Recent decades have seen an increase in intellectual property protection worldwide. Accompanying this trend, there have been growing concerns about how best to encourage the development and distribution of technologies that benefit developing countries within this new and rapidly changing landscape of intellectual property rights (IPRs). PIPRA (The Public Intellectual Property Resource for Agriculture) addresses these issues in the area of agriculture by mobilizing collaborative support of a wide range of public sector institutions worldwide. In addition to this broad base of institutional support, PIPRA’s molecular biology labs and its network of pro bono IP attorneys together allow a coordination of scientific and legal resources that is crucial for the provision of practical IP services to support advances in developing country agriculture.

**Keywords:** PIPRA, IP management in agriculture, agricultural biotechnology, enabling technology, trait technology

Under TRIPS and subsequent bilateral agreements, many developing countries are obligated to implement substantial reforms to their IPR systems, often including the introduction of new legislation. In developed countries, the use of patent protection has expanded, especially in the life sciences. Accompanying this trend, there have been growing concerns about how best to encourage the development and distribution of technologies that benefit developing countries in this new and rapidly changing landscape of intellectual property rights (IPRs). PIPRA, as an innovative collaborative IP management model designed to support the common goals of its members’ public missions, beginning with the original members’ dialogue initiated by the Rockefeller and McKnight Foundations, a general discussion of PIPRA’s current structure and function before a more detailed description of the five main areas in which PIPRA provides services are discussed in detail. PIPRA’s intellectual property information clearinghouse, PIPRA’s information and analysis services; provision of technical assistance and capacity enhancement for better management of IP; development and management of pools of technology; and PIPRA’s work in the lab, development and distribution of biotechnology resources, PIPRA’s future role, and how this model for the collaborative management of intellectual property may be applied to other sectors of technology beyond agriculture are also discussed in detail.

**PIPRA’s Origin and Functioning**

PIPRA emerged in 2004 after lengthy consultations among approximately twelve public sector agricultural research institutions and two philanthropic foundations (the Rockefeller and McKnight Foundations). Public and non-profit institutions have a long history of developing new agricultural technologies and delivering those research results to seed companies, farm equipment manufacturers, or directly to farmers as a public good. Land-grant universities and affiliated Cooperative Extension Service in the United States provided an integrated system of public research and delivery of innovations to the agricultural sector. Internationally, similar institutions and activities also supported the development of so-called green revolution crop cultivars and their delivery. This direct role of public universities and non-profit research centres in agriculture is strongly embedded in the culture of these institutions and in agricultural research, more generally.
In the early 1980s, combination of several events in the US contributed to a shifting paradigm for the transfer of technology from universities to the agricultural industry. These events included: advances in the life sciences that set the stage for a broad field of innovation in both crop and animal genetics through biotechnology; changes in the Federal law that allowed universities to own patented inventions resulting from federally-sponsored research; and a landmark Supreme Court decision allowing the patenting of living organisms.

Simultaneously, a research-intensive private biotechnology sector developed that was technologically and financially equipped to take early-stage inventions from universities and make the substantial investments in research and regulatory approval necessary to bring new products to market. Patent protection was important to these private firms in order to justify the large follow-on investments in the development of university innovations. Beginning in 1980, universities began to seek patent protection on a wide range of technological innovations, including agricultural innovations.

During the 1990s, it became clear that there were growing impediments to universities and non-profit agricultural research institutions fulfilment of their historical role of directly providing many new agricultural innovations—particularly biotechnology-derived innovations—to the agricultural industry or to farmers. Technology transfer of public agricultural innovations increasingly involved the navigation of a rapidly changing landscape of intellectual property rights. The challenges faced by the public sector were especially apparent for crops that do not engage large, private sector interest: subsistence crops for developing countries and specialty or horticultural crops which do not occupy the vast acreage of agronomic crops, but nevertheless provide high nutritional and high regional economic value.

While there are many contributing factors, legal access to the suite of proprietary technologies required to produce a genetically modified crop has been frequently cited as a barrier to the commercialization of public sector agricultural research (Graff et al., 2003a). In Europe, a similar picture emerged in 2000, when a Swiss scientist developed ‘Golden Rice’, genetically modified rice with elevated pro-vitamin A (Ye et al, 2000) which triggered an intellectual property audit. The audit revealed that 70 proprietary technologies had been infringed in the development of golden rice and illustrated the complex patent thicket that surrounded biotechnology innovations for crop improvement (Kryder et al., 2000).

As a result of the emerging and complex intellectual property landscape in agricultural biotechnology, the presidents of a number of universities, non-profit research centres and foundations wrote a compelling article for the ‘Policy Forum’ of Science magazine (Atkinson et al, 2003). The article addressed the historical mission of public/non-profit institutions and lamented how intellectual property and its management were now impacting their institution’s own ability to ‘develop new crops with the technologies it has itself invented’. The article considered the structure of intellectual property ownership in the agricultural sector and recognized that, while the public and non-profit research sector had invented nearly 25% of the reported innovations, this ‘portfolio’ of inventions was highly fragmented across many institutions that did not necessarily collaborate well, particularly, when it came to intellectual property management. The conclusion suggested that collaboration to unify this broad portfolio under a common philosophical framework may be a powerful approach to reconstruct a ‘commons’ of patented technologies to support a range of agricultural innovations that were not being addressed by private firms—particularly, projects addressing developing country needs and specialty crops. The strong and public statements made by major institutional leaders were a critical step in advancing the initiative that became PIPRA.

**Structure and Function**

The primary strategy of PIPRA was to develop a strong membership base that would represent major agricultural technology developers in the world. Unifying the highly fragmented portfolio of agricultural intellectual property under a common set of principles and within a framework of open and collaborative communication was viewed to be the most important first step. As a consequence, the barriers to joining PIPRA have been kept quite low—membership fundamentally requires an agreement to populate the PIPRA patent database with institutional information, to participate in PIPRA meetings and to agree at a high institutional level to support collaborative efforts that promote broad technology access.
PIPRA’s present membership base is comprised of 41 institutions in 12 countries. Although US institutions are currently predominant, this is expected to change in the near future. Current members account for approximately 50% of the public/non-profit patented agricultural biotechnologies.

As PIPRA developed, a structure was implemented that was designed to allow the organization to address a wide variety of IPR issues, all in support of its core goals. The initial focus on creating a database of patents and patent applications was an important beginning, but the capacity for in-depth legal analysis, and the ability to integrate the legal information with work in the laboratory was needed before PIPRA could fully address its mission. Therefore, in addition to the development of the database, a network of pro bono attorneys was engaged, PIPRA increased its in-house expertise for legal research, and laboratory facilities were provided by the University of California, Davis.

PIPRA recognized the need for IP services and expertise to address a range of issues including: access to technologies (including access to know-how), licensing, IP management training, public domain, germplasm exchange, international differences in patent landscapes, freedom-to-operate, plant breeders’ rights, and more. The organization’s structure was designed to put PIPRA staff at the nexus of a large amount of information and resources. The capacity to analyse this wealth of information, combined with the potential for collaboration among its member institutions allows PIPRA the flexibility to meet the heterogeneous IP needs of the international public sector agricultural community.

Requests from member institutions often come from researchers themselves, or staff involved in identifying IP issues for the future development of a technology. The range of issues varies widely, including advice on: Defensive publishing vs patenting, patent landscapes surrounding a technology/freedom-to-operate, identifying export markets and how the patent landscape differs among them, understanding IP terms in contracts such as material transfer agreements or research agreements, marketing technologies, gaining access to technologies, and many more.

**PIPRA’s IP Information Clearinghouse**

A major programme and activity within PIPRA is its clearinghouse for patent information within the agricultural sector and the creation of a common source of information on public/non-profit patented technologies. This has primarily involved the establishment of a searchable database of PIPRA member’s technologies that can be accessed by both members’ technology management staff and by the general public. The database contains information on patents and patent applications across 72 reporting jurisdictions. PIPRA does not require its members to assign patents or license them to PIPRA; instead, all licensing decisions are still left to the individual members owning the IP. Had membership in PIPRA required contractual constraints in this arena, many institutions would have been unable to join PIPRA.

Also included is information on the licensing status of each technology, which provides the basis to evaluate whether the technology is available for deployment in specific crops or jurisdictions. The database is hosted by M-CAM, a software firm that has developed a powerful suite of analytical tools for intellectual property analysis. These tools are also
available to PIPRA staff and members. They can be used to evaluate the intellectual property landscape around key technologies.

PIPRA recognizes that finding a patent in a database goes only part way towards accessing the technology. Among other challenges, know-how may be required, licenses may need to be negotiated, liability and stewardship issues may need to be addressed, and related public domain technologies may be worthy of examination. PIPRA’s database was designed to provide a direct way to get assistance with these other critical areas of technology transfer. What sets PIPRA’s database apart from others is not just the inclusion of licensing information, but the fact that PIPRA, beyond the provision of information or data, has collaborative working relationships with the owners of the technologies displayed. Connections to scientists and technology transfer offices can be facilitated along with assistance in licensing negotiation, and legal analysis can inform the decisions.

Information and Analysis Services

In addition to an information clearinghouse, PIPRA has developed the capability to evaluate the freedom to operate for deployment of specific technologies. For instance, PIPRA can examine whether commonly used patented technologies have a functional equivalent in the public domain, or what legal limitations (either geographic or technical) are provided by surrounding patents. In this way, PIPRA provides an exceptional service to public sector researchers, answering their individual queries about IPR issues.

This capability is supported by an in-house staff with the skills to prepare detailed background research characterizing the scientific and patent landscapes around specified technologies. Additionally, PIPRA’s analysis work is supported by a pro-bono network of patent attorneys who provide patent claims analysis and FTO opinions. The external legal resource has been a critical addition to expand the scope and impact of PIPRA’s analytical capability and to provide rigorous evaluations of intellectual property constraints and opportunities for the implementation of specific projects.

Technical Assistance and Capacity Enhancement for IP Management

PIPRA provides services to public sector research institutions to assist in the navigation of IP issues in agriculture. Services directed to developed country research institutions are provided for research into specialty crops and developing country subsistence crops. Recognizing that research institutions in developing countries have very different IP management needs, PIPRA is currently assessing the best way to provide services to these institutions.

PIPRA’s IP management services begin with an individual consideration of the goals of the project and the institution(s) involved. IP strategies can be tailored to support a variety of management goals that may include, for example, achieving the broadest possible delivery of a product or ensuring the preservation of access to newly developed technologies. To support desired outcomes, PIPRA can assist in assessing the best path forward using some combination of IP management tools that might include: sponsored research agreement language, in-license considerations, use of the public domain, defensive publishing, patenting, trademarks, humanitarian use reservation of rights, licensing language, etc.

In addition, PIPRA is working with MIHR, the Centre for the Management of Intellectual Property in Health Research and Development (www.mihr.org) to produce a Handbook of Best Practices for Management of Intellectual Property in Health and Agricultural Research and Development that is designed to practical guide to IP management.

Development and Management of Pools of Public Sector Technologies

PIPRA, in developing enabling and trait technology packages for implementation of projects designed to improve crops, will also develop and manage pools of intellectual property rights that are required to fully implement the projects. PIPRA is just beginning this activity which will have some similarities to managing patent pools in other technology sectors, but will also have significant differences. For example, PIPRA does not anticipate that technology providers will either assign or license the rights to PIPRA to allow for subsequent sublicensing. Rather, PIPRA anticipates that it will manage rights under pre-negotiated terms on behalf of each of several technology providers. The ability to evaluate and integrate technologies from multiple sources has the benefit of accessing complementary technologies that only together provide the basis to enable a complete project. In this way, PIPRA has the potential to create new opportunities to enable
projects and new product development that could not be achieved by single institutions working alone.

Biotechnology Resources

PIPRA has developed the laboratory research capability to utilize intellectual property information and analysis to inform the design of research tools and entire projects for implementation. For plant biotechnology there are two broad classes of technologies: Enabling Technologies that are required to genetically engineer a crop and the more specific Trait Technologies that confer the specific trait of interest (e.g. disease resistance, drought resistance or specific nutritional traits). One of PIPRA’s first projects has been targeted at acquiring and testing a suite of complementary technologies required for transfer of foreign genes into plant cells that confer maximum freedom to operate. The construction of this plant transformation vector involves the development of a pool of proprietary technologies that can be distributed under a set of defined terms for research, humanitarian and commercial uses.

To initiate this project, PIPRA convened a panel of experts to develop recommended design parameters that met technical and regulatory criteria as well as legal criteria for access to the underlying intellectual property. The recommended design parameters were then used to identify appropriate technologies that were extensively evaluated internally by PIPRA’s research staff and externally by PIPRA’s network of attorneys. The results of this analysis provided the basis to identify the core proprietary and public domain technologies required to meet the technical objectives – with an emphasis on incorporating the required proprietary technologies from either the public domain or from PIPRA member institutions. PIPRA is now working in the lab to combine the identified technologies into sets of research tools for distribution to the broader research community and to develop pre-negotiated terms of access to each of the incorporated technologies. In the future, PIPRA will be in a good position to link its Enabling Technology package with specific trait technology pools to fully enable project implementation relying primarily on PIPRA member technologies.

Future Roles

Both PIPRA’s membership and demand for its services are expanding rapidly. As PIPRA becomes more of a truly international resource, significant investment will be needed to ensure that it is able to continue to support the articulated international needs. In particular, attorney networks will need to be developed in other regions of the world, and PIPRA will likely need to grow to include regional staff. However, the resulting broad public sector portfolio, and the networking of agricultural public sector institutions on such a global scale is an exciting prospect.

The early successes of the PIPRA model have earned accolades, and have led others to ask whether the same model may apply in other technology areas, such as tropical medicine; water purification and management; environmentally stable power generation, storage and transmission; infra-structure minimal communications systems; bio-energy; etc. The PIPRA model may find applications eventually in widely diverse areas of technology.

Conclusion

PIPRA is a unique resource combining scientific and legal expertise, and enabling collaboration among public and non-profit agricultural research institutions internationally. PIPRA’s mission is to address the IP needs of public researchers and support the development and distribution of agricultural technologies for developing countries. The organization has been structured so as to leverage its many resources – a broad membership base, laboratory facilities, committed IP attorneys, patent analysis tools, and data – to most effectively provide IP services and information.

Strategic thinking about intellectual property rights is necessary for the prudent stewardship of many innovations in agriculture. When these innovations are ones developed in public research institutions that hold the potential for reducing poverty and increasing food security in developing countries, the need for an understanding of intellectual property rights becomes both compelling and challenging. PIPRA has been designed to meet a wide range of the complex and heterogeneous IP needs of the public sector agricultural research community and fulfils a role that is likely to become ever more significant in the future.

References

3. PIPRA’s membership MOU, http://www.pipra.org/docs/
While PIPRA responds to requests for information and analysis from both individuals and institutions, it is PIPRA’s policy to make public the results of analyses done for any client if appropriate.

Section 7 describes PIPRA’s work on this project.

