participants and commentators to weigh in. The research centers hosted a meeting in October of 1993 that included a hearing on the recent proposals. Perhaps not surprisingly, CGIAR received varied reactions that reflected opposing goals. Comments helped to illustrate the very difficult task CGIAR faced in

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[57] "Report of the fifty-ninth meeting of the Technical Advisory Committee," March 1993: 50. http://www.cgiar.org/corecollection/docs/cg9305b.pdf (accessed December 21, 2010).
[58] "Summary of Proceedings and Decisions, CGIAR Mid-Term Meeting," 1993: 13. http://www.cgiar.org/corecollection/docs/csop0593.pdf (accessed December 21, 2010).

keeping everyone happy. For example, representatives of the non-governmental organizations "expressed strong concern that the document may give the impression that the CGIAR and the centers are in favor of [intellectual property rights]." By contrast, representatives of the International Union for the Protection of New Varieties of Plants (UPOV) detected "antipathy" to intellectual property in the same document.[59]

The comments also reflected a growing recognition that the ideal of common heritage had given way to the need for fair compensation. Advocacy on behalf of the developing world had not waned but it had been recast in economic terms. The problem was a growing distance between the individual farmer and the sovereign nation as the ultimate beneficiary. Advocacy groups began to hound CGIAR for settling on research centers, governments and large farmers as the beneficiaries of the potential profits generated by intellectual property rights in the perhaps naïve expectation that those benefits would trickle down to all farmers. For example, the Rural Advancement Foundation International asserted that "if [CGIAR research] Centers were to adopt intellectual property practices they would be seen to be endorsing a system which is taking away rights from farmers in favor of breeders … there is no discernable line between genebank collections and research products and that, as much as trusteeship applies to the former it must also apply to the latter." The Columbian Institute for Agriculture (ICA) similarly observed that "[c]ountries of origin of genetic resources, or which supply these resources, must have unrestricted access not only to the [research

[59] Center Directors' Committee on Intellectual Property Rights, "A Review of Intellectual Property Protection within the CGIAR," October 8, 1993: 1. http://www.cgiar.org/corecollection/docs/cg9310i.pdf (accessed December 21, 2010). Among those who offered unreserved support for the CGIAR position were institutes, both private and public in the following countries: Ecuador, Colombia, Brazil, Malaysia, Korea, India, Costa Rica, China, Japan, Ghana, Kenya, Nigeria, Myanmar, Burundi, Zimbabwe, Cameroon, Tanzania, Argentina, Bolivia, Mexico, El Salvador, Venezuela, and Costa Rica. Ibid., Annex V.

centers'] active collections, but also to base collections when necessary. This preferential treatment is a fair reward for the fact that they own a major part of the Earth's biological diversity." Even the Secretariat of the FAO Commission on Plant Genetic Resources chimed in: "The recognition or seeking of patents over plant genes is the most worrying; the CGIAR should not be involved in any process which might render difficult the downstream utilization for developing countries of plant genetic resources in its trust. … If this germplasm belongs to the world community, then the policy related to it should be defined with the representatives of the world community."[60] In a separate hearing, a representative of the NGO community complained that profits from plant material did not benefit originating farmers. He was adamant that "it is not acceptable to allow patents on research products while maintaining free access to raw plant material."[61] Unfortunately, much of the material had been given freely to research centers and there was no paper trail of exchange. Because of the wide extent of sharing around the globe and the homogeneous quality of germplasm, it was difficult if not impossible to trace materials back to their country of origin.

The research centers generally believed that intellectual property rights should not apply to donated material but parted ways with some of the developing nation advocates in drawing a clear distinction between donated material and materials arising from their own breeding programs.[62] As for the proposal to place the seed collections under the FAO umbrella, the research centers approved and hoped to sign agreements by 1994. It appeared that the FAO lent to CGAIR and air of credibility that some developing

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[60] Ibid., Annex IV, 23-29.
[61] "Summary of Proceedings and Decision, International Centers Week," December 1993: 24-25. http://www.cgiar.org/corecollection/docs/csop1193.pdf (accessed December 21, 2010).
[62] Center Directors' Committee on Intellectual Property Rights, "A Review of Intellectual Property Protection within the CGIAR," 2-3.

countries had perceived as lacking. The report stated that the action would "increase the confidence of developing countries and others that the Centers are taking their role as trustees seriously."[63]

The meeting report included a draft model agreement for placing CGIAR seed collections under the auspices of the FAO. The agreement noted the "importance to humanity of protecting and conserving plant germplasm for future generations" and also stated that "germplasm accessions have been either donated by individual countries or institutions to the [CGIAR research centers] … on the understanding that these accessions will remain freely available and that they will be conserved and used in research on behalf of the international community, in particular the developing countries." The FAO would "hold the designated germplasm as trustee for the benefit of the international community, in particular developing countries, in accordance with the International Undertaking on Plant Genetic Resources."[64]

Despite agreement on placing the CGIAR collections under the auspices of the FAO, the research centers still had to access and use the materials as before and the manner in which they did so remained troubling. The FAO trust strategy simply provided CGIAR with a legal entity capable of asserting property rights in a court of law. The onus

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[63] Ibid., 3. Five years later, the CGIAR would summarize the strategy as follows: The Food and Agriculture Organization's International Undertaking on Plant Genetic Resources was designed to short-stop national laws that might have crippled CGIAR collection and storage programs. In other words, get a treaty in place before the nations start creating their GATT mandated in-situ laws, which would create ownership rights for the private sector that CGIAR did not want to comply with or complete against. The agreement would place an International Network of Ex Situ Collections under the Auspices of FAO. CGIAR was concerned that TRIPS was a forum where the agricultural community has limited influence, making it urgent for CGIAR to find its own solution, one of which was the international undertaking that would allow CGIAR to work within its traditional framework and "free of burden of many current political controversies." The undertaking would cover not only the CGIAR collections but also national collections. Failure to act could "have negative impacts on long-term donor support." See, "Summary of Proceedings and Decisions, International Centers Week," October 25-29, 1999: 59-60. http://www.cgiar.org/corecollection/docs/icw99sop.pdf (accessed January 4, 2011).

[64] Ibid., 35-39.

to minimize the need to use this resource remained with the research centers. Little would be accomplished if the FAO was forced to spend significant time and money pursuing legal remedies shoddy practices necessitated. Despite the new policy statement, individual research centers still acted autonomously and varied greatly on their policies toward protection of germplasm they used and new materials they created.[65] Moreover, the north-south divide burst into the limelight as CGIAR participants and commentators debated the wisdom of protecting and profiting not only from seeds but also from genes and genetic resources.[66] TAC tried to build consensus by pointing out that the current CGIAR system entailed extensive sharing of undocumented germplasm, which was becoming more risky in the biotech age. A TAC report stated that the CGIAR System distributed over 745,000 accessions in the period of 1987 to 1991. Of those, 45% were distributed between CGIAR research centers and their associated international institutions; one-third were distributed within respective host countries; and one-fifth

[65] See, Ibid., 5-17. The individual research center positions on use of germplasm are summarized as follows: CIAT – Free access but would 'contemplate' patenting its own science and technology as a 'last resort.'; CIFOR – address all IP issues in agreements; CIMMYT – Free access but will protect products of its own research; CIP - no policy; ICLARM – no policy; ICRAF – no policy; ICRISAT - prefers 'open door' approach plus publication. No 'defensive patenting' which is cost prohibitive; IFPRI no policy; IIMI – no policy; IlTA - will seek intellectual property protection over the results of its research only as necessary; ILCA – no policy; ILRAD – will retain for itself the proprietary rights to such its own discoveries; IRRI - unrestricted availability will not seek intellectual property protection on breeding lines. Will provide non-exclusive use to any entity. Collaboration with profit-making organizations for the development of hybrid rice technology will proceed after consultation, where appropriate, with the authorities in the respective host country; ISNAR – no policy; WARDA – no policy. Ibid.

[66] Comments suggested unease with CGIAR finally taking firm action, perhaps reflecting that most parties remained uncertain as to who would win and lose as a result. At CGIAR sponsored panel discussions, the commentary was varied. A representative of Kenya still feared that CGIAR plant material obtained by a private company in a developed country would be genetically improved and then patented and would come back to the originating country "with a price tag." She noted that "developing countries will be particularly careful that they are not taken for a ride when negotiating with companies who may know the value of what their resources better than the country." By contrast, representatives of the private seed industry argued that a stand against patenting natural genes would make the adoption of any intellectual property policy meaningless and valueless and would substantially delay technology transfer and postpone welfare gains. He argued that if FAO truly supported the policy of seeds held in trust, then the World Health Organization would be forced to discontinue its substantial portfolio of collaboration with the private sector to develop key technologies such as malaria-vaccines, which relied extensively on patented natural genes. "Summary of Proceedings and Decision, International Centers Week," December 1993: 24-25. http://www.cgiar.org/corecollection/docs/csop1193.pdf (accessed December 21, 2010).

went to other countries, with a small but growing proportion going directly to the private sector.[67] Clearly the private sector still played a minor role at this time, but once the material began to circulate, and given the great disparity between CGIAR research centers in their policies on sharing, the potential for germplasm to end up in the hands of a for-profit end-user with access to intellectual property protection was inevitable. According to TAC, "[T]he issue of 'ownership' has now changed from the idea of genetic resources being the common heritage of mankind, envisaged in the FAO International Undertaking, to the notion of national sovereignty under the Convention."[68] The FAO trust would: "help clarify the ambiguities surrounding national sovereignty over the germplasm now held by the CGIAR Centres."[69] Just when momentum seemed to emerge, the complex CGIAR machine once again brought it to a halt. At the July 1994 TAC meeting, the research centers' Directors Committee reported that it "hoped to complete its work and produce a final centre-wide policy statement on intellectual property rights within twelve months."[70] As the research centers took the lead in slowing down the process, CGIAR began to reinvent itself in way that justified its new patent-friendly philosophy.

CGIAR's Mission: A Moving Target

A new Intellectual Property Rights Panel chaired by Dr. M.S. Swaminathan reported at the October 1994 meeting of the research centers. The Swaminathan report's introduction contained a fascinating piece of historical perspective, bordering on

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[67] CGIAR Secretariat, "Stripe Study of Genetic Resources in the CGIAR," April 26, 1994: 13, contained in "CGIAR Mid-Term Meeting, May 23-27, 1994." http://www.cgiar.org/corecollection/docs/tc9403c.pdf (accesed January 5, 2011).
[68] Ibid., 6.
[69] Ibid., 14.
[70] "Report of the Sixty Third Meeting of the Technical Advisory Committee," July 1994: 24. http://www.cgiar.org/corecollection/docs/tc9403b.pdf (accessed January 5, 2011).

historical revision, that was indicative of the entire 1994 meeting. As the world had changed, CGIAR not only struggled with how it would change in response but it also struggled in defining what it had been in the past. CGIAR attempted to justify its new position on intellectual property by casting it as consistent with long-held CGIAR values. Within the new report, CGIAR's goal became social and environmental justice for small farmers and the planet. The report stated: "The major aim of the CGIAR has been to protect and promote the interests of small and resource poor farming families in developing countries. CGIAR's new vision places the productivity, profitability, and stability of food-based farming systems in the developing countries on an environmentally sustainable and socially equitable basis as being of highest priority."[71] This aim was not consistent with the repeatedly stated goal in the early 1970s of increasing food production in order to prevent mass starvation, even at the expense of farmers unwilling or unable to adopt a modern, commercial mindset toward agriculture. Keeping a small farmer small was never going to feed the world, something that the Rockefellers and the World Bank under McNamara saw very clearly in the early days. The Swaminathan committee attempted to meld its revised CGIAR vision with a progressive attitude toward intellectual property. The panel endorsed the 1992 CGIAR position that research centers would not seek intellectual property protection for the purpose of generating income as a source of operating funds. The panel also recommended that patent protection could be appropriate as a defensive measure to keep others from patenting and profiting in CGIAR research, or as a means to the goal of delivering still better products to the farming community. In addition, the committee saw

[71] "Report of the Intellectual Property Rights Panel," September 15, 1994, in "Consultative Group on International Agricultural Research, International Centers' Week," October 24-28, 1994: 1. http://www.cgiar.org/corecollection/docs/cg9410g.pdf (accessed January 3, 2011).

patents as a tool to provide CGIAR with a chip for negotiating for other proprietary technology for the benefit of developing countries.[72] In other words, patents helped provide better products to small farm families, clearly a more humane position than one of modernizing farming to enhance local economies at the expense of small farm families.

The Swaminathan report also took on the longstanding tradition of sidestepping political entanglements. The report departed sharply with the earlier stated policy of IBPGR in 1985 when that group had resolutely pledged to stay away from lobbying developing countries on intellectual property issues. With the advent of TRIPS, the Swaminathan panel saw the CGIAR as a champion, perhaps the lone champion, of the position that TRIPS-mandated legislation should incorporate UPOV-type provisions allowing farmers to save and exchange registered seed as well as providing an exemption for academic research. Thus, CGIAR should: "co-sponsor with interested developing countries, a program on the development of national systems for plant variety protection, in partnership with interested countries." The report also encouraged CGIAR to get the centers' germplasm collections under the auspices of the FAO "as quickly as possible."[73] By the reports' conclusion, the committee had melded the old and the new into an awkward alliance: "The foregoing steps are designed to ensure that the primary purpose for which donors provide funds to the CGIAR, namely promoting sustainable food security and livelihoods among the world's economically and ecologically disadvantaged

[72] Ibid., ii - iii. Two years later, a contingent of commentators urged CGIAR to take a lead role in using the intellectual property issue to set social policy and to take into account "new information about women and their role in genetic resources control and ownership." While the board did not adopt the policy, it was "accepted as an interim set of working guidelines" and the Genetic Resources Policy Committee under Swaminathan was reestablished for another two years. See, "Summary of Proceedings and Decisions, International Centers Week," January 1997: 67 http://www.cgiar.org/corecollection/docs/csop1196.pdf (accessed January 4, 2011).
[73] Ibid.

women, men and children is achieved under the emerging global trade environment."[74]In the same sense that CGIAR had always tried to juggle multiple interests, it also tried to juggle traditional goals that reflected the harsh reality of feeding the world with the more popular goals of cultural identity and environmental responsibility. The fact that CGIAR felt obligated to address those goals and put itself forward as their champion without really changing its *modus operandi* suggests two things. First, those issues still carried some clout and the voices of common heritage had not fully succumbed to industrial capitalism. Second, addressing those issues was less a matter of substantive change and more a matter of arguing that the industrial agriculture model already took care of them. If anything, CGIAR was moving closer to industrial capitalism but spinning it as environmentally and family friendly.

The Swaminathan report generally concurred in the idea that all CGIAR genetic resources were held in trust and made freely available and that research centers should not seek intellectual property protection unless absolutely necessary to ensure access by developing countries to new technologies and products, but never for income-generating purposes[75] In a companion document entitled 'Suggested Guiding Principals for the [Research Centers]' the panel also recommended a position that naturally occurring genes were common property and not eligible for patent protection.[76] Swaminathan also sought

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[74] Ibid., 9.
[75] Ibid., 22.
[76] Ibid., Annex 3. Interestingly, the Committee resurrected a policy statement in intellectual property rights from 1991 provided by the Rockefeller Foundation to its rice research institute. The policy suggests that Foundation was more aggressive when speaking for itself rather than as a co-founders of CGIAR. The Foundation clearly expected to see results. It advised that pursuit of intellectual property rights in developed countries was permissible if used for a proper goal. The purpose of the policy statement was to "clarify what the Foundation expects of grantees with regard to collaboration and the sharing of materials. Our consideration of requests for financial support will increasingly be based on the degree to which grantees contribute to this chain of collaborations as well as the scientific quality of their research.... It is expected that Rockefeller Foundation rice biotechnology grantees will share materials and technology

to rein in the research centers by securing their collective authorization to speak on their behalf with "the numerous institutions that shape international policy in this area."[77] In sum, the panel report moved CGIAR much closer to acknowledging the reality in which it lived as well as the need to work on its public message.

By the end of 1994, CGIAR and the FAO had executed agreements placing the genetic resource collections of the CGIAR research centers under the auspices of the FAO's Commission on Plant Genetic Resources. CGIAR also strengthened its recommendation on intellectual property for research centers, sating that "Centers should seek patent protection in order to prevent appropriation by others, to ensure further product development, and to use ownership of intellectual property to negotiate access to other proprietary technology for the benefit of developing countries." [78] The direction was timely if not long overdue. TAC reported in 1995 that every CGIAR research center was involved in "many -- in some cases well over 100 -- collaborative research projects involving other research institutes." While not every collaboration was relevant to use of patentable property, many were classified as "high-science."[79] In such cases, funding usually came from the outside research institute or the country in which it resided. TAC

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resulting from Foundation-supported research with cooperating researchers at zero royalty for use in developing countries. Grantees should not enter into agreements that conflict with this obligation … At the same time, it is recognized that grantees may wish to pursue intellectual property rights on their discoveries and their improved materials in order to obtain economic return in developed countries for the support of further research and to maintain a strong bargaining position in the event of any intellectual property disputes. For purposes of this policy 'developing nations' include all the nations of Central and South America including Mexico, all the nations of Asia except Japan and the Soviet Union, all the nations of Africa, and the nations of Oceania except Australia and New Zealand. All other nations are considered 'developed'." Ibid., Annex 4 The panel concluded that the Rockefeller statement "may serve as a useful basis for CGIAR policies." Ibid.

[77] "Report of the first Steering Committee Meeting," September 15-16: 5-6. http://www.cgiar.org/corecollection/docs/cg9410f.pdf (accessed January 3, 2011).

[78] Summary of Proceedings and Decisions, International Centers Week," 1994: 9-10. http://www.cgiar.org/corecollection/docs/csop1194.pdf (accessed January 3, 2011).

[79] Technical Advisory Committee, "The Role of Advanced Institutions in the Work of CGIAR," September 1995: 1. http://www.cgiar.org/corecollection/docs/cg9510i.pdf (accessed January 5, 2011).

wanted to make sure that such efforts were cost effective and that the results would contribute to development of international public goods. With a wary eye on GATT, TAC cautioned that "partnership arrangements would need to continue to ensure that all products and processes discovered in the research can be made available to all [CGIAR research centers] and to all [national agricultural research centers] of developing countries," a goal that would require "considerable attention to legal issues."[80] In other words, even with the seed collection under the FAO umbrella, CGIAR still faced the challenges of management and enforcement. Not surprisingly, there was no shortage of opinions on how those responsibilities should be handled.

The Private Sector Committee

CGIAR's move to place its seed collections under the auspices of the FAO and green-light use of patents by research centers roused several interest groups and generated diverse reactions. Although CGIAR reiterated its desire to facilitate free sharing, it had nevertheless sent a clear message that sharing did not encompass exploitation. CGIAR would not be deprived of assets and income to which it had a superior claim. To the extent it made money in the process, that money would be used to benefit the developing world. The imprecise nature of that benefit brought commentary on behalf of the basic cultural unit within the developing world: the individual farmer. CGIAR seemed to respond by staying course but modifying its message to suggest that its mission had always focused on farm families and the environment in which they operated and such concern would be continue to be well served in an intellectual property paradigm. On the other side, the private sector likely woke up to the fact that CGIAR's

[80] Ibid., 3.

new policies, while positive, could enhance its ability to compete for emerging markets. Although it generally supported a CGIAR adept at using intellectual property laws, it wanted to be sure that it was done in a manner that did not foster unnecessary competition.

Ever cognizant of its delicate balance of supporters, CGIAR established a new Private Sector Committee (PSC) in 1995 to better understand and interact with the burgeoning market sector that was hungry for genetic material. The PSC wasted no time in pushing CGIAR toward a more industry friendly position. The committee quickly established a vision of cooperation and role assignments based on profitability. There was no reason for public or charitable entities to compete in profitable genetic research that the private sector was more than willing to take on. The simple answer was to let the private sector focus on "high productive areas" thus allowing the national agricultural research centers and CGIAR "to be increasingly concentrated on more marginal areas."[81] In order to help accomplish a proper split in focus, CGIAR needed to do a better job of marketing itself to the private sector.[82]

The PSC delivered a white paper to CGIAR at the latter's May 1997 midterm meeting. The paper warned CGIAR that it could not gain access to needed technology absent a willingness to partner with the private sector. Such partnership required recognition of the fact that private companies could eventually find developing nations worth their efforts once those countries became sufficiently advanced to be a customer. The private companies were less interested in increasing yields in obscure crops and more interested in reaching a critical mass of purchasers. The PSC described the private

[81] "Report of the First Meeting of the Private Sector Committee," December 7-8, 1995: 2. http://www.cgiar.org/corecollection/docs/psc001.pdf (accessed January 11, 2011).
[82] Ibid., 4.

sector as "less interested in crops per se than in potential markets … The market segments of greatest interest to the private companies are those where they can capture the most value."[83] It is notable that the private sector's desire for developing countries was the same as CGIAR's; both wanted them to see agriculture produce for the marketplace rather than subsistence.

In order to partner with the private sector, CGIAR would be required to build up its intellectual property assets so that it could gain entry into the market by becoming an attractive business partner. Doing so "would compel the CGIAR to reconcile the public good nature of its work with the norms prevailing in the biotechnology industry."[84] The PSC paper identified two processes in the new world of biotechnology: Creation of genes that encode the proteins responsible for the desired trait, and techniques for inserting, identifying, or manipulating the genes in cells through plant transformation systems, selectable markers, and gene expression techniques. New issues created by these

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[83] Private Sector Committee, "Strengthening CGIAR-Private Sector Partnerships In Biotechnology: A Private Sector Committee Perspective on Compelling Issues," April 30, 1997: 7, in "CGIAR Mid-term Meeting," May 26-30, 1997. http://www.cgiar.org/corecollection/docs/cg9705k.pdf (accessed January 11, 2011). One attraction to biotechnology was similar to the attraction of traditional crop breeding and that was its scale neutrality. In other words, any farmer could plant a bioengineered seed instead of a land race, whereas not every farmer could afford a new tractor. The advocacy conveniently ignores the cost of fertilizer, pesticide and irrigation, however. See, "Summary of Proceedings and Decisions, CGIAR Mid-Term Meeting," May 26-30, 1997: 20. http://www.cgiar.org/corecollection/docs/csop0597.pdf (accessed January 15, 2011).

[84] Ibid., *i*. According to the report: "The private sector is responsible for approximately 80 percent of research in plant biotechnology worldwide. In the United States alone, the private sector spent US$595 million on agricultural biotechnology research in 1992. The private sector's large investment in biotechnology has made it a major player in the "basic" research end of the "basic-strategic-applied-adaptive research" continuum. This contrasts with the private sectors traditional role as the user of the basic and strategic research findings of public sector institutions. While agricultural biotechnology firms were concerned with approval of their regulatory submissions on transgenic plants in the early 1990s the CGIAR and its partners were assessing how science could be used more effectively to address the developmental and environmental challenges faced by developing countries. This was the major theme of the CGIAR's Renewal Program, which, after a careful review of issues, redefined in 1995 the CGIAR system's mission as 'contributing through research to sustainable agriculture for food security in developing countries,' and outlined a research agenda to help accomplish this mission. A major emphasis of the Renewal Program - to strengthen global and regional research partnerships - was sparked by a number of factors, including … declining public resources devoted to research." Ibid., 1-2.

processes included valuation and separate pricing of the new trait distinct from the value of the entire seed (or 'vehicle') that carried the trait, thus creating a "trait market" for technology at the molecular level.[85] CGIAR, because of its reputation and credibility, served as the entity best suited to introduce the new technology to the developing world, or at least that portion of the developing world that was able to change: "Developing countries with strong [intellectual property] regimes, regulatory environments, and private sector are of interest to the private sector in the North because there is potential to capture value from investments."[86] The PSC envisioned a system to equip the CGIAR research centers with the new technology and allow them to push it down to the developing countries along with advice and guidance in setting up intellectual property regimes. Because of their credibility in the developing world, the research centers would "play an important intermediary role" including one of "honest broker" in linking private companies to new markets.[87] In other words, if CGIAR could convince the developing world to accept hybrid seeds, it could also convince it to accept biotechnology.

The PSC paper made clear that for the private sector to be interested in such partnerships there had to be sufficient incentives. One incentive, of course, was access to the germplasm, which CGIAR had moved in the wrong direction by placing in trust with the FAO. That the developing world's most valuable asset was potentially outside of a private commercial framework by being held in trust was a clear source of concern and perhaps even frustration to the private sector: "The vast majority of the world's ex situ plant germplasm (3.8 million stored seed samples) is held by the public sector …

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[85] Ibid.
[86] Ibid., 3. The report notes that even the private sector players had to consolidate because many did not have the ability to survive in such a market. How, then, could developing nations, hope to compete? Ibid.
[87] Ibid.

although the [CGIAR research] Centers hold only 14 percent of these seed samples, this amounts to roughly 40 percent of the unique food-crop germplasm in living collections. The elite breeding material of the [research centers] on tropical and orphan crops is of particular global importance. In contrast, in developed countries, most of the important elite breeding material is held by private companies."[88]

Given the "research vacuum" in developing countries due to a lack of private sector investment, in turn linked to a lack of opportunity for intellectual protection, CGIAR was in the driver's seat. It had "few equals in developing countries" in terms of resources.[89] What it lacked was capacity to deal with biotechnology. There were 3800 scientists and engineers per million of population in the United States and less than 200 per million of population in the southern hemisphere based on 1990 data. In the United States, (referred to as "the country most dedicated to the idea of intellectual property rights and the primacy of the private sector") market capitalization of biotechnology firms stood at $83 billion, an increase of over $30 billion since the market's inception less than a decade before.[90] Private investment dwarfed CGIAR's commitment of $30 million to biotechnology annually as of 1997.[91] The private sector led the pack in advancement and its platform for achievement rested on intellectual property rights in order to recoup investments. Europe and the south lagged behind the United States due to the former's "strong public sentiment against biotechnology" and the latter's lack of patent laws. CGIAR was not without influence however as fully 70% of seed crops then used in

[88] Ibid., 5.
[89] Ibid., 10.
[90] "Summary of Proceedings and Decisions, CGIAR Mid-Term Meeting," 19-20, 22.
[91] Ibid., 47.

developing counties had benefited in some way from CGIAR material.[92]

Those who read the PSC report endorsed it. In plenary session, "the CGIAR was urged to become a more significant global player in biotechnology, by raising its capacity and profile in select biotechnology areas of particular relevance to agriculture and natural resources management in developing countries."[93] Ultimately, "it was recommended that the CGIAR assemble portfolios of intellectual property across the system as a basis for enhancing the CGIAR's position in negotiating access to enabling technologies, many of which are held by the private sector."[94]

The report presented CGIAR with a new vision and challenged it to move its economic strategy to a new level. If CGIAR truly wanted to help the developing world and if it defined help in economic terms, then it should take the developing world's germplasm and not only turn it into improved crops but also use it to advance biotechnology. If higher yields could enhance local economies, biotechnology could attract private investors. For CGIAR this may have been too much advancement coming too quickly or possibly a signal that its vision of economic growth for the developing world could be pushed too far. Whatever the reason, CGIAR responded with typical caution.

More Committees – More Opinions

The CGIAR board established two new committees in 1998 to address general issues of biotechnology and proprietary science.[95] In addition CGIAR took to the bully

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[92] Ibid., 21.
[93] Ibid., 46.
[94] Ibid., 47.
[95] "Draft Report of the Seventy-Third Meeting of the Technical Advisory Committee," February, 1998: 11 http://www.cgiar.org/corecollection/docs/tsop9802.pdf (accessed January 5, 2011). TAC charged the new committees to, among other things, identifying "heavy hitters in biotechnology." CGIAR awarded the

pulpit to enlist the help of government regulators in its efforts to protect the germplasm that had been circulating before the new procedures had been put into place. What it could not accomplish legally, it tried to accomplish through public pressure. The 1998 CGIAR press release called for a moratorium on the granting of intellectual property rights on designated plant germplasm originating from the collections of CGIAR agricultural research centers around the world. CGIAR conceded that recipients who obtained materials prior to 1994 were in no way legally bound to refrain from seeking intellectual property rights, but called upon all such parties "to honor the spirit of the agreements with FAO and to refrain from applying for intellectual property rights, regardless of the date the material was received."[96]

The new proprietary science committee quickly became bogged down in conflict. It reviewed all mainstream intellectual property systems as well as "alternative rights regimes" such as the United Nations' Convention on Biodiversity, farmers' rights and traditional sovereign rights over resources.[97] It was unable to reach consensus on recommending a position: "Because our views differ strongly, we can neither endorse the current systems of rights nor oppose them."[98] The panel veered into, and similarly disagreed on, the impact of biotechnology in the developing world. Some members feared that too much of a good thing would eventually harm rather then help local farmers. They saw an inherent conflict in using advanced technology for the poor because

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chairmanship of the Panel on Proprietary Science and Technology to a representative of the United Kingdom, with a United States representative serving as secretary. Ibid.

[96] "CGIAR Urges Halt to Granting of Intellectual Property Rights for Designated Plant Germplasm," press release, February 11, 1998. http://www.cgiar.org/corecollection/docs/n98002.pdf (accessed January 15, 2011).

[97] "Report of the CGIAR Panel on Proprietary Science and Technology," in "CGIAR Mid-Term Meeting," May 25-29, 1998: *xiii*. http://www.cgiar.org/corecollection/docs/mtm9805c.pdf (accessed January 11, 2011).

[98] Ibid.

greater yields invariably forced prices down.[99] As far as the CGIAR research centers were concerned, they cautioned that research and development should never have as its objective the generation of income or the creation of marketplace leverage. Some condemned any efforts by CGIAR research centers to seek intellectual property protection primarily to create "bargaining chips." They claimed that generation of income would be a "constant temptation" that would divert the research centers from their mission. In addition, they claimed that few such efforts ever yielded income but all such efforts carried expenses.

Others on the committee found use of intellectual property to be acceptable in limited circumstances but wanted to see the resulting income pushed further down the social ladder. "The money generated should be used for the mission, and for remunerating sources of germplasm (there are many possibilities, including paying farmers who preserve biodiversity, royalties to communities of origin supporting research, into on site conservation benefiting the poor, etc.). Not to protect such developments is to waste useful resources."[100]

One area of agreement, however, was shock regarding the CGIAR research centers' blissful and sometimes willful ignorance as to their handling of germplasm. The committee identified 166 applications of proprietary technologies CGIAR research centers used: "The majority of the categories of proprietary technology used by [the research centers] are protected by patents, though may not be in the countries where the CGIAR's clients operate … It is worth mentioning that for nearly 40 research

[99] Ibid., *xiv*.
[100] Ibid., 6.

applications, the type of permissions were not known or lacking in the questionnaires."[101] In other words, the research centers were flaunting the patent laws either because they were convinced that those laws did not apply in the jurisdiction where the materials were being used or they simply did not know and had no desire to find out. This revelation suggests that the research centers' long standing concern with intellectual property was not uniform across all centers and more focused on protecting what went out as opposed to what came in. It is telling, however, that the report did not cite a similarly long list of lawsuits. Whomever was working with the research centers was either equally uninformed or had made a strategic decision that harassing CGIAR was not worth the time or money. It could be that the material those entities received from CGIAR was worth the trade. Another possibility is that, knowing the lack of expertise on the part of CGIAR and its geographic areas of operation, other entities did not fear that they would seek patents.

Perhaps in an effort to defend their practices, center directors highlighted the collaboration of the maize research center in Mexico and the French research center ORSTOM as a good case study of patent potential for CGIAR. The two entities were co-owners of a patent for apomictic maize, which they obtained in order to protect access to the crop by resource poor farmers and to ensure that the CIMMYT-ORSTOM project could continue its research.[102] The joint effort rejected proposals from two private companies due to unacceptable terms but remained willing to partner with the private

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[101] Ibid., 3.

[102] 'Apomixis' refers to the asexual production of seeds. Apomictic seeds are those contain a trait that allows them to be cloned from the mother plant. There is no detail in the CGIAR document, but other sources dedicated to helping small farmers indicate that commercially viable apomictic crop seeds did not exist by the turn of the century. "Apomixis: The plant Breeder's Dream," September 26, 2001, Grain Website, http://www.grain.org/article/entries/218-apomixis-the-plant-breeder-s-dream (accessed August 25, 2011). This article suggests that the patent in question was precautionary and never fully developed.

sector. The Center directors put the problem bluntly: "[T]he challenge is to reconcile the goals of both sides. For CIMMYT and ORSTOM the goal is to help the poor; for the private sector, it is profit."[103]

Despite the anecdotal success of patent use, the research centers continued to display a shocking disregard of patent rights belonging to outside parties. When polled, the research centers expressed two views. According to the first view, the research centers were using patented technology only for research purposes: "[T]his is at least within the spirit of the patent laws, if not necessarily the letter in all cases … owners are unlikely to sue, because of the bad publicity it would cause them." The alternate view was that the research centers, as bodies supported largely by public funds, had a duty to behave in an exemplary manner, including respecting all rights of all parties, no matter what excuses they might be able to rationalize.[104]

Those research centers cited three basic but competing arguments regarding CGIAR's use of intellectual property. The first argument was 'pro' intellectual property. It stated that biotechnology was central to CGIAR's goal of increasing food production and use by CGIAR of such technology could proceed only in the context of strong intellectual property regimes, thus necessitating CGIAR's involvement as both a licensor and licensee. CGIAR's inability or refusal to participate in the intellectual property realm would eventually isolate CGIAR from its private industry peers. If CGIAR refused to get more involved in intellectual property and instead claimed the moral high ground of common heritage and human rights, it would essentially cut off its nose to spite its face:

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[103] "Summary of Proceedings and Decisions, International Centers Week," January 1998: 26. http://www.cgiar.org/corecollection/docs/csop1197.pdf (accessed January 4, 2011).
ORSTOM is the Institut Francais de Recherche Scientifique pour le Developpement en Cooperation.
[104] "Report of the CGIAR Panel on Proprietary Science and Technology," in "CGIAR Mid-Term Meeting," May 25-29, 1998: 9. http://www.cgiar.org/corecollection/docs/mtm9805c.pdf (accessed January 11, 2011).

"Some who hold this view are gravely concerned about the idea of the CGIAR acting as a 'voice for the poor.' "[105] The mission and method of CGIAR was still unsettling to some. CGIAR had done a very good job of increasing crop yields by helping certain farmers expand their operations and bring more income into the economy. The poorest farmers might not be able to continue as before but they should theoretically be able to find work in a growing economy. In that sense, CGIAR did not 'speak for the poor' but rather for the nation as a whole. If it were to shift its focus to the well-being of the poorest farmers and to further define well being as honoring their avocation, problems could result.

The second and third arguments, while resigned to some need for intellectual property, expressed a fear of becoming too enmeshed. The second position argued that CGIAR could accomplish the majority of its aims through its traditional methods. Entering the intellectual property realm was something CGIAR was simply not equipped to do in terms of money or expertise and to reorient CGIAR in that direction simply did not pass a cost-benefit analysis. If time were to be spent in the area of intellectual property, it would be better spent establishing and asserting a strong legal basis for exempting itself from intellectual property, such through argument for the research exemption.[106] In other words, the research centers were on the right track and simply needed to solidify their assumptions about operating under an exemption.

The third philosophy argued that the CGIAR mission was "alleviating hunger and poverty and serving the majority of farmers." Biotechnology came in far behind a process driven approach to achieving this goal. CGIAR was well positioned to work in a field that required high input of local knowledge and specialized crops. The extent to which

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[105] Ibid., 15-16.
[106] Ibid., 16-17.

outsiders genuinely improved crops obtained from with in this dynamic was negligible. "The CGIAR need not become involved with proprietary science: it should only make research investments in technologies that the private sector is not investing in, and for which the only 'market' is the poor." This view saw CGIAR's job as protecting small farmers in developing countries by fighting TRIPS, not bowing to it: "CGIAR should point out the degree to which the increased use of intellectual property impinges on the [CGIAR] system's ability to carry out its mandate, and the negative consequences of the standardised implementation of the TRIPS accord."[107]

The Private Sector Committee (PSC) weighed in at the same meeting with its own comments designed to negate any suggestion that there was a conflict between CGIAR's mission and a closer association with the private sector and its methods. The PSC observed that the two catalysts for the debate about CGIAR's best course of action had been ratification of the CBD by most nations "with the United States representing one notable exception" and TRIPS, which made it "clear - that a paradigm shift in agriculture research is occurring."[108] The PSC Committee readily associated the private sector with the CGIAR mission, which it interpreted as economic in nature. In fact, the PSC claimed to have a "vested interest" in the mission, which it saw as "promoting the economic development of the CGIAR's client countries, many of which represent important market interests."[109] The statement suggested that the private sector viewed CGIAR as an entity that would advance agriculture in the developing world to a point where those nations could attract and deal with the private sector directly. This philosophy stood in stark

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[107] Ibid.
[108] "Private Sector Committee Comments on the Reports of Biotechnology and Proprietary Science Panels," May 14, 1998: 1, in "CGIAR Mid-Term Meeting," May 25-29, 1998. http://www.cgiar.org/corecollection/docs/mtm9805a.pdf (accessed January 13, 2011).
[109] Ibid.

contrast to those on the Proprietary Science Committee, which seemed resigned to the fact that poor countries would always be poor and the job of CGIAR was to help them in ways that held no interest for the private sector.

The PSC was livid at the suggestion by research centers that owners of technology would not take legal action because of the research exemption and potential for negative publicity. Such thinking, they claimed, "sends a negative signal to industry and is likely to further impede open cooperation." In addition, "donors, especially those with significant positions on IPR protection, may be less inclined to support the CGIAR if it adopts a policy of outright disrespect for proprietary systems."[110]

The PSC wholly endorsed the idea of CGIAR taking to the bully pulpit and "assume a clear advocacy role on behalf of the poor and food insecure" but encouraged it to use the stage to promote the use of technology "in addressing the dual requirements for increased food production and preservation of the environment." As if to hit CGIAR where it lived, the PSC also noted that CGIAR's involvement with biotechnology to date had been "sub-optimal" and would have to increase "if the CGIAR system is to remain scientifically current and credible and to fully realize the impact of donor funding."[111]

The midterm CGIAR meeting concluded with the board acknowledging that it was "inevitable" that the research centers would increasingly be using proprietary material in their work and would need to use patents "in ways that prevent the profit making private sector from getting a free ride on publicly funded research that uses germplasm held in-trust."[112] Still, the board made no effort to tell the research centers what to do.

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[110] Ibid., 5.
[111] Ibid., 2.
[112] "Summary of Proceedings and Decisions, CGIAR Mid-Term Meeting," May 25 – 29, 1998: 19. http://www.cgiar.org/corecollection/docs/mtm98sop.pdf (accessed January 15, 2011).

The Technical Advisory Committee continued to wrestle with the issue. TAC agreed that CGIAR should seek intellectual property protection in order to access needed technology, partner with needed institutions, and transfer technology in a safe and secure manner. TAC acknowledged that securing and protecting patents was costly and could divert the research centers from their primary mission and threaten relations with developing countries. Overall, however, TAC concluded that intellectual property rights should not be the end goal of any research project but should be pursued when they could be traded for technology or used to generate income.[113] Once again the target shifted slightly as to the CGIAR mission: "For the CGIAR, the ethics of the case for IPR are rooted in the CGIAR 's people-centered strategies for poverty alleviation."[114]

TAC dropped a bombshell, however, when it went on to state that intellectual property revenues should go, in part, to fund the cost of intellectual property acquisition and enforcement. The remainder would stay with CGIAR to be used for the benefit of its partners but would not go back to them in the form of revenue sharing.[115] The Private Sector Committee continued to pound its drum at the research centers' meeting in October of 1998 by calling on CGIAR to either get its house in order or forget about private sector cooperation.[116]

For its part, the CGIAR board appeared more concerned about liability than opportunity. The board's Oversight Committee requested an opinion from legal counsel for the World Bank "on whether there is any liability on the members of the CGIAR for

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[113] "Draft Report of the Seventy-Fourth Meeting of the Technical Advisory Committee," August 1998: 26-27. http://www.cgiar.org/corecollection/docs/tsop9803.pdf (accessed January 6, 2011).
[114] Ibid., 29.
[115] Ibid.
[116] Ibid., 5.

the conduct of the [research] Centers or any other part of the CGIAR system."[117]

At the mid-term meeting in 1999, CGIAR received a series of recommendations on integrated gene management in the context of intellectual property. Noting the massive consolidation of the private sector and its huge influx of research funding, accompanied by aggressive pursuit of intellectual property rights, CGIAR admonished that "no research organization can afford to remain static" and that facing the new intellectual property wave was: "arguably, the biggest issue before us."[118] The research centers remained adamant, however, that no central legal body would speak or hold patents for them collectively, a position that exasperated the CGIAR.

Three pressing issues were on the table by century's end: first, compliance by the developing nations with internationally agreed upon conventions, such as GATT; second, loss of ability to provide products to partners resulting from ineffective intellectual property management; and third, compliance and enforcement, assuming an effective intellectual property strategy could be adopted and implemented. By this time CGIAR had rejected public disclosure as an effective strategy, owning in part to the fact that the research centers needed the proprietary technology of others to continue their work. Given the strong aversion to patenting raw materials, CGIAR had to establish a policy on what minimum work had to be done to germplasm before intellectual property protection could be claimed. Once again, the CGIAR was floundering in unfamiliar waters.

The private sector committee continued an aggressive campaign to get the CGIAR board to do something about intellectual property, finally arguing that CGAIR donors

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[117] "Report of the 16th Meeting of the CGIAR Oversight Committee," November 1998: 3. http://www.cgiar.org/corecollection/docs/over16.pdf (accessed January 15, 2011).
[118] "System Review Follow-Up: Consultative Council Propositions on Science, Progress Reports on IPR Matters and Proposal for Review of Plant Breeding," May 24, 1999: 7. http://www.cgiar.org/corecollection/docs/SRFUigm.pdf (accessed January 4, 2011).

faced legal liability if practices did not change. The PSC upped the ante by pointing out that CGIAR's head-in-the sand attitude would make it virtually impossible to secure funds that the organization deserved and also impossible for the private sector to make any rational decision on partnering with CGIAR. It described the CGAIR approach to intellectual property as "90 percent political and 10 percent legal … The private sector's interest is simple: it would like to know what the rules are when it engages into a transaction with the CGIAR."[119] In October, the Committee claimed CGIAR's methodology was not only robbing it of potential income, status and progress, but also making it a contributory infringer by distributing materials it held from outside sources.[120] The clear message was that CGIAR, despite its posturing, was not really contemplating getting into biotechnology. It was very much into it already and in a very sloppy and dangerous way. As a result the Private Sector Committee claimed that "fast action on the CGIAR's behalf was absolutely essential to avoid a serious risk of litigation."[121] The committee then went for the jugular: "The committee was concerned that the lack of clear legal arrangements may pose a 'contributory infringement' problem for CGIAR investors."[122]

In May of 2000, CGIAR greeted the new century with the same list of issues and the same uncertainty for their resolution. The private sector continued to lobby for a better and more business-like relationship with CGIAR, noting that CGIAR's efforts to collect and preserve germplasm had been "a great service to mankind, but did not

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[119] "Report of the Ninth Meeting of the CGIAR Private Sector Committee," October l- 2, 1998: 3, in "CGIAR Mid-Term Meeting," May 24-28, 1999. http://www.cgiar.org/corecollection/docs/mtm9905e.pdf (accessed January 13, 2011).
[120] "Report of the Eleventh Meeting of the CGIAR Private Sector Committee," October 23,1999: 2. http://www.cgiar.org/corecollection/docs/psc011.pdf (accessed January 13, 2011).
[121] Ibid., 3.
[122] "CGIAR 1999 Summary of Proceedings and Decisions, International Centers Week," October 25-29, 1999: 124-126. http://www.cgiar.org/corecollection/docs/icw99sop.pdf (accessed January 4, 2011).

contribute to poverty reduction *per se*." The PSC set forth a vision that encapsulated the debate that had been growing for the previous fifteen years and which had painted CGIAR into the corner where it then stood. The PSC envisioned working with CGIAR to create a truly new variety of crop with "a demonstrated benign benefit, given away for nothing." Such an effort would placate the donors, world opinion and, perhaps more importantly, serve the private sector well: "Increasing the income of poor subsistence farmers would eventually make them business partners for the [private sector] - a relevant outcome for the CGIAR, the poor and the industry."[123]

As the twenty-first century dawned, CGIAR had taken significant steps to place its germplasm into a legally recognizable framework with the power to establish and enforce legal rights connected to sharing of plants and seeds. What it had not accomplished, however, was a clear set of policies and guidelines to dictate how and when this new structure would be utilized. In one sense, CGIAR's inclusiveness was its undoing. It constantly invited commentary, study, and recommendations from a broad group if interested parties, and consistently shied away from hard and final policy statements. CGIAR's indecisiveness derived from its diversity. It pursued too many goals and employed too many allies to make consensus a reasonable possibility. It is not surprising, therefore, that it reverted to the base philosophies that had created it in the first place: improvement of people's lives through greater income. Its spirit of philanthropy was firmly encased in the language and procedures of the commercial and economic world. Two legacies of the industrial world - biotechnology and the General Agreement on Tariffs and Trade – effectively assured that result. Biotechnology and

[123] "Report of the Twelfth Meeting of the CGIAR Private Sector Committee," May 19-20, 2000: 3. http://www.cgiar.org/corecollection/docs/mtm0015.pdf (accessed January 6, 2011).

GATT were not, however, the opening salvos in a battle between the philosophies of common heritage and for-profit commerce; they were rather the final blows in a long historical line of developments that defined progress in economic terms, using the tools of intellectual property and agricultural production.

CONCLUSION

Historical study of agriculture and patents provides an ideal setting in which to examine how Americans define progress and value and how those definitions affect various parts of the world when exported in the form of assistance and aid to developing nations. The events summarized in this dissertation suggest that we define progress and value in economic terms and measure them according to monetary value. This perspective has historically guided and even dictated actions taken by those who have sought to help developing nations through improved agriculture, making it a significant factor in the international debate over ownership of plants, seeds and genetic information, as well as the impact of intellectual property rights on multiple issues including environmental protection, food safety, nutrition, bioethics and cultural identity.

Contemplating the impact of intellectual property laws on the status of plants and seeds in the developing world can lead to an incomplete and overly simple conclusion: Industrial countries with more resources and technology force change on developing countries by offering assistance in the form of techniques that reward risk-taking with profit. This conclusion, while valid in some respects, threatens to frame the issue as a basic power-struggle between polar interests - profit-oriented seed companies and industrial governments versus people-oriented human rights organizations and philanthropies – an easy and attractive narrative, especially for a mass audience dealing with complicated issues. The importance of food production to the world community, however, calls for a broader perspective, including analysis and discussion of historical dynamics that shaped American attitudes toward intellectual property rights and

agriculture. Failure to examine these issues in their historical context could lead to policy decisions and public opinions about those decisions that are not fully informed.

Historical context helps in understanding the political, cultural and economic forces that shape and define value and progress. Examination of actions taken by organizations such as the Rockefeller foundation and CGIAR indicate willingness at times to embrace private property and profit as a tools for promoting progress in the developing world, as illustrated by the Rockefeller program in Mexico and CGIAR's abandonment of free sharing in favor of a trust model of seed protection. Their missions and tactics reflect a bias or at least an openness toward economic solutions that works against cultural-based advocacy seeking to bring non-economic criteria into the definitions of value and progress. These observations may seem counter-intuitive to devotees of the simple 'industrial versus human rights' model but are entirely consistent when examined against the history that helped shape their definition of progress. The historical record suggests that these historical catalysts are not recent; they have roots that stretch back to 1790.

Economic definitions of value and progress are also convenient, offering solutions tied to a monetary value based on a market price, something relatively easy to establish in most circumstances. The system works well for outputs such as harvested crops based on yield and market price. Directed breeding and genetic modification, however, shifted the focus to inputs, which included in some cases landraces containing desirable traits. Landraces survived and ultimately thrived as a result of natural adaptation to their environment as well as through multiple generations of agricultural knowledge. Seeds from landraces carry genetic information that has stood the test of time and selection.

Despite this long process of improvement, the western perspective views landraces as products of nature - raw materials for breeders and geneticists. There was no question that seeds in nature had value or else no one would have cared about who used them or how or if they paid for using them. The problem lay in determining exactly what that value was and how it would be recognized. Placing economic value on landraces as inputs into hybrid seeds created two problems: determining the owner of the input and the input's fair market value. Calls for recognition of value in non-economic terms, such as preservation of cultural identity, only complicated the process. Filtering these issues through a market-oriented system ultimately forced advocates for the developing world to adopt, whether willingly or resignedly, economic solutions, reflecting the modern industrial perspective of most participants. For example, one solution to dealing with the proper valuation of seeds was to designate them as either free or part of a fair exchange in both their natural and improved states. The U.N.'s International Undertaking and CGIAR's policy of freely available germplasm reflected this position. Both policies acknowledged economic value in landraces and sought to secure a share of that value to developing world farmers through some kind of 'fair' exchange of cultural knowledge for technical knowledge. This philosophy became less tenable as the economic value of seeds increased in the late twentieth century. Advocates of those philosophies, such as CGIAR embraced more rigid and legalistic strategies in part because their policy makers came from that background. The Rockefeller Foundation and then CGIAR were strong advocates for their system of free inputs and free sharing of seeds but to the end of delivering modern commercial farming to the developing world. The idealism of their philanthropic mission to help developing nations existed within a set of commercial

strategies to achieve that goal. Free sharing of seeds was a preferred means to that end but not an exclusive one, as CGIAR's actions bear out. CGIAR's actions suggest that common heritage was not a social or cultural construct within its mission, but rather a practical means of justifying its long-used system of managing its seed collections. CGIAR needed free sharing of seeds in order to keep from fading in relevance. CGIAR adopted the trust model when its free-sharing philosophy proved inadequate to protect the value of its assets. In other words, CGIAR's actions support the conclusion that its concepts of value and progress were sufficiently malleable to embrace an economic model that indirectly benefited developing nations that contributed landraces but did not put money into individual farmers' pockets or even assure their continued livelihood. This example illustrates why it is overly simplistic to simply group organizations such as CGIAR with human rights organizations in a battle over intellectual property rights and common heritage.

Anthropologists offer a welcome perspective in understanding value and its meaning across different cultures. Small farmers unable or unwilling to change faced extinction in a modern agricultural milieu that required complex and costly systems of fertilizer, pesticides and irrigation necessary for use of improved seeds. From an anthropological standpoint those farmers, and the rest of the world, faced loss of cultural identity, a portion of which arguably produced landraces that made improved seeds possible, resulting in debate as to if and how cultural knowledge should be recognized and compensated, either financially or through preservation. From an economic standpoint such farmers had the option of wage labor in the expanding economy. Advocates for small farmers argued that it was unjust compensation and also unfair to

simply pick a spot in the historical timeline of plant improvement, in this case a spot considerably far along, and declare that an entity, usually a large corporation, deserved exclusive rights for having taken the final steps in a multi-generational process. Plants, they argued, were humankind's common heritage and should remain so both before and after improvement by whatever means. If the goal was an expanding economy, advancement in agriculture was best accomplished in the developing world by imitation: observing what others did and then doing the same thing. This was not possible under a patent regime, which monopolized innovation rather than expanding it.[1] Some advocates went further, arguing for cultural preservation over a sterile uniformity in which tradition and unique identity were lost forever.

It would be wrong to think that small indigenous farmers had no interest in their financial standing or were anti-technology. For example, anthropologists have cited cases of traditional farmers embracing technology such as global positioning to settle boundary disputes.[2] The primary difference for the non-western world was that the concept of value was not limited to economic value; it reflected non-economic concepts as well, including social status, reinforcement of gender roles, privilege of age, and kinship. Use of seeds and technology was based on cultural as well as economic needs.[3] The narrower western definition essentially stripped plants and seeds of their non-economic characteristics in favor of the more universal concept of economic value. Western tradition was to calculate economic value and compensate the party that created it, as with intellectual property rights. The process proved to be much easier for the specific action of a person or persons

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[1] See, Michele Boldrin and David K. Levine, *Against Intellectual Monopoly*, Cambridge: Cambridge University Press (2008), 80.
[2] David A. Cleveland and Stephen C. Murray, "The World's Crop Genetic Resources and the Rights of Indigenous Farmers," *Current Anthropology*, Vol. 38, No. 4 (1997), 479.
[3] Ibid., 483.

who invented a tangible thing such as a machine or even a hybrid derived from directed breeding or genetic modification. The process was not so easy with landraces. First, a landrace might not present a precise attribute with a calculable market value and, second, its value could not be traced to a specific person or group of persons deserving of compensation.[4] Even if a fair market value could be determined and a traditional act or practice credited with its creation, cultural affiliation did not create legal identity sufficient to pursue intellectual property rights or enter into contracts. Trying to negotiate with self-appointed representatives of native cultures could result in unenforceable agreements as well as faulty assumptions that all natives were homogenous, much like the experience of some U.S. treaties with Native American tribes in which the negotiators assumed that one tribal chief was as good as the next.[5] Some advocates proposed recognition of legal status for 'communities of peoples' with sovereignty over their own knowledge and folklore without regard to national boundaries, thus removing the ability of governments to absorb unique communities of people into a more homogenous nation-state.[6] The fact, however, is that current trends are in the other direction. For example, indigenous knowledge was not protected under the U.N.'s Universal Declaration of Human Rights. The only way a cause could survive was if national laws recognized it. Even then, the Declaration deemed the cause an individual right and not a collective right

[4] Stephen B. Brush, "Indigenous Knowledge of Biological Resources and Intellectual Property Rights: The Role of Anthropology," *American Anthropologist*, Vol. 95, No. 3 (1993), 661.
[5] See, Michael F. Brown, *Who Owns Native Culture*?, Cambridge: Harvard University Press (2003), 111-114.
[6] J. Sanford Rikoon, "On the Politics of the Politics of Origins: Social (In) Justice and the International Agenda on Intellectual Property, Traditional Knowledge, and Folklore," *The Journal of American Folklore*, Vol. 117, No. 465 (2004), 333.

of an indigenous group.[7] This left the need for some entity with legal standing to step in and represent the rights of the cultural group. The idea of a legal right, after all, suggested a corresponding duty to assure that the right could be enjoyed.[8] The result was a tendency to push cultural issues into institutional settings such as governments, which were receptive to western thinking when tied to financial aid. This dynamic underscored a concern among some advocates as to the true goals of those who purported to act for cultural interests, whether it was CGIAR, the U.N. or governments. Just as agricultural modernization favored wealthier and more progressive farmers, decisions at those institutional levels were made by people drawn primarily from a more progressive, better-educated and commercially oriented population.[9] The result was property-oriented policies being applied to people-centered issues. In the minds of some, it was not that the indigenous farmer was not creative or a contributor if economic value, but rather that he simply had no power over those things when he was thrust into an arena with no representation other than people who agree with his cause in theory but were trained to solve problems in a western style.[10] The result was an attitude that perhaps acknowledged the need for some form of compensation but steered it toward an institutionalized setting to be used for some general good. The dynamic resisted any deeper acknowledgement of cultural autonomy, such as the right of indigenous people to preclude or limit uses based on cultural or religious values.[11] The source of such an absolute prerogative right fell

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[7] Peter-Tobias Stoll and Anja von Hahn, "Indigenous Peoples, Indigenous Knowledge and Indigenous Resources in International Law," in *Indigenous Heritage and Intellectual Property*, Silke von Lewinski, ed., The Hague: Klewer Law International (2004), 18.
[8] James M. Donovan and H. Edwin Anderson, III, *Anthropology and Law*, New York: Berghahn Books (2003), 146.
[9] Rikoon, "On the Politics of the Politics of Origins," 327.
[10] Ibid, 326-327.
[11] Cleveland and Murray, "The World's Crop Genetic Resources and the Rights of Indigenous Farmers," 482.

under the broad heading of 'human rights,' an amorphous concept even in the context of anthropology. The idea of a human right suggested a right that existed by virtue of being human, not by virtue of any cultural circumstances. There was no truly universal concept of an obvious and inherent right by virtue of being human, however. The definition of a human right varied from culture to culture.[12] In fact, there was an argument that even human rights were defined only in the context of relationships and that relationships existed only when there was a potential for exchange of goods and services. Value, therefore, was derived not simply from being human but rather from the services that humans could render.[13] Even in the context of human rights, economic worth found a toehold.

In examining the issue of plant patents and its impact on agricultural policy, it is reasonable to conclude that the processes of invention and crop production have been and continue to be dominated by a philosophy that views economic advancement as the end goal. Inventors and farmers are seen as improving their situation when their efforts result in something that generates income. This philosophy is not without implications in social and cultural areas of concern that are harder to quantify in terms of value, such as public property, common heritage, cultural preservation, environmental protection and even human rights. Comprehensive discussion of these issues demands commentary from a broad array of constituencies including historians, sociologists, anthropologists, economists, agronomists and philosophers. The dominant voice, however, has been one

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[12] Ibid., 493. Donovan and Anderson suggest that there are four rights that could be considered as universal without much controversy. All are expressed in the negative: Freedom from slavery, genocide, racial discrimination and torture. Donovan and Anderson, "Anthropology and Law," 147. None of these standards, with the possible exception of freedom from racial discrimination, could likely be employed in a theory of limiting seed use in the name of cultural preservation.

[13] Peter Lawrence, "Law and Anthropology: The need for collaboration," 1 *Melanesian Law Journal* 40 (1970), 44, quoted in Donovan and Anderson, "Anthropology and Law," 163.

of capitalism and the marketplace. This author makes no comment on the rightness or wrongness of this fact but rather an observation that solutions to these issues are found within an extremely narrow band of options. If we understand those options in their historical context, then we can better understand the parameters of the contemporary debate, regardless of whether the goal is to support them or change them. Those who fall into the latter camp have an uphill battle because their voices struggle for an audience within halls of power concerned with trade, profit and progress.

In his brilliant novel, *Nineteen Eighty-Four*, George Orwell explored an idea called 'Newspeak' in which the fictional party members systematically purged the English language of words with the ultimate goal of rendering dissenting speech impossible.[14] A rebel could not proclaim rebellion if he had no idea how to express what he was thinking. That is perhaps too harsh an analogy for the debate between the ethics and economics of food production but it behooves historians as well as philosophers, anthropologists and socialists to be ever diligent in keeping the debate alive if they hope to make a difference and to understand the historical context that drives our understaninf og value and progress. No one is trying to purge language or close debate, but the forces of economic progress do not face a similar challenge. They have a ready stage and audience in the halls of government and commerce. History is replete with instances of individuals standing up against institutional forces in the name of individual rights and interests that have no interest in profit. A study of those instances and their impact on these questions would be a welcome contribution because, if we parse the language of common heritage and human rights from our vocabulary of agricultural policy, whether intentionally or by neglect or resignation, we risk the arrival of a day when we can no

[14] George Orwell, *Nineteen Eighty-Four* (New York: Harcourt, Brace and Co., 1949), 309.

longer engage in a well-rounded debate about how we should deal with the wisdom in the earth.

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