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PUBLIC AGRICULTURAL RESEARCH AND THE PROTECTION OF INTELLECTUAL PROPERTY: ISSUES AND OPTIONS

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This paper discusses the significance of intellectual property (IP) protection by public research institutes. It argues that such protection can be compatible with the mission of public organizations, especially in cases where private firms will underinvest due to thin markets, high development costs or technological complexity. The paper outlines the main reasons for obtaining IP protection by way of examples from the Michigan State University experience.

Key words: intellectual property rights; biotechnology; Michigan State University; research and development; technology transfer.

The expansion of intellectual property rights (IPRs) in agriculture has created new opportunities and challenges for research cooperation between the public and private sectors. The enactment of the Plant Patent Act in 1930 and the Plant Variety Protection (PVP) Act in 1970 expanded the IPR regime in the United States (U.S.) to include the protection of biological innovations. The 1980 Bayh-Dole Act allowed universities ownership rights to intellectual property generated by federally funded research. The passage of Public Law 98-620 further expanded universities' ownership rights in 1984. These last two pieces of legislation, along with the expanded IPR for biological innovations, have made universities a major participant for contracting IPRs in biotechnology.

The ability to protect intellectual property gives universities an opportunity to increase the source of funds, as well as provide incentives to researchers to produce innovations. Although the extension of

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IPRs may seem to be in conflict with the traditional role of universities to create, sustain and disseminate knowledge as a public good, it also provides a way to meet the objective of increasing social welfare, which might not be possible without IP protection.

This paper argues that IP protection by the university can be compatible with its mission. It outlines the main determinants for obtaining IP protection and also provides guidance on options faced by a public research organization by giving examples from the Michigan State University experience.

Should A Public University Protect Its Intellectual Property?

One of the missions of public universities, especially the land-grant colleges and universities, is to generate knowledge, technologies, and products that promote the "public good." Pursuing this mission demands that universities practice "open science," which means that scientists completely disclose all new discoveries to the scientific community (Argyres & Liebeskind, 1998). Full disclosure ensures the quality of research and facilitates the development of future innovations and, hence, strengthens the mission of a public university. The university's mission is in sharp contrast with that of a private firm, which seeks to gain a competitive advantage over rivals by keeping its discoveries secret (Argyres & Liebeskind, 1998).

The protection of intellectual property should not be considered at odds with the mission of the university. The ability to protect intellectual property has raised the value of university research on biotechnology, even though the underlying technology still retains its public-good characteristics. There are several examples that show that returns to university research protected by IPRs can be high. For example, the patents on anti-cancer drug treatment, Cisplatin and Carboplatin are bringing more than $20 million in royalties to Michigan State University. This implies that the opportunity cost for universities to maintain the research as a public, rather than a private, enterprise increases (Argyres & Liebeskind, 1998), and therefore, the protection of university research and innovations that come out of it may make economic sense in certain instances. The critical condition on which to base the decision to protect an innovation should be whether in the absence of protection there will be a significant loss in the social value of current or future innovations (i.e., whether the loss exceeds cost of protection).

One of the instances where protection makes economic and social sense is when the protection of intellectual property helps promote public-private cooperative relationships and speeds the development of new products and services based on publicly-funded research. The legal protection process requires the inventor to describe his or her invention and disclose sufficient information so that others can replicate, learn, improve upon, and develop new inventions. Thus, by seeking protection, innovations become public knowledge. This minimizes duplication of research efforts and makes the early access to findings from a university's basic research possible.

Other benefits to society are in the form of minimizing social costs of research investments. For example, if the publicly-funded research generates a technology or a product with great potential social benefits (e.g., a cancer-curing drug, or a pollution-decreasing bio-fuel), the university can best serve the public's interest by protecting and restricting its use. This is necessary to give protection to the private sector, which will be the vehicle through which the technology will be made available for

public consumption (universities do not have the financial resources or business structure to market major scientific breakthroughs). Given the costs involved in commercializing a technology, no private enterprise will use research results without being given the legal protection by a university in the form of an exclusive or non-exclusive licensing agreement. Thus, by protecting the IP, a university decreases the social costs of research investments in the form of social gains foregone if an innovation were to remain undeveloped or not commercialized.

More direct benefits arising from the protection of intellectual property for a university are in the form of increased returns generated from these protected technologies in the form of royalties, which help run research programs at the university. This is important when one considers that the contribution from the government to the Land Grant institution has remained stagnant over time. Real U.S. Department of Agriculture (USDA) funding, for example, has risen only 3% from 1982-1992 (Beattie & Innes, 1997). With decreasing government funding, patents have the potential to increase university revenues from non-traditional sources.

How Should A Public University Protect Intellectual Property? Examples From MSU

There are many different methods of protecting the intellectual property generated from agricultural research such as: plant variety protection, patenting (either plant patenting or utility patenting), licensing, trademark, brand names and copyrights. The decision on the type of protection usually depends upon potential market size and share, the nature of the innovation, and the economics of commercialization.

The Size of the Potential Market and Competition in the Market

The decision to seek protection of a new crop variety under the PVP Act or under the Patent Act will depend on the size and share of the potential market. Although the motive is not to reap monopoly profits, the university has to consider whether the protected item will generate enough demand to attract private sector licensee(s) and make the protection costs worthwhile for the university. The estimated cost of patenting typically ranges from $20,000 for a U.S. patent, which is approved by the patent inspector without major revisions, to hundreds of thousands of U.S. dollars for worldwide patent rights. The size of the market to justify protection will thus depend on the type of innovation and the estimated costs of protecting it. In some instances it is not the market that drives the need to get protection, rather, it is the need to control what a university has developed. With protection one can control who uses the innovation and for what purposes.

Thus, the market does not need to be large to justify protection. This latter point is illustrated by an example of two oat varieties developed at MSU, which served a special niche market. Though the overall market was small, these varieties had the potential to generate enough demand from the niche market to create interest from a private seed company. The potential revenue streams expected from commercialization of these varieties made the costs of protecting under the PVP Act worthwhile for the university. By seeking protection, the university made sure that the licensee had rights to control the market.

The Nature of Invention

In some cases, the nature of invention determines the type of protection a university can legally seek. For example, if the new product developed from research is such that it does not strictly conform to the standards of patenting and PVP, the university may then opt for the trademark or brand name options. This occurred when an MSU researcher imported a cherry tree from Hungary which underwent further research and development at MSU. However, the improved tree did not conform to the guidelines of PVP or the patent law. Michigan State University, therefore, sought trademark protection and has since licensed the product to several private firms.

Costs and Technical Complexity in Commercialization of a Technology

In order to commercialize some inventions, a private firm has to incur a large sum of time and money costs (e.g., testing; generating data; getting approval, certification, and clearance from an appropriate government body). If the university discovers a technology that has a great market potential, but also requires substantial commercializing costs (e.g., a drug that cures AIDS), patenting would be most beneficial from the "public-good" point of view. The rationale is that without protection no private company will invest the time and financial capital necessary to develop the product for market. Thus, if the university does not patent and restrict the use of such technology, the innovation may not reach the market.

Such a case could also occur if the technology involved is complex. For example, MSU researchers developed an onion variety that had characteristics and quality desired by consumers. But the technology involved was complex. Michigan State University, therefore, decided to license the technology to a private firm. Licensing gave the private firm access to the complex seed procurement technique along with the knowledge and information involved in commercializing the onion variety on a large scale. Restricting the technology by licensing it to a private firm not only made the technology available to the public but also assured the product quality and characteristics to consumers.

The protection of intellectual property by a public university is thus a complex decision making process based on economics, as well as the desire to serve the public good. In making decisions about the type of intellectual property protection, a public institution needs to assess the most effective way of generating public benefits from an innovation. Protecting intellectual property and restricting its use for the primary purpose of generating income through royalties is not compatible with the responsibilities of a public institution. However, in special instances, protecting an innovation and assigning its production exclusively to one, or non-exclusively to more than one, company may be the most desirable action to ensure the promotion and utilization of an innovation.

Options For Technology Transfer Of Protected Intellectual Property

In addition to the decision on the type of protection, a university also faces the decision about how to transfer the protected technology to the private sector. One option for the university is to license the technology to an existing company. The choice of the licensee will depend upon whether the

university is able to reach a license agreement which contains mutually beneficial terms and conditions. The university also needs to make a decision on whether a technology will be transferred through an

exclusive- or a non-exclusive license agreement. This decision will depend on the technology and the possible uses of the technology. If a university licenses exclusively, there must be provisions in the license agreement for the owner to terminate the license and take the technology back.

An issue that often arises in the technology transfer process is the control over the use of the intellectual property, especially when the researcher has a vision for the development or use of the research results. Since many university researchers have a long-term interest in a particular research project, they may not want to divest all control over future use of intellectual property. Although not biotechnology in nature, an example of this behavior arises with the Curtec™ air-curtain pesticide sprayer. This sprayer, developed and patented by Michigan State University, is under exclusive license to a local machinery firm. This firm has not been promoting the sprayer in States other than Michigan, and so is perhaps not generating maximal revenue. However, the firm has agreed to give Michigan State University researchers autonomy on further development and refinement of the sprayer. The issue of control over further development was a key point in determining the licensee.

The other option for a university is to license an innovation to a new start-up company, often incubated within a university research park. For MSU researchers, the Michigan Biotechnology Institute (MBI), a private, non-profit firm, adjacent to campus, provides an avenue to commercialize their innovations. Michigan Biotechnology Institute uses university-based innovations to develop cost-effective technologies for biobased industrial products, and transfers these technologies to the private sector for commercialization. It's subsidiary companies, Grand River Technology, Inc. (GRT) and the BioBusiness Incubator of Michigan (BBIM) act as "lightning rods" to commercialize new technologies. Michigan Biotechnology Institute, through these subsidiaries, assists scientists and entrepreneurs in creating spin off companies and joint ventures, provides seed financing for new businesses, offers tenants (start-up biotechnology firms) access to office and laboratory space, research and development (R&D) expertise, marketing services, computer and accounting services, and secretarial support.

Concluding Comments

The opportunity to protect plant and animal intellectual property raises several opportunities and challenges for a public research institute such as a Land Grant University. In making decisions about the appropriate type and level of protection, a university has to weigh benefits against the social costs to consumers, and the public expectation that all intellectual property created by a public university should be made available free of cost and without restrictions. As universities create innovations, seek to serve the public and bring forth their products to market, alliances with private companies are becoming inevitable. The need for a private sector intermediary to develop and market an agricultural biotechnology product makes it necessary for a university to seek protection of its intellectual property.

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