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Lessons from the Interaction of Biotechnology, Intellectual Property and World Needs

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Intellectual property in agricultural biotechnology has spurred vigorous public debate over the global impact of advanced research in the life sciences. The University of Minnesota is not only a significant source of cutting-edge research, it is also a neutral forum for public debate. As the host of an April 29, 2004 conference, called "Intellectual Property Rights for the Public Good: Obligations of U.S. Universities to Developing Countries," the University of Minnesota has taken the lead in examining the economic, societal, and ethical implications of its agricultural research.[1]

Resolving debates over intellectual property in agricultural technology is more than just a theoretical exercise. The ability to feed a growing population may rest on ensuring that the developing world receives and adopts new technology. Sharing that technology is a complex matter that involves social justice and academic ethics. My education in intellectual property and the development of genetic engineering and other forms of biotechnology began almost twenty years ago. Over this time, I have learned three lessons that guide my approach to intellectual property and biotechnology.

First, a biotechnology product and the patent that covers it do not necessarily translate into widespread use of the technology. In 1985, my former company filed a patent application for a corn plant that had higher levels of tryptophan, an essential amino acid. We were hopeful about the technology and deeply disappointed when the U.S. Patent and Trademark Office (USPTO) rejected our patent application. Our lawyers, however, advised us that in 1980 the Supreme

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1. *See Intellectual Property Rights for the Public Good* (Apr. 29, 2004), *at* http://www.lifesci.consortium.umn.edu/conferences/ip.php (last visited Nov. 17, 2004).

Court ruled in *Diamond v. Chakrabarty* that genetically engineered microorganisms are patentable subject matter.[2] On this basis, our company appealed the USPTO's decision and won. Our case, *Ex parte Hibberd*[3], has been frequently cited as a landmark decision holding that a plant is a patentable subject matter.[4] Although we succeeded in the legal arena as our corn was the first plant to be patented,[5] this success did not translate into commercial success. Good science and strong legal groundwork are not enough to cause a biotechnology product to sprout in the field. Biotechnology and the legal system do not exist in a vacuum, and decision makers need to be aware of the impact of market forces on the adoption of biotechnology.

Second, only appropriate technology can solve food problems. In 1986, I chaired a National Research Council (NRC) panel on biotechnology in Indonesian agriculture. This NRC panel met in Jakarta, and, as part of our duties, we visited farms to analyze the potential impact of biotechnology.[6] At that time, Indonesian dairy farms were producing less than one-fourth the volume of milk per cow than was the average Minnesota dairy farm. Our group analyzed the impact that embryo transfer and other biotechnological tools might have had on these dairy herds. We hoped that biotechnology could improve these cows' genetic potential and cause a rapid increase in milk production. After visiting farms and talking to Indonesian producers, our group concluded that improving genetic potential through embryo transfer alone would not improve Indonesian milk production. The limiting factor in the Indonesian dairy industry was not genetic. Rather, Indonesian milk production was primarily limited because Indonesian cows were not receiving enough feed or the proper types of feed. Productive cows in the United States succeed because they combine genetic potential with high-quality feed, veterinary care, and housing. The effort to improve Indonesian milk production needed to focus on increasing feed supplies and animal care, and not on using biotechnology to improve

2. Diamond v. Chakrabarty, 447 U.S. 303, 318 (1980).

3. Ex parte Hibberd, 227 U.S.P.Q. (BNA) 443 (Bd. Pat. App. & Int. 1985).

4. *See, e.g.*, J.E.M. AG Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 131, 145 (2001).

5. *See* U.S. Patent No. 4,581,847 (issued Apr. 15, 1986).

6. *See generally* SUMMARY REPORT, WORKSHOP ON BIOTECHNOLOGY IN AGRICULTURE (1986).

genetics. Embryo transfer was not the appropriate technology for this situation.

Agriculture and food production involve a complex mix of technology, natural resources, economics, and societal values. Producing food for global needs requires a full toolbox of solutions. Biotechnology alone cannot solve the problem of global hunger. Relying on biotechnological solutions alone limits the possible solutions as it is one among many tools needed to increase the world's supply of safe and healthy foods. Persons interested in fixing food problems in the developing world need to be cautious and realize that the challenge of the developing world requires a full toolbox. One of those tools might be biotechnology, but many other tools will also be involved.

And third, excluding biotechnology from the toolbox may cause great harm to individuals and society. Used correctly, biotechnology can dramatically improve life. Philip G. Pardey, a contributor to this symposium,[7] has joined three other University of Minnesota faculty members in writing a new book, *Ending Hunger in our Lifetime*.[8] In the conclusion of their book, Professor Pardey and his coauthors provide a stunning comparison between two futures for the Hassan family in Bangladesh.[9] Both of these futures are situated twenty-five years from now.[10] In one of those futures, the economy, education, health, and nutrition have markedly improved in Bangladesh.[11] The sons of the Hassan family are working as computer programmers, the daughters are teaching school, and the Hassan grandchildren are growing up happy and healthy.[12] The other future that Professor Pardey and his coauthors describe is grim. The Hassan sons end up working as rickshaw pullers, the daughters are trapped in undesirable financial and social situations, and the Hassan grandchildren suffer from malnutrition and disease.[13]

Biotechnologically-improved crops are one of the changes

7. *See* Philip G. Pardey, Bonwoo Koo & Carol Nottenburg, *Creating, Protecting, and Using Crop Biotechnologies Worldwide in an Era of Intellectual Property*, 6 MINN. J.L. SCI. & TECH. (forthcoming, 2004).

8. C. FORD RUNGE, BENJAMIN SENAUER, PHILIP G. PARDEY & MARK W. ROSEGRANT, ENDING HUNGER IN OUR LIFETIME (2003).

9. *See id*. at 201-02.

10. *Id*.

11. *Id*. at 201-02.

12. *Id*. at 202.

13. *See id*.

that bring a brighter future for the Hassan family, but it is only one of the tools. Even more important to the future sustainability and quality of life are women's rights, improved trade policies, better transportation, improved education, and adequate nutrition. Professor Pardey and his coauthors concluded, "The battle against hunger and poverty will require broad cooperation among rich and poor nations and their peoples."[14] As part of that cooperative effort, universities should take steps to enhance the flow of technology to the developing world. A bright future for the entire world depends on the transfer of appropriate technology from universities to the developing world.

This movement of biotechnology and other appropriate technologies ratifies the two principles that Vernon Ruttan, emeritus professor of applied economics at the University of Minnesota, has outlined in describing what society should expect from agricultural science:

> [S]ociety should insist that agricultural science maintain its commitment to expanding the productive capacity of the resources used in agricultural production.
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> ...
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> [S]ociety should insist that agricultural science embrace a broader agenda that includes a concern for the effects of agricultural technology on the health and safety of agricultural producers; for the nutrition and health of consumers; for the impact of agricultural practices on the aesthetic qualities of both natural and man-made environments; and for the quality of life in rural communities.[15]

Agricultural science needs every available tool if it is going to live by these principles. This goal requires an enlightened approach to intellectual property as well as creative solutions that balance humanitarian concerns, business interests, and societal needs.

14. *Id*. at 207.

15. *See* Vernon Ruttan, *Moral Responsibility in Agricultural Research*, 15 S. J. AGRIC. ECON. 73, 78 (1983).