Patents and Agricultural Biotechnology

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The dramatic progress of modern agricultural biotechnology ("ag biotech") over the past 20 years has created an increased awareness of the patenting of plants and other inventions which are useful in horticulture and agriculture. Not surprisingly, therefore, patenting has sometimes been inaccurately portrayed as a relatively new development in agriculture, and even as an undesirable aspect of ag biotech. However, the practice of securing patent protection for inventions of benefit to agriculture extends back more than 200 years. For example, mechanized harvesting of cotton in the U.S. began with the cotton gin, patented in 1794, and the patenting of plant varieties for vegetatively produced crops beginning in the 1930s.

A patent provides the inventor, or sometimes another owner of the invention, with the right to exclude others from reproducing that invention. This protection has a defined time limit (e.g., 20 years in the U.S.), and one purpose of ensuring exclusive production of the invention during that time is to enable the invention's owner to realize financial return to offset the often considerable cost of the invention's original development and its future manufacturing. By providing this opportunity for financial gain the patent system also, naturally, stimulates both the emergence of new inventions and the sharing of their benefits with the public at large.

While the notion of just releasing new ideas to the public domain without a patent process might seem attractive, it is doubtful if anyone would be willing to spend very large sums of money in creating new machines, agricultural crops, veterinary drugs, and other valuable entities while knowing that other people could then simply copy those innovations and market them. The patent, in providing a period of exclusive ownership, creates the incentive for investment that then stimulates both invention and subsequent production.

Question: Why obtain patents covering plants and other items used in agriculture?

Answer: Specialized varieties of crop plants, pest-control chemicals, advanced feed formulations for livestock, veterinary drugs, and innovative mechanical equipment like crop planters and harvesters are all examples of inventions that can greatly assist the farmer to achieve higher product yields and enhanced product quality. They are also examples of technologies whose development may require many years of research and testing. The legal right to exclusive ownership, provided by the patent for a finite period of time, ensures that the individuals and companies who invest heavily in that research and development have an opportunity to recoup those costs and to provide a return for their investors through subsequent marketing of the technologies.

Question: Can patents be obtained for the mere discovery of naturally occurring plants, genes, etc? What items of relevance to agriculture might be patented?

Answer: An application for a patent is expected to show that the invention is novel, that it can work (the demonstration being referred to as "reduction to practice"), and that it addresses some practical, useful need. Thus, generally speaking, it is not possible merely to patent the discovery of something that exists naturally unless the practical application or usefulness is also cited.

The resulting protection would then most likely apply to the application. In the U.S., plant variety protection (PVP) patents provide a good example of this principle, in that the patent does not cover the plant purely as a new natural entity in itself, but rather the particular variety which, through breeding or genetic-engineering work, has been better adapted to a particular (stated) purpose relative to its naturally occurring predecessor. Similarly, patents covering genetic sequences will usually be found to relate those genes to particular uses. Other items of relevance to agriculture which might be patented include novel pesticides (herbicides, insecticides, fungicides, etc.), animal-feed ingredients or formulations, veterinary medications, diverse kinds of machinery for use with livestock or crop production, etc.

Question: One might expect to see companies patenting their inventions, but why do publicly funded universities also patent some of the outcomes of the agricultural and biotechnology research which they undertake?

Answer: University research is a major innovator and contributor to improvements in agriculture, and the universities have mechanisms in place to facilitate the "translation" of their discoveries and inventions to the agricultural community. Sometimes, depending on the particular technology or know-how, public release is the best way to ensure benefit to farmers. For example, basic cultivation practices for a new crop may not require any further development and could be adopted by farmers immediately. On the other hand, a genetically modified plant, a new pesticide, or a new vaccine for livestock will usually be developed only to the "prototype" stage in the university. Before they can be employed routinely in agriculture, these technologies need to undergo extensive efficacy and safety testing, not to mention further optimization. This "commercialization" research is very expensive, and it is much more likely to be undertaken if an investor is assured of exclusivity (at least in certain applications of the invention). Accordingly, the best way to ensure that the technology can benefit agricultural producers is to patent it and then license it to one or more companies which are interested in commercializing it.

Question: Does a farmer need to be concerned about whether materials he or she is using are patented?

Answer: Marketed products containing patent-protected components are used by consumers on a daily basis, for the purpose stated by the manufacturer, without the consumers' having any interest in the applicable patents. However, in some instances and particularly where the opportunity might arise to inadvertently reproduce the invention (for example, to produce seeds from patented crop varieties for use in the following season), the farmer might be required to enter into an agreement specifying terms of use. These terms may include the inability to save seed for future planting.

Question: Is there any benefit to the agricultural producer (farmer) if materials that he or she is using on the farm are patent-protected?

Answer: Improved crop varieties, pesticides, animal feeds, equipment, etc. that are patented are also likely to be improved over previous products, and thereby to contribute convenience and productivity enhancements that were not formerly available.

Question: Opponents of agricultural biotechnology often claim that patenting of genetic technologies, plant varieties, and other entities reliant on living things is detrimental to farmers and to the progress of agricultural innovation. Is this a realistic assessment?

Answer: As described above, patents have provided the incentive for seed companies to continuously invest in the production of new varieties that are higher yielding, more disease resistant, better in appearance or taste, etc. Generally speaking, it is very unlikely that the considerable enhancements represented by many new technologies could, or would, be realized by farmers and consumers if the companies that developed them were unable to obtain patent protection. Without some assurance of a return on their investment, the cost of development and evaluation of efficacy and safety would be sufficiently high to render such projects too risky financially. Thus, in regard to major agricultural products, patents generally work as drivers of innovation, enhancement, and benefit. Farmers may choose to avail themselves of these new developments, or to continue to emphasize more established or traditional methods.

Question: Are there situations in which patents might limit the development of new opportunities for agriculture, and if so, how might these limitations be overcome?

Answer: A patentable technology is most likely to be deployed in applications that can earn sufficient revenue to recover its development and commercialization costs. It follows that those applications addressing small, niche, or low-profit markets that cannot be expected to generate that kind of return may not readily benefit from the technology. And since the technology is patented, programs and organizations that might raise funds to extend it to those alternative applications will also need to license it from the patent holder. This, in turn, may prove challenging if many different patented components are required to achieve the end result.
A well-known instance of this situation in agriculture is the challenge of extending plant biotechnology to small-market crops, and to agriculture in developing countries. Perhaps the best-known example is the nutritionally enhanced rice ('Golden Rice') referenced below, whose introduction into commercial agriculture required the establishment of licensing agreements with many diverse entities which own essential components of the underlying technology.

An organization known as the Public Intellectual Property Resource for Agriculture (PIPRA, referenced below) works to facilitate the sharing and licensing of patented biotechnologies to non-profit organizations, to agriculture in developing countries, and to smaller-scale applications.

References and further reading

To learn about the U.S. Patent Office and patenting in the United States, and to search for U.S. patents, see www.uspto.gov.

An introduction to international patents and a means of searching them can be found at www.wipo.int.

For the Public Intellectual Property Resource for Agriculture (PIPRA), visit www.pipra.org.

The experience of gathering all necessary licenses for the commercialization of 'Golden Rice' is described on: www.goldenrice.org/Content2-How/how9_IP.html.