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THE PUBLIC UNIVERSITY, INTELLECTUAL PROPERTY, AND AGRICULTURAL R & D

By

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INTRODUCTION

The process of moving a research discovery to the successful adoption of the derived products or services is a necessary function if investments in scientific research are to be justified as a public expense. But the old method of "open access" technology transfer seems to be failing in some instances. New methods for deploying research discoveries for economic, social, health, and environmental benefits are being sought by public institutions. As a result, these evolving policies and changing expectations are clashing on campuses nationwide with more historical professional standards and academic traditions. The sources of these campus tensions are not new, but their intensity is increasing. New management solutions are needed if we are to preserve our most important academic values and traditions, while fulfilling rising internal and external expectations to deploy our research results in ways that will have more of an impact.

Much of that debate over how to manage university research and development (R & D) interests stems from the new applications of molecular biology (or biotechnology), and computer sciences (or information technology). The issue is in deciding how best to deliver university-derived discoveries to the intended public. The considerations are complex, and constantly changing. Traditional technology transfer channels have in some cases proven to be inefficient, some say, while others say we must find new commercial channels to deliver the results of publicly funded research. The core of the tension we face today is found in the difference between the traditions of openly sharing our research discoveries (as "public goods") and the protection of those intellectual discoveries for commercial purposes (as "private goods").

This chapter will look at underlying institutional concepts that have created the tensions we face, and the factors impacting the management of publicly held intellectual

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property, all from the perspective of a public institution. And, it will look at the consequent tradeoffs that must be considered when meeting legal, social and institutional obligations. All of that will be viewed from the perspective of publicly supported institutions that are also charged with responsibility to produce “public goods”.

PRIVATE GOODS

Intellectual property consists of personal property resulting from the creative work of the mind or intellect. Intellectual property protection refers to that body of law involving patents (utility patents and plant patents), copyrights, trademarks, trade secrets, plant variety protection certificates, contracts, and laws of conversion. Thomas Jefferson’s philosophy that *“inventors should receive liberal encouragement”* is embodied in the modern system of intellectual property protection. Intellectual property rights are grounded in the U.S. Constitution, which gives Congress the power *“to promote the progress of science and useful arts, by securing for limited times, for authors and inventors, the exclusive right to their respective writings and discoveries”.*

In 1790, Congress recognized the need to provide inventors with the protection of the law, and in doing so stimulated the development of inventions by granting inventors exclusive use of their inventions. During this period of exclusivity, the patent owner is protected against competition from others. The first patent act provided protection for *“any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof".*

A U.S. patent is a legal monopoly granted by the U.S. government to an inventor, which permits the inventor to prohibit anyone else from making, using, or selling his or her invention, usually for (17) 20 years. Thus a patent is a grant issued by the U.S. government giving the patent owner a temporary right to exclude all others from making, using, or selling the invention during the term of the patent. As with other forms of property, the right to make, use, or sell a patented invention may be regulated by federal, state, or local law.

Copyrights give authors protection against duplication of their work for unlimited periods of time. Copyrights protect the expression of an idea rather than protecting an invention. Most published books, music, and movies are today protected by copyright.

Trademarks are used to identify the source of the owners' goods, products or services. If a company’s high-value product is associated with a particular trademark, the owner of the product is able to better preserve its market position as a result of brand recognition and brand loyalty, through its legally protected trademark. As an example, Coca Cola’s brand name is protected as a trademark.

Trade secrets refer to any information giving its owner an advantage over competitors not having that information. Trade secret law can protect a technology from theft, although the degree of protection afforded is dependent on the technology itself. As an

example, Coca Cola's drink formula is protected as a trade secret.

Patents are not intended to protect secrets or withhold technical information from the public. Quite to the contrary, a valid patent must provide sufficient information so that *"one of reasonable skill"* can duplicate the invention described in the patent. This ***"enabling information"*** is disclosed so that others can learn from the invention, improve upon it and develop new inventions, thereby advancing technology. Owners of intellectual property can either sell or lease their intellectual property, or enter into contractual and license agreements with others, regarding the property's use.

Two particular parts within the current body of patent law speak to agricultural issues. The Plant Patent Act (PPA) of 1930 granted plant breeders an exclusive right to propagate new varieties by asexual methods, and was designed to encourage research investment in asexually reproduced plant species. PPA is administered by the U.S. Patent and Trademark Office (PTO).

Plant variety protection with certificates was promulgated in the Plant Variety Protection Act (PVPA) of 1970 to provide patent-like protection to sexually reproduced materials, since protection was not available under the PPA. The PVPA, interestingly, is administered by the U.S. Department of Agriculture, not the PTO. The PVPA was amended in 1994 to change eligibility from "first to discover" to "first to file a claim", bring the U.S. into more agreement with much of the rest of the world. The amendments of 1994 also added coverage to tuber-produced crops (e.g., potatoes). Tuber crops had been excluded from the original Plant Patent Act, as a food. Finally, the 1994 changes clarified the rights to saving seed for replanting, and the concept of "essentially derived varieties" to define better the distinctions required to claim a new variety.

In the early 1980s U.S. case law and administrative decisions extended common utility patent protections to all forms of living organisms. This too has had an enormous impact on the opportunities and responsibilities of public institutions to protect their intellectual property, especially in agricultural research. The patenting of life was fist permitted in the Diamond vs. Chakrabarty court decision that allowed a Utility patent claim on a microorganism. This was followed by *ex parte* Hibberd, that allowed a patent on a plant (maize). Several administrative decisions followed. Recently (December 2001), the U. S. Supreme Court affirmed these case rulings and administrative decisions in a majority opinion written by Judge Clarence Thomas.

PUBLIC GOODS

Public goods (e.g., products, services, and knowledge) are, as defined by Samuelson 1) freely available to all and 2) are not diminished by use. Illustrative examples of public goods are: food safety guidelines; best farming practices; and integrated pest management methods.

For the most part public institutions are responsible for providing public goods, because such socially necessary research investments are unlikely to yield private companies

any return (or profit) on their investments. This is to some, a public research and education institution's *reason d'etre.*

But, public institutions may also produce private goods, or goods and services that **could** have commercial value. Illustrative examples are: computer software and databases; improved varieties of crops; and animal vaccines, to name but a few. Public institutions are then put in the position of deciding how best to commercialize those private goods, if at all.

There are basically two strategies for protecting the intellectual property of a public institution. Some university-derived intellectual property is placed in the public domain (a.k.a. a "public trust patent") by claiming intellectual property protection with no intention of going beyond making sure that everyone has open access to the discovery. The second strategy is to seek intellectual property protection with the intention of commercializing the creation, discovery or invention, either directly or through limited licensing.

The first strategy is important for preventing others from claiming someone else's discovery as their own, and thus foreclosing the public's open access to that intellectual property. Fortunately, in the U.S. the "first-to-discover" doctrine can also be used to stop others from appropriating property intended for open public use. It is fairly easy to demonstrate that "prior art" contradicts a first-to-discover claim, invalidating any patents that might have been wrongfully issued. And, recording one's discoveries in scientific journals is an effective means for establishing "prior art". Unfortunately, only the U.S. and The Philippines employ the first-to-discover doctrine when deciding the merits of a patent application. The rest of the world uses the "first-to-file" doctrine, allowing for a lot of intellectual property misappropriations, unless an actual patent is issued that is to be held in "public trust". And that can get expensive.

The second strategy is important for preventing "generic" offerings by others, especially in those cases when commercialization costs may be substantial and need to be recovered through direct sales or licensing royalties, or through partnering with private interests.

THE ROLE OF THE PUBLIC UNIVERSITY

Universities play an important role in the development of science and technology. As centers of higher education, universities are involved in educational and research activities that have served as significant sources of knowledge for society. Universities have determined that their role in society is largely focused around a three-part mission that includes discovery, outreach and instruction. The fulfillment of the threefold mission places the university in a privileged place as a generator of new knowledge.

Public agricultural research has been conducted for over a century and is the primary responsibility of the federal-state partnership supported Land Grant University system and it's affiliated State Agricultural Experiment Stations (SAESs), working in

collaboration with the USDA. The success this system has generated has benefited from a focused program with local and/or regional inputs. In addition the system has had excellent cooperation with other public agencies, as well as private sector. Much of this success can be attributed to the free exchange of information, and the development of a cooperative infrastructure that allows for new information to be acquired, maintained, shared, developed, enhanced and ultimately put to good use. But that was all created before the emergence of intellectual property protection issues.

The Land Grant University system has a historical tradition, moral obligation and a legal responsibility to transfer new inventions, discoveries and technologies to the intended stakeholders[3]. This responsibility now includes, some have argued, an obligation to see that, when appropriate, the products of research reach adoption through commercialization. And thus appropriate commercialization mechanisms are needed to help insure technology transfer. The question then becomes, if we accept this premise, not whether we transfer any of our technologies commercially, but how and when we transfer technologies, and what role we as faculty and administrators of those research programs have in these decisions?

THE DILEMMA

Traditionally, universities have been excellent sources of knowledge for the private sector. And at the same time the private sector has benefited from access to newly educated professionals. More recently there has been an incremental change in the relationship between the academic and private sector. Many universities are now opening to the challenge of getting involved with the private sector in a more systematic and managed manner.

The diminished financial environment within which the (State Agricultural Experiment Stations (SAESs) operate within today's Land Grant Universities is driving decision-making. Without question, both university and SAES research budgets are constrained to the point where they can support only the bare minimum required for high cost, basic and fundamental research programs. Moreover, the cost of research is escalating rapidly and thus there are increased pressures to expand the funding base. Universities are hiring more science discipline-oriented scientists, and who in turn rely more heavily on competitive grants and contracts (both public and private) for their support. This has occurred as state contributions each year make up a smaller portion of the institution’s budget. Stronger university-private sector relationships and greater dependence on revenues generated through the management of intellectual property are now seen as potential, and possibly significant, sources of research support.

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3. Land Grant University faculty and research administrators should periodically review the language of the Morrill Land Grant Act of 1862 and the Hatch Act of 1887. There one will find that there is an inherent obligation to place their research results before the public for adoption and use.

Data from various governmental agencies indicate that the number of patents being issued to universities is increasing significantly (ADD FIGURE HERE?). In fact, more universities are increasingly using the number of patents issued as a measure of research success, replacing the published peer-reviewed journal article as a prime metric for faculty evaluation[4].

The U.S. issues more patents and publishes more scientific papers than its trading partners, yet we lag significantly in transferring new technologies to the marketplace. Perhaps as a response to this disappointment there are a growing number of public and private universities that have established corporate research parks. These investments are intended to stimulate the development of high-tech industries as a means of encouraging local and /or regional economic development[5].

Increasingly, state governments are establishing technology centers or development agencies to stimulate "marriages" between a research university and high-tech industries, often with the use of seed money to accelerate the effort. Whether or not these efforts will stimulate basic and fundamental research is yet to be seen.

With the widespread recognition of the growing importance of intellectual property management new university management positions that specialize in “technology transfer” have recently emerged on most campuses. The initial impetus for creating a technology transfer office can be attributed to federal legislation designed to promote technology transfer. Most notable is the Bayh-Dole Act of 1980, which obligates universities to commercialize the results from the creations, discoveries, and inventions resulting from federally funded research. But, beyond requiring the protection of intellectual property and expecting its commercialization, the Bayh-Dole Act allows the collection of royalties and fees that can provide needed income streams to universities, to further enhance their research programs.

This “sea change” in intellectual property philosophy has caused considerable consternation on some campuses, and out right strife on others. This is because many within our university communities have come to view the transfer of new technologies as simply “business ventures”. We suggest, however, that this is a misplaced vision and an inverted priority. It is clear that the greater purpose derived from our Land Grant University mission is to serve the agricultural and food system communities so that it remains viable, competitive, and profitable. This distinction makes the Land Grant University community somewhat unique, and amply justifies the continuation, as well as justifiable increases, of funding for the federal-state partnership in agricultural research and extension.

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4 Research administrators should be very careful in using the number of patents issued as a measure of productivity, for it sends mixed signals to the faculty.

5 Interestingly, this also sends a mixed message to faculty regarding expectations for productivity and advancement, quite possibly at the expense of serving the public’s need and well-being.

THE TRADEOFFS

The opportunity to manage intellectual property resulting from the work of agricultural scientists has opened many opportunities for research cooperation between universities and the private sector. But this opportunity comes at a price. For each of the claimed benefits opponents will cite some drawbacks. Listed below are some of the current "pros" and "cons" to these issues, hopefully without the subjective judgment of the authors.

Establishing Trust

Pro: Research partners can more confidently approach the other with less risk, knowing that ideas and valuable technical information will be protected and not compromised if there is a formal research partnership.

Con: Selecting one research partner over others creates problems for a public institution, and adds to distrust within the broader stakeholder community.

Access to findings

Pro: Private sector partnering with public universities gains through early access to findings from basic research programs. The private sector also gains access to potential employees. Some companies, especially smaller and/or start up firms also can gain access to special research services.

Con: Exclusivity in the access to research findings is contrary to the fundamental principles upon which a public university rests. A tax-supported institution cannot play favorites with selected research partners.

Increase in research funding

Pro: Limited funds for agricultural research, especially in the basic sciences, especially when applied toward the agriculture and food system, have resulted in the neglect of many important problem areas. In working with universities, the private sector is genuinely interested in basic research, research that cannot or will not be conducted as readily, or that has limited potential for commercialization.

Con: Private partners in a public university research project rarely pay the full cost of discovery research. Most pay only a few cents on the actual dollar cost. Why should they have an insider's access to research results that others have paid for with tax dollars? Obviously, they should not.

Focus on relevant issues and problems

Pro: Private sector involvement in university research helps to insure that research funds are focused on those problems that have potential for payoff, and address relevant issues. Such focus is consistent with the goal of maintaining agricultural/life science and private sector competitiveness.

Con: By allowing private partners to set the research agenda, other stakeholders with different needs are excluded from participation and the benefits. This is an untenable position for a public university.

Improved technology transfer
Pro: In some cases, the results of university research fail to capture the attention of the private sector and investors, as they are unable to translate findings into products and services. Private sector involvement in the research program can help achieve effective translation of research results to products and services.

Con: Recognizing the appropriate use of private interests in transferring technology has challenged universities from the beginning. Most institutions end up selecting those research topics that seem to be most likely to yield big royalties, and pass on the most socially relevant, or environmentally significant opportunities. Until a better system for distinguishing the important from the opportunistic, this argument is fraught with problems.

Employment opportunities for students
Pro: A significant and growing portion of the graduate students trained in university research programs find employment with the private sector. The opportunity to interact with scientists from the private sector during the research program improves the students understanding of the corporate research environment and establishes valuable contacts upon entry into the job market.

Con: Many students are reluctant to tie their research projects in with private interests as publication of their results (a must for gainful employment) may get embargoed for commercial reasons.

Ready access to research findings
Pro: Universities and federal laboratories are recognized as primary sources of basic research. When technology is evolving rapidly, access by the private sector to the findings of basic research programs is valuable. Sponsorship of research provides an opportunity for early access, not only to protect the intellectual property, but more importantly it provides the private sector access to valuable know-how. This know-how might include the techniques, methods, and materials usually associated with a state-of-the-art research program.

Con: For many emerging technologies (such as biotechnology) this has not proven to be true. Many of the large companies have more advanced (and proprietary) research knowledge, making access to public universities irrelevant. Most of the more campus-active corporations may be interested in “fishing expeditions”, but not for active partnering.

Contact with leading researchers

Pro: Through research partnerships university and industry researchers can establish contact with experts in the reciprocal sector that might be difficult to establish otherwise. In some situations these contacts can be important and productive consultancies.

Con: The possibilities for conflicts of interest are numerous when public-private research partnerships form. This is especially true when consultant fees are paid for services. And, some universities are notoriously poor at policing this aspect of its "outreach".

Student contacts

Pro: Companies look to universities as the primary source for technically trained employees. Sponsored research relationships offer the private sector the opportunity to become acquainted with students and post-doctoral scientists. Additionally, students are usually not constrained by the experiences and prejudices as one might find with well-established investigators, hence, students are sources of imaginative new approaches to researchable problems.

Con: The primary mission of a university is to provide education to students. That experience needs to be carefully managed. Contacts with private firms may, in some cases, not be in the student's best interest. The selection of research topics, the enforced timing of publications (noted above), and the quality of student scholarship may be called into question when there is some private interest involvement. Too few institutions have mechanisms in place to guard against such academic interference.

Access to special research services

Pro: Within the private sector, smaller and/or start-up firms often lack the capacity for special research services such as amino acid analysis, or DNA sequencing. Collaborations with the university research community can make such services available.

Con: Sharing publicly funded facilities with private interests, especially if done exclusively, is contrary to the best interests of a public institution, and can only lead to conflict.

Access to intellectual property

Pro: Most private sector - university collaborations provide the private partner with some form of access to their intellectual property. Admittedly, there is a risk that some in the private sector might benefit disproportionately from such relationships. But, the benefits of contributing to the private sector through licensing technologies developed collaboratively can be substantial.

Con: Such private access to publicly funded research results is inappropriate for a public university in that the licensees may acquire exclusive or limited exclusive access to technology developed at least partially with public funds.

IMPLICATIONS FOR SOCIETY

As some have argued, providing the private sector with access to technology acquired through research partnerships is inappropriate in that the private sector may acquire exclusive access to technology developed with public funds. This position, however, must be weighed against the prospect that, without an opportunity for the private sector contributors to license the technology, and to thus recover development investments, new technologies may go undeveloped. If this should happen, no one benefits from the public's research investment, and society forgoes the economic gain that might be brought about by new business ventures and new value-adding technologies.

There is however, no reason for this to happen. Measures such as:

- Limitations on the period of exclusivity;
- Reasonable royalty rates and/or fees; and,
- March-in rights[6], can all help to assure that the public's best interest is being served.

THE RESPONSE: How do we as a community of scholars respond to these issues and challenges? Should we cling to our traditional approaches, putting all discoveries on the public shelve, available to everyone? Or should we be moving to a new philosophical position on the management of intellectual property?

University-developed technologies can reduce agricultural production cost, provide for a more sustainable agriculture, address emerging environmental issues, increase farm profits, and even provide the general public with lower cost, safer, more nutritious, and healthier food. To see those technologies fail to be adopted because of the lack of an incentive for commercial development seems wasteful. Thus, some degree of partnering with the private sector, and the licensing intellectual properties to private interests is necessary, but this is not itself sufficient. Some careful thought is needed as to when and under which circumstances such public-private partnerships are the best solution for transferring technologies. Opening up the university research system to private interests may be critical for letting the market place determine the real value of the property. But the public institutions' purpose in each case must be to consider the need to advance the technologies that they have developed, either by the traditional public channels or through private commercialization. The key to getting this right is in the decision making process through which institutions reach their final choice regarding the appropriate means for transfer of technology. And we believe that needs to be done on a case-by-case basis, and with the corresponding research faculty's input. And importantly, many factors need to be considered in each case.

The research community has, to a great degree, foregone this obligation and forfeited

6 Provisions that allow the owner of a technology to reclaim the property from the licensed company, if it fails to fulfill its obligation to develop and market the technology under the terms of the agreement.

much of their responsibility regarding intellectual property rights management to their central university's decision-makers, resulting in research laboratories being seen as *"profit centers*", useful for replacing public funding lost over the past two decades.

We recognize that universities need to meet budget shortfalls in the public revenues used to support needed agricultural and biological research. But it is too easy for universities to rationalize that, with diminishing appropriated funding, they need to license all discoveries to the highest bidder. Public institutions have an obligation to transfer the results of their research to the general public, as a returned payment for their continuing tax-based support. There are circumstances that warrant the use of patent licensing or other forms of intellectual property protection to insure that a discovery is commercialized. But that is not always the case.

FACULTY-INVENTOR EXPECTATIONS

From the public university's perspective and that of research administrators, there are issues from the point of view of the inventors, owners and users of intellectual property. What do the inventors and owners expect to accomplish when seeking intellectual property protection of improved germ plasm, bioprocesses, analytical techniques, etc.? Why do they seek protection? Do the motivations and the benefits expected from intellectual property protection match with the mission of the institution? What are the responsibilities and expectations of potential users of protected materials? What latitude should be allowed for the use of protected materials for further research purposes? What does the public institution expect with regard to benefits and expectations of intellectual property protection?

Recognition of research accomplishments and accountability are extremely important in today's world. Intellectual property rights protection, regardless of the type is a form of recognition and reward for conducting quality, meaningful research. This recognition is important for faculty morale, and in many cases to the tenure, promotion and merit review processes as well. Intellectual property rights also provide a form of protection from economic interests. In some instances, this may be with the intent of developing and/or securing funding sources needed to keep research programs viable.

In short….. What do scientists expect to accomplish and why do they seek intellectual property right protection for their work? Knowing that intention is necessary for good decision-making.

STAKEHOLDER INTERESTS

One of the fundamental challenges facing the publicly supported university today is to develop effective strategies and mechanisms for educating the public and their elected officials on the economic, social, health, and environmental benefits of basic and applied research in agricultural and the life sciences. There is a real need to support the range of basic and mission-linked research as an investment in the long-term cumulative process that generates solutions to practical problems. The public needs to know that, if public tax support is to continue, relevant, responsive and high-quality

scientific research will result.

Some public interest groups, however, seem to perceive that some part of today's public agricultural research effort is unjustified, and should be conducted in the private sector without the benefit of public funding. As the private sector begins to shoulder a larger part of the responsibility for applied agricultural research, it will become increasingly difficult for the general public to accept the merits of publicly funded agricultural research.

Continued erosion of state and federal funding for research has generated pressure on university researchers to seek funds from other sources. As noted above, other funding sources may include the private sector, from which funds can normally be secured much more readily if universities are willing to protect intellectual property and grant licenses to sponsors of such research. As a consequence of such arrangements the goals of long-term university funded research programs may be redirected by the provider of the marginal funds. It is this potential for the redirection of programs by the marginal provider of funds that has university and agricultural research administrators concerned.

Redirection of the research agenda may be more directly related to funding sources than intellectual property rights, *per se,* but it is present regardless of whether the marginal funds are provided by the private sector or by a federal granting agency. The provider of the marginal funds can have an enormous and significant impact on the direction of the research program. Additionally, the prospect of collecting royalty income from the licensing of intellectual property may also affect the research priorities of some institutions and for some individual researchers.

Decision-makers and researchers often lack sufficient information and background about intellectual property rights and appropriate institutional procedures or policies for exercising these rights without compromising public interest. Decision-makers should be better informed of the impact of intellectual property protection shifts on the direction of research programs and the impact of such directional shifts on the ability of these programs to meet the public's expectations.

PRINCIPLES OF IP MANAGEMENT

Arguably, this is an emerging field of research management, we offer with hesitation some guiding principles that can help to focus the issues surrounding the management of intellectual property generated by publicly supported universities.

Principle 1. It is clear that marketing intellectual property is a legitimate activity of a university, but the faculty and administration must understand that in addition to the income that is placed back into research programs, the intended technologies must serve a public need.

Principle 2. It is critical that as university efforts to commercialize discoveries increase, faculty and research administrators must not allow that activity to give priority to short-term, low quality research to boost an institution's or an individual's financial gain.

Principle 3. The decision on how to handle and manage the intellectual property developed by the faculty must always be balanced against the substantial costs required to protect and market inventions, *versus* the need to have the technologies made available to those who have invested in the technology, most notably the tax paying public. This is not an easy balancing act.

Principle 4. Within the academic community there must be due diligence when collaborating with the private sector, as a university must not sacrifice its independence or its integrity.

Principle 5. It is important that each academic institution clearly understands and pursues its mission, and, in turn, exercises care in its relationship with the private sector.

Principle 6. It is important for any university to strive to diminish any potential conflicts that might be derived from its management of intellectual property.

The above thoughts lead to several frequently asked questions regarding intellectual property rights and property protection generated by university scientists. We offer our perspectives as answers.

- *Who should be involved in the decision-making process for protecting, licensing, and managing the academic institution's intellectual property?*

This should primarily be done by the involved research faculty, with the proviso that they are informed on the issues of intellectual property management policy.

- *Who should assign the intellectual property rights to the creations, discoveries and inventions of an academic institution?*

This should primarily be decided at the faculty and department level with concurrence from the college administration. Otherwise, too many conflicting interests get involved.

- *What mechanisms are available to assist faculty to become knowledgeable on the issues of intellectual property?*

Few mechanisms if any exist at this time. The University administrative community should work collectively to fill this gap as soon as possible.

- *What is the role of the university, department and faculty in the commercialization*

of new products, technologies or process's that will benefit the agricultural community and the general public?

While this is not true of all institutions, departments and faculty who are impacted by such decisions, should be front and center in both the discussion and decision-making process involved in commercialization of intellectual property. Currently, this is not the case in many institutions.

- *How should the process of identification of the intellectual property and the technology transfer activity of the university be structured or otherwise institutionalized?*

In the best of all worlds, each academic department should develop its own policy on intellectual property management, however, owing to the difficulty of such, and the potential outcome that the university might end up with dozens of IP management schemes, it would be wise for the university to have guidelines that focus the process. A policy statement should be developed to take into account the traditions and values of that department/discipline, the mission they are committed to, and the realities of the types of research they are engaged in, and plan to be engaged in. In reality, the most common approach in most universities is to defaulting to the central administration, however faculty must find models that improve the level of engagement on these matters.

- *Who should provide general guidance to those who will make the final decision on which property or properties to protect and by what mechanism?*

The existing "Technology Transfer Offices" should be transformed into a service function for the academic departments. No longer should they drive the intellectual property agenda for the faculty. The faculty should work under broad institutional guidelines and clearly stated principles, with facilitation from centralized support offices.

- *How do we (or should we) license all discoveries and intellectual property that result from publicly funded research programs?*

Not all discoveries should be (or indeed need to be) protected. And not all protected intellectual property needs to be licensed. Each case is different. It is the **intention** that is important to the decision, and faculty involvement in deciding on a case-by-case basis is deemed the best possible configuration for a publicly supported institution.

RECOMMENDATIONS

Given the summarized views, the derived guiding principles and our perspectives as research managers we offer the following recommendations:

We recommend that the faculty-inventors who are/were involved in the discovery research must participate in the decision making process for the transfer of that technology. And in turn, the involved faculty has an obligation to become informed on the issues related to intellectual property management and its commercialization.

We further recommend that the final decision on technology transfer strategies must reside with the faculty and their department, and not with the central administration. In the end it is the faculty, the department and the college administration that have the greatest appreciation for the political and societal consequences of a decision to license intellectual property, particularly when public (state and federal) funding has been used extensively.

We recommend that faculty weigh their need to generate funds to support their continuing research in the face of declining funds, against the likely societal or economic impacts associated with each option for technology transfer, and against the political consequences of protection and licensure of property. We note that the consequences of a wrong choice can lead to a loss of years of good will and trust from those who have supported agricultural research.

We recommend that training and information on intellectual property right issues be made more widely available to the faculty, especially within the agricultural and life science research system. Additionally, the community of faculty needs to take a genuine interest in understanding the issues and consequences of decisions made that might impact their future.

We recommend that effective efforts be given to counteract the serious erosion of public financial support for agricultural research. Better public funding would mitigate many of the negative impacts of intellectual property rights protection on public research agendas. This would occur by removing much of the pressure to acquire from the private sector marginal research money where intellectual property rights must necessarily be an important part of the funding arrangements.

We recommend that public institutions improve their capacity to appropriately manage intellectual property in a way that will encourage rapid commercial development of research findings, while the same time protecting the public's interest. This might include segmenting budget lines to better track public versus private investments; more transparency in the management of royalty streams derived from licensing; and greater involvement of all stakeholders in the development of intellectual property management policy.

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