IP and Information Management: Libraries, Databases, Geographic Information Systems, and Software

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ABSTRACT
The last decades have seen a revolution in knowledge management, library services, and information resource database configurations. The use of integrated computer networks and the ability to produce and distribute information have had far-reaching implications for IP (intellectual property) protection. In order to demonstrate IP laws and their application, this chapter will use, as its primary example, Geographic Information Systems and Remote Sensing (GIS/RS), a technology that presents interesting and complex IP issues.

1. INTRODUCTION
The management of databases and library volumes is becoming increasingly complex. In many organizations, library staff are responsible for the storage and retrieval of information, as well as the development of new books or articles. Library staff face ever-increasing challenges regarding the intellectual protection (IP) rights that apply to these various materials.

IP is a term that refers to creations of the mind: inventions; literary and artistic works; and symbols, names, images, and designs used in commerce. U.S. law allows for various sorts of IP protection.

Much of this chapter focuses on a technology that creates a unique IP management challenge: Geographic Information Systems (GIS) and Remote Sensing (RS). GIS/RS is a particularly interesting example of intellectual property because it combines and interfaces a series of different component parts: hardware, software, and other protectable components (including maps, survey data, aerial photographs, information from land records, and so on). Each of these components may carry its own IP protections and restrictions through various licenses. As a result, the final product will also have various IP protections and restrictions attached to it. In other words, GIS/RS systems are affected by IP issues in relation to databases and software, as well as in relation to the technologies that create entirely novel sets of data. These are not always straightforward: for one thing, many different intellectual property and licensing terms appear to have overlapping meanings. Box 1 at the end of this chapter provides a list of the most common technical and legal terms encountered in the context of data, databases, GIS, and software.

In almost all countries, various forms of IP protection are available for the protection of data and data-related products. These are copyrights, trademarks and trade secrets. Thus:

- Symbols, names, and images used in commerce can be protected by trademarks.
- Creative works can be protected by copyrights.

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- Information can be protected by keeping it a trade secret.

GIS/RS is protected by copyrights and trademarks and, to some extent, trade secrets.

2. COPYRIGHT AND THE PUBLIC DOMAIN

A copyright protects an original work and allows the author the exclusive right to:

- reproduce the work exclusively
- prepare derivative works
- distribute copies by sale, transfer of ownership, lease, renting, or lending
- perform the work publicly
- display the work

Generally, the types of works that are protected by copyright are: literary works; musical works (including accompanying words); dramatic works; pantomimes and choreographic works; pictorial, graphic, and sculptural works; motion pictures and other audiovisual works; sound recordings; and architectural works.

2.1 *Public domain*

Works in public domain are not protected by copyright and are publicly available. They may be used by anyone, anywhere, any time, without permission or license. A work may enter into the public domain if its term of copyright protection has expired. In the United States, works of the U.S. government are all in public domain (Title 17 U.S.C. § 105); they cannot be protected by copyrights. However, U.S. government employees may produce copyrighted work not created during the course of their official duties. If U.S. government works are disseminated in foreign countries, such works may be copyrighted to the extent allowed by the domestic laws of those countries.

It is very important to note that authors are not required to give notice that their work is copyrighted. Therefore, it is the responsibility of the potential user to determine whether or not a work is in public domain. This may become an issue for example in a case where a private work has been included in a government publication by permission of its author. Under U.S. law, such private work is not in the public domain, and therefore one using the government publication may still need permission, or license, to use such private portions of the publication.

2.2 *Fair use exemption*

Section 107 of the U.S. Copyright Act states that an author's original creation is subject to "fair use": that is, the work can be used in special cases without permission for purposes of criticism, comment, news reporting, teaching, scholarship, or research. This exemption is one of the most important copyright limitations. *De facto* fair use should never be assumed. Fair use is determined on a case-by-case basis, taking into consideration the purpose and character of the use, the nature of the copyrighted work, the amount and substantiality of the portion of the work used in relation to the work as a whole, and the potential effect of the use on marketing and distribution of the work.

2.3 *Copyright registration*

Copyright is automatically granted at the creation of a work. Registration of the copyright with the U.S. Copyright Office is not necessary, but a copyright cannot be enforced, or damages collected for improper use, unless it is registered. Currently, the cost for registering a copyright is $30.

2.4 *Copyright duration*

In the United States, a work that is created and fixed in tangible form for the first time on or after 1 January 1978, is automatically protected from the moment of its creation for the lifetime of the author, plus an additional 70 years after the author's death. In case of a joint work, the term lasts for 70 years after the last surviving author's death. For works made for hire, and for anonymous works, the duration of copyright is 95 years from publication or 120 years from creation, whichever is shorter. A work that was copyright registered or published with a copyright notice before 1 January 1978 can be protected at most for 95 years from the date of securing.

It is important to note that duration of copyright varies somewhat from country to country. In European Union member countries the

copyright, generally speaking, protects the work for the lifetime of the author plus 70 years. In Japan the protection is generally lifetime plus 50 years. In Mexico the protection is lifetime plus 100 years.

2.5 *First sale doctrine*

The first sale doctrine, codified at 17 U.S.C. 109, limits the rights of copyright holders to control the distribution and display of copies of their works. The owner of a particular copy is entitled to "sell or otherwise dispose of the possession of that copy" and to "display the copy publicly ... to viewers present at the place where the copy is located." Therefore, the first sale doctrine gives the copyright owner the right to control only the first sale of the work. The owner of a lawfully made copy may in turn dispose of it by any means. The first sale doctrine is the legal basis for public libraries, which lend copies that they have previously purchased. The first sale doctrine does not, however, allow anyone except the copyright owner to make more copies. The Digital Millennium Copyright Act of 1998 authorizes the creation of digital copies for archival and preservation purposes nonprofit libraries and archives. The right to distribute such copies requires authorization from the copyright owner.

2.6 *Copyright ownership*

Generally speaking, the author of a work owns its copyright. In case of work for hire, the employer is considered to be the author and the owner of the copyright.

In the case of GIS/RS, if all work (including aerial photography and geographical data entry) is completed by the employees of a company under the terms of their employment, then the work-for-hire requirements would be fulfilled and the company would own any relevant copyrights. It is important that companies have written agreements (with appropriate work-for-hire language) with any independent contractors that they hire.

If, at the time of creation, the authors intend to combine their contributions into an inseparable or interdependent whole, the resulting work is considered a joint work and the authors are considered joint copyright owners. Each copyright owner has an equal right to exploit her or his copyrights. A company can license or obtain an assignment for the copyright of the joint work from only one of the authors. If, on the other hand, at the time of creation the authors did not intend their works to be parts of an inseparable whole, the resulting work is considered a collective work and the authors are considered collective copyright owners. A collective copyright owner only owns copyrights for the material that she or he added to the final product.

2.7 *Work for hire*

A work for hire is defined in copyright law as that which is prepared by an employee within the scope of his or her employment, or a work specially ordered or commissioned for use as a contribution to a collective work, a part of a motion picture or other audiovisual work, a translation, a supplementary work, a compilation, an instructional text, a test or the answer key to a test, or an atlas. The parties must expressly agree by signing a written instrument that the work shall be considered a work made for hire.

In academic environments, the terms of employment typically require inventors to assign *ex ante* their patentable inventions (but not necessarily their copyrightable works) to the university. If a company hires consultants who are also academics, it is important that their consultancy contracts explicitly state that the contracting institution owns all work done by the consultant. The following is an example of such a clause:

Property and Property Rights. Consultant agrees that any computer programs, software, documentation, copyrightable work, discoveries, inventions, or improvements developed by Consultant solely, or with others, resulting from the performance of Services pursuant to this Agreement, are the property of Contractor, and Consultant agrees to assign all rights therein to Contractor. Consultant agrees that the Services constitute a Work for Hire as such term is used and defined in the Copyright Act. This provision shall survive expiration and termination of this Agreement.

2.8 *Assigning and licensing copyright*

The owner of copyright may transfer the copyright wholly or partially to another party. A transfer is usually done by an assignment or by licensing. With an assignment the copyright owner sells his or her rights to the assignee, while with a license the copyright owner retains the ownership but grants the licensee a right to use the copyrighted material according to the limitations in the agreement.

It is important to realize here that copyright includes numerous rights (for example, a right to reproduce the work, a right to prepare derivative works, and a right to distribute copies). Therefore, the copyright owner can transfer the copyright via an assignment or a license partially or wholly. The copyright owner may, as well, transfer the copyright on an exclusive or a nonexclusive basis. The transfer of exclusive rights is not valid unless that transfer is in writing and signed by the owner of the rights. Transfer of a right on a nonexclusive basis does not require a written agreement.

As an example, the author and copyright owner of a database, could transfer to a company a right to copy and distribute the database. However, the author could also transfer a right for another company to make a derivative work using the database. Either of these rights granted could be exclusive or nonexclusive ones. Probably both of them would be made via a license.

Works by the U. S. government, including maps, are not eligible for U. S. copyright protection. A map, in pictorial form, would not lose its copyright protection if its information were to be digitized and stored in an electronic database. However, a geographical information system whose data have never existed in a coherent pictorial form would be considered a compilation.

2.9 *Databases*

A compilation is only copyrightable if its facts have been selected, coordinated, or arranged in such a way that the resulting work, as a whole, constitutes an original work of authorship (joint work, see Section 2.6). Copyright is meant to reward originality, not effort. Therefore, not all databases are protectable under copyright law. An example of a compilation that did not have the requisite originality for being protectable under the Copyright Act was a telephone catalog, for which the telephone company has simply selected names and arranged them in alphabetical order. Such a database is not original or creative and would not warrant protection.[1] It is, however, important to note that there is no requirement of novelty; therefore, the data or information that is used for the compilation may well be known. The way to select, organize, and arrange the information has, however, to amount to some minimal originality or creativity.

Copyright Act Section 102(b) reads, in part: "*in no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.*" This clause has been interpreted to mean that the individual data in a database are not protected under the Copyright Act. Therefore, even if a database may be copyrighted, a user may use data extracted from it. However, the original data/images that were used to develop the new work must not be passed to any third party or used in a way inconsistent with the terms and conditions under which they were given. In order to prevent such use, the copyright owner usually includes preventing clauses into the licensing agreements.

2.10 *Maps*

Even if a map's geographical features are not protectable by copyright law, the map may still be original enough to warrant copyright protection, depending on what information it includes, from which sources the information was collected, and how the information is represented in pictorial form.

2.11 *Photographic Images*

GIS/RS may use aerial photographs instead of maps. A photograph may be protectable under the Copyright Act if it exhibits a certain amount of uniqueness. The U.S. Court of Appeals, 11th Circuit, has stated that copyright law protects "*the selection of lighting, shading, timing, angle and film*" of a photograph.[2] Copyright protection does not, however, extend to physical facts the photograph expresses.

3. TRADE SECRETS

Under U.S. law, spatial databases are granted fewer IP protections than even the most mundane cloak-and-dagger international spy novel. Therefore, keeping the database a trade secret may be the best way to protect it. A generally accepted definition of *trade secret* appears in the 1939 Restatement of Torts. The subject matter of a trade secret must be secret, and only known to those involved in the particular business in which it is used. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by anyone as his or her secret. Matters that are completely disclosed by marketed goods cannot be trade secrets, either.

4. IP PROTECTION FOR SOFTWARE

4.1 *Protection*

A software program is potentially covered by two types of statutory IP protection:[3]

- The software code is protected by copyright
- The algorithm of the software, if original, is protectable in the United States (but not in most other countries) by patent

Because software algorithms cannot be copyrighted, it is possible for a third party to reproduce the flow and function of the software program and (provided he or she did not derive the new code from the original code) legally use and sell the resulting software.

Patents may offer better protection from competition, but they have several drawbacks:

- Patents are expensive to file and prosecute (and software patents are often even more expensive than the average utility patent). Depending on the number of countries where patent protection is sought, the cost of a patent may amount anywhere from $10,000 and beyond.
- The algorithm must be demonstrably original.
- The patent laws of most countries do not cover software.
- By the time the patent is issued, the program may well have become obsolete.

4.2 *Licensing*

Both copyrights and patents can be licensed for commercialization. Some software licenses in the United States are combined copyright-and-patent licenses. Generally, copyright-alone licenses for software are of limited value unless the program in question is very large and was developed over many years and is therefore difficult for a user to replicate.

A number of different types of licenses are applicable to software:

- **end-use licenses.** The licensee may use the software but not distribute it. These licenses are almost always nonexclusive. The licensor may or may not provide a source code.
- **nonexclusive distribution licenses.** The licensee may distribute the software, either as code or in hardware form (such as a semiconductor). The licensor usually provides a source code.
- **exclusive distribution licenses.** The licensee will distribute the software to end-users and will also improve and support the software. The licensor always provides a source code.
- **open-source licensing.** The software is provided free to users, usually over the Internet. There are many different forms of open-source licenses, each with different restrictions on use.[4] Two of the most common are described below:
- **minimally restrictive.** The licensee may use, improve, sell, and even establish proprietary rights to any improvements he or she makes to the software, provided that he or she acknowledges the licensor's ownership of the copyright.
- **quite restrictive.** The licensee may use and improve the software, but any improvements or modifications to the software must be made available to other licensees under the same conditions. Any licenses the licensee grants to his or her improvements must carry the same obligations and restrictions for the licensees; that is, the rights granted originally to the licensee who made improvements to the originally copyrighted product has to flow through to the improved versions.

4.3 *Collaboratively developed software*

Software created for later distribution or commercialization is a special case. Software programs often have a number of authors and frequently incorporate software that was written by third parties and obtained either formally (through license agreements or open-source licensing) or informally (such as through colleagues).

Technology transfer offices should make sure ahead of time that they are legally able to license software programs, especially if they hope to grant exclusive licenses. In order to determine the legality of licensing, the following questions must be considered:

- Does the potential licensor own the copyright for the primary software program? Are all authors obliged to assign their copyrights to the potential licensor? To ensure this, the potential licensor should:
  - have in place clear policies that delineate under which circumstances students and employees must assign their copyrights to the licensor
  - have written agreements with any other authors (such as consultants or students) that software produced under the consulting arrangement will be assigned to the potential licensor
- Is there any code in the program that was written by a third party? If so, the licensor should:
  - find out from whom or what the code was obtained and whether copyright permission has been granted by this party; learn what restrictions, if any, have been imposed on making and/or distributing *derivatives* of the software that incorporate the original code
  - if the code was obtained from an open source, determine what type of open-source license was involved and what *restrictions* have been imposed on the distribution of the code

Technology transfer offices should take steps to educate creators of commercializable software about ownership issues. A lack of knowledge about IP rights may lead to an unmarketable product.

The Uniform Computer Information Transaction Act (UCITA) standardizes the rules for licensing digital information, including software. UCITA is, however, very controversial and at this point only two states (Virginia and Maryland) have implemented it.

4.4 *Shrink-wrap and click-wrap licenses*

Shrink-wrap and click-wrap licenses are common in software licensing. Shrink-wrap licenses are enclosed in the plastic shrink-wrap packaging of software products; they inform the buyer that if he or she does not agree with the terms of the agreement, he or she should return the software and its packaging to the retailer. Click-wrap licenses appear on the screen before the software installation begins, and typically read: "*Before downloading this software, you must read and agree to the following license terms and click the 'I Agree' button to accept.*" In the United States, these types of licenses are enforceable.

5. INTERNATIONAL ASPECTS

Sometimes, data is obtained from multiple jurisdictions, each with its own laws. IP protection for databases is stronger in Europe than it is in the United States. The European Union Database Directive, adopted by the European Parliament in 1996, grants two rights to the makers of databases:

1. The right to prevent unauthorized use of the database
2. The right to prevent unauthorized acts of extraction and reutilization of the contents of a database

The first right, which is similar to that provided under the U.S. Copyright Act, protects databases that are sufficiently original in their selection or arrangement of data. This right does not, however, protect the data itself.

The second right is a sui generis right that prohibits the extraction or reutilization of any database that has required a substantial effort to obtain, verify, or present. Under this second right, there is no requirement for creativity or originality.

A database is protected for 15 years from the date of its creation. If substantial changes are made to the content of the database, the modified database will be protected for an additional 15 years. Protection under the directive is available only to nationals of member countries of the European Union. Other countries will obtain such protection only if they offer comparable protection to databases of European national and if a bilateral agreement is reached.

6. CONCLUSIONS AND TWO HYPOTHETICAL SITUATIONS

Library and database management professionals are faced with a wide range of IP issues regarding who owns what and how and by whom various media can be used. There is no need to obtain permission to use a work if it is in public domain or if a license or agreement allows the intended use. Nor is it necessary to obtain permission to use facts from a copyrighted source, because the Copyright Act does not protect facts. However, charts, graphs, or figures that use these facts may be copyrighted. It is extremely important to know who the owner of a copyrighted work is: the potential user needs to know whether it is a work for hire or a collective work. Also, it is important to carefully inspect the terms of any licensing agreement in order to determine what rights the licensee will have. In order to place these critical conclusions into perspective, Box 2 presents hypothetical examples of the various IP issues that emerge from library and database issues, and Box 3 offers examples from software development and use. ■

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1 *Feist Publications Inc. v. Rural Telephone Service Company Inc.* 499 U.S. 340 (1991)

2 See *Leigh v. Warner Bros., Inc.* 212 F.3d 1210,1215. [11th Cir. 2000]

3 This section is based on a text graciously supplied by Lita Nelsen, Director, M.I.T. Technology Licensing Office.

4 Further details on open-source licensing can be obtained from the Open Source Initiative at www.opensource.org.

5 www.uspto.gov/web/offices/tac/notices/examguide4-06.htm.

Box 1: Common Technical and Legal Terms Related to IP and Information

author. either the person who creates a copyrightable work or the employer of the person who creates a copyrightable work as a work for hire (see Section 2.7) (The word ***author*** in copyright law includes not only writers of novels, plays, and treatises, but also those who create computer programs, arrange data in telephone books, choreograph dances, take photographs, sculpt stone, paint murals, write songs, record sounds, and translate books from one language to another.)

book. a printed literary composition

collective work. a work, such as an issue of a periodical, anthology, or encyclopedia, in which a number of contributions, each a separate and independent work in itself, are assembled into a collective whole

compilation. as defined by Section 103 of the Copyright Act, "*a work formed by the collection and assembling of preexisting material or of data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship*"

copyright assignment. the giving away or selling, by the copyright owner, all rights to the copyright

copyright license. a license by which an owner retains ownership to a copyright but allows another person to use or sell the copyrighted material under defined conditions (for example, for a certain purpose, for a certain period of time, or inside a limited geographical area)

copyright. an intangible, incorporeal right granted by statute to the author (or originator, in the case of certain literary or artistic productions), whereby he or she is invested for a specified period of time with the sole and exclusive privilege of multiplying, publishing, and selling copies of the work

creative works. works in which the content does not change, whether the work is in printed, recorded, or electronic form (Materials such as books, sound recordings, downloadable songs, downloadable ring tones, videocassettes, DVDs, audio CDs and films, are usually ***single creative works***. Creative works that are serialized, that is, the mark identifies the entire work but the work is issued in sections or chapters, are also considered single creative works. A theatrical performance is also considered a single creative work, because the content of the play, musical, opera, or similar production does not significantly change from one performance to another.[5])

data. organized information often collected for a specific purpose and generally used as the basis for adjudication in case of litigation

database or data bank. a computer-readable compilation of data and/or information, arranged for ease of search and retrieval

design. the visual ornamental characteristics embodied in an article of manufacture

electronic copy. a computer-readable copy of data or information

facts. a statement or assertion of verified information about something that is the case or has happened (From a more legal perspective, a fact is an actual thing or happening [which must be proved at trial by presentation of evidence and which is evaluated by the finder of fact].)

Geographical Information System (GIS). a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information

image. a reproduction of the form of a person or object, especially a sculptured likeness (An image can be an original visual image or a copy of the original image; for example, it can be a digital image of a painting or a digital image made from a slide of the painting printed in a book.)

joint work. collaboration between two or more authors in which their contributions are joined into a single cohesive work.

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Box 1 (continued)

patent license. an agreement between licensor and licensee allowing the licensee to practice the invention with agreed provisions while the licensor retains the ownership of the patent

photograph. an image, especially a positive print, recorded by a camera and reproduced on a photosensitive surface

public domain. the realm in which there are no laws that restrict a work from use by the public at large

text. the body of a printed work, as distinct from headings and illustrative matter (on a page) or from front and back matter (in a book)

trade secret. any valuable business information that is not generally known and is subject to reasonable efforts to preserve confidentiality

transfer of copyright. the transfer of any or all of the copyright owner's exclusive rights or any subdivision of those rights (Transfers of copyrights are normally made by contract; usually by a license or an assignment.)

work. something that has been produced or accomplished through the effort, activity, or agency of a person

work for hire/work made for hire. a work prepared by an employee within the scope of his or her employment or a commissioned work that all parties agree in writing to treat as work for hire (The real person, partnership, or corporation for which the work is prepared is considered to be both the author and the owner of copyright from the moment the work is created.)

Box 2: Hypothetical Example: Library and Database Issues

Let us imagine that a librarian is in the process of assembling a work that recounts and reflects upon a research institution's 50-year history. In order to complete this project, the librarian will use various materials that may or may not carry IP restrictions:

(A) photographic images stored in the institution's archives for 20–50 years

Although the organization has had physical custody of these images for as long as 50 years, they are still protected by copyright.

(B) photographic images taken by staff members and donated to the library

If the photos were taken in the course of the employee's duties, they are the property of the institution. If taken outside of work, they may have been given to the institution with attached terms and conditions.

(C) photographic images of the institution taken by a commercial photographer

The commercial photographer may have issued a use license to the institution, thereby preventing further use of the images.

(D) articles written by staff members, some of whom are now retired

If the articles were written during the course of an employee's duties, they are owned by the institution. If they were written after the employee's retirement, the following questions should be asked: Did the employment or separation contracts assign copyright to one party or another? Is the information contained in the article based on knowledge that the author acquired while an employee?

(E) a foreword written by a retired director general, who has been awarded a Nobel Prize

The author owns copyright over the document and should sign a waiver or copyright assignment document so that the material can be legally used.

(F) reproduction of key research articles published by scientists in peer-reviewed journals

It is very likely that the peer-reviewed journals requested and were granted the copyright over the authors' material; the institution will therefore need permission from the owners of the journals to reproduce these articles. Such requests are almost always granted so long as there are no clear competition issues identified.

(G) a text written by professional media consultants on the history of the institution

The consultants should sign contracts indicating that all intellectual property developed during the term of the consultancy is property of the institution.

(H) data (generated by the institution's employees in cooperation with colleagues around the world) showing that the institution is still producing Nobel-Prize-quality data

Care must be taken that the disclosure of data does not infringe on the IP rights of the scientists or their institutions. The terms of the agreement with the external scientists (there had better be one!) may also limit the institution's data ownership and distribution rights.

(I) a special 50-year anniversary logo

The logo may be trademarked.

In many cases, the most important IP protection is common sense. If the probability of a dispute over IP infringement is extremely low, the institution might choose to judiciously cut corners.

The institution can, of course, seek protection for the final document, regardless of whether it is in print or electronic form. However, the IP protection of the final document must not infringe upon the IP ownership of its collective authors.

Box 3: Hypothetical Example: Software Issues

Now, let us consider another example: a GIS/RS project to create maps that will assist in cultivating new plant varieties, conducted by an employee of a research university. In order to develop the project, the principal researcher has to deal with various types of materials, each with its own IP restrictions.

(A) a soil map of country X (obtained from government X)

The U.S. government does not, of course, have copyright on the maps it produces; this may or may not be the case for the IP laws of country X. It will be necessary to draw up a material transfer agreement (MTA) that delineates the specialist's rights of use. The agreement might include a reach-through clause that gives the government of country X rights over new materials created through the project.

(B) a meteorological dataset (purchased from the Meteorological Office of country X)

The principal researcher should check to make sure that there is no specific language in the license that would prohibit commercial use of the dataset (a research-only license) or restrict its distribution.

(C) photographic images of the area of interest (from a commercial source)

As mentioned above, purchased materials almost always come with restrictions; see the previous paragraph.

(D) information on the agricultural performance of a certain plant variety (obtained from an international development organization)

Just because information comes from an international development organization does not mean that it is not protected. The organization may require potential users of this information to sign a material transfer agreement.

(E) a topographical map of country X (obtained informally from a collaborating scientist)

Informally shared information usually leads to IP conflicts. The employer of the collaborating scientist may have ownership rights to the map. If the employer is a U.S. university, it will probably protect its intellectual property and sell information only when it sees fit to do so. There is also a chance that the government of country X has rights to the map.

(F) a software program bought by the principal researcher, using university grant money

The software may have been licensed with an "educational use only" license

(G) data collected in the field by the principal researcher

Since the principal researcher is a university employee, the university may claim ownership over any data he or she collects.

(H) a data manipulation algorithm developed by the principal researcher during the course of his or her employment

As mentioned above, the university may claim ownership over the algorithm, since it was developed during the course of his or her duties as an employee of the university.