MANAGING RESEARCH WHEN OUTPUTS ARE OWNED

by

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INTRODUCTION

International centers have been slow in becoming actively involved in intellectual property issues. This perhaps reflects a certain reluctance to permit tawdry business affairs to interfere with work that we consider to be of social and scientific importance. Whatever our scruples, we now find it increasingly difficult to ignore such issues. Many of the organizations we collaborate with have elected to assert proprietary rights over-innovations, and ICRISAT has concluded that we must now develop appropriate policies regarding how we are to deal with the outside world in this regard.

Our paper suggests the following areas -for consideration:

(i) a center's perception of the importance of the current changes in the legal protection for innovations arid discoveries in the context of its external or outer environment;

(ii) the specific legal, organizational, and operational characteristics of a center, and

(iii) responses to those changes in the internal activities and external relations of a center, irrespective of whether the responses are only contemplated or already implemented. For convenience we use the term Intellectual Property Administration (IPA) for all administrative activities that affect the establishment., enforcement., and transfer of rights to intellectual goods for the achievement of an institute's goals.

Accordingly, our discussion here focuses on practical issues that must be dealt with. We avoid discussing the merits of suggestions for legislative changes, and instead focus on dealing with the legal environment that we are actually faced with today. We exclude discussion of the issue of *farmers' rights,* as they are understood by some. Such rights must not be confused with *farmers' exemption* as conceived, for example, in the Plant Variety Protection Act of the USA. The issue of farmers rights tends to be charged with intractable ethical overtones and it is not clear, at this time, such as who would be the holders of such rights, what powers they would grant, and how such rights could be enforced.

Furthermore, we avoid discussing the social desirability of intellectual property rights. The debate over this question most

likely began before 1474 when the Republic of Venice enacted a promise of exclusive rights to inventors. One of the foremost students of patents and patenting, the late Frits Machlup (1984, p.163) characterized the on-going controversy about patenting as *...one of the oldest themes in economic analysis.* Under the circumstances, it is unlikely that we could do more than reiterate some old arguments. The best we can do is to appreciate that the domain of intellectual property rights is extending and to adapt our own business to whatever laws and rights exist.

THE SIGNIFICANCE OF INTELLECTUAL OROPERTY RIGHTS FOR ECONOMIC ORGANIZATION

Perhaps the most serious error in administrative or managerial affairs is that of solving the wrong problem,. Before we jump to recommendations for IPA let us reflect for a few minutes on what the purposes of intellectual property rights might be in the present and future international agricultural research arena.

Property as exclusion

Exclusion is a fundamental principle underlying any economy with production for exchange rather than for immediate consumption. Further, the division of labor is the hallmark of an advanced economy. The division of labor is, however, not feasible without economic exchange. Exclusion is therefore a fundamental principle for an advanced economy.

Intellectual property rights are temporary or permanent exclusive rights to innovations, that is to things that have been produced with h substantial creative mental inputs. Without intellectual property rights the supplier of creative mental inputs might be unable to recover the costs of creative research if the relevant market was populated by imitating competitors. Without the prospect of returns to research, organizations that have to live from their own earnings are unlikely to invest in research. Furthermore, even if they invested in research, they could not offer research products for exchange.

Intellectual property rights have substitutes. Exclusion can also be achieved through secrecy, and a firm's superior marketing skills, first-mover advantages in producing the innovative product, and others may be sufficient to discourage competition from imitators. In contrast to most of its alternatives, intellectual property rights are enforced by the state, which reduces the costs of achieving exclusion that have to be borne by the excluder. The introduction or extension of intellectual property rights is therefore likely to lead to their more widespread use, but intellectual property rights will not be the only means for achieving exclusion as long as the holders of the rights have to bear a considerable share of the enforcement costs.

Bundles of rights

Intellectual property rights, like most property rights, are bundles of basic rights. The owner of the bundle may, or may not, choose to exercise or alienate any or all of the basic rights in the bundle. For example, a patent gives the patent holder the basic rights:

- to exclude others from practicing the invention;
- to practice the invention;
- to licence others to practice the invention;
- to licence the rights to exclude others, and
- to receive royalties from licenses,

The ability to unbundle an intellectual property right provides its owner with considerable flexibility for tailoring the rights held and alienated to serve its business purposes.

Intellectual property rights and competition

Conventional theories of intellectual property rights emphasize the aspects of reward for invention, incentives for research investment, incentives for commercialization of inventions, and exchange of temporary monopoly power for the obligation to publish. Recent theories perceive intellectual property rights as an addition to an organization's arsenal of competitive instruments-For example, von Hippel (1988) stresses the importance of patent, which tend to earn little royalty income in most industries as a defense against patent infringement suits (p. 53):

> *Firm A's corporate patent department will wait to be notified by attorneys from firm B that it Is suspected that A's activities are infringing B's patents. Because possibly germane patents and their associated claims are so numerous, it is in practice usually impossible for firm A - or firm B - to evaluate firm B's claims on their merits. Firm A therefore responds - and this is the true defensive value of patents in the industry - by sending firm B copies "of a pound or two" of its possible germane patents with the suggestions that, although it is quite sure it is not infringing B, its examination shows that B is in fact probably infringing A. The usual result is cross-licensing, with a modest fee possibly being paid by one side or the other. Who pays, it is important to note, is determined at least as much by the contenders' relative willingness to pay to avoid the expense and bother of a court fight as it is by the merits of the particular case.*

Recently, "The Economist" in one of its leaders, noted that the patent systems, in spite of its popularity in industry, may be breaking down as companies in fast moving industries don't wait for a patent to be issued but move into markets as soon as possible. In the same article, copyrights and plain, continuous

innovation were suggested as the new substitutes for patents in fast moving industries.

Hence, in our assessment of the IPR issue it is not sufficient to consider the incentive effect on research within an industry of a particular type of IPR alone. We must also keep an eye on:

- the likely rate of progress in the research industry;
- the availability of alternative means for obtaining competitive advantage, and
- the availability of alternative forms of IPRs.

PRINCIPALS AND CONSIDERATIONS FOR SHAPING INTELLECTUAL PROPERTY ADMINISTRATION AT ICRISAT

Legal status and organizational form of ICRISAT

Legal status

ICRISAT's legal status is defined in its Constitution as that of an autonomous, international, philanthropic, non-profit, research, educational, development and training institute with headquarters at Hyderabad, India and with full juridical personality.

Important powers of ICRISAT are defined in Article III(1) of the Constitutions

To receive, acquire or otherwise obtain from any governmental authority, national or local, foreign or domestic, or from any corporation, company, association, person, firm, foundation, or other entity, such charters, franchises, licenses, rights, privileges, consequenses and assistance, financial or otherwise as are conducive to and necessary for the attainment of the purpose of the Institute.

Section 6 of the Article gives ICRISAT wide-ranging, unspecific powers

To do and perform all acts and things as are in the opinion of the Institute necessary, expedient, suitable or proper for the furtherance, accomplishment or attainment of any and/or all of the purposes and activities herein stated, or which shall appear, at any time, as conducive to and useful for the purposes and the activities of the Institute.

b) Organizational form

ICRISAT is a donative non-profit organization. Donors fund ICRISAT's activities not for their own direct benefit but for the benefit of third parties, i.e. the farmers and consumers in ICRISAT's client countries. The non-profit characteristic obtains from a strong version of a non-distribution constraint imposed by the CGIAR on the centers. Usually, a non-distribution constraints only prevents management to distribute earnings amongst its staff but does not prevent the organization from retaining earnings. In the strong -form implemented in the CGIAR, the non-distribution constraint also prohibits the centers from retaining earnings from other than financial transactions.

The strong non-distribution constraint eliminates the incentives for ICRISAT to generate income through the sale or licensing of research products.

Principles constraining Intellectual property administration

The purpose of ICRISAT, as of other CGIAR centers, is to add to research capacity in the areas of the mandate, to stimulate research, and to provide a vehicle for exploiting international spill-overs from research. ICRISAT discharges its obligations through fostering, facilitating, and conducting applied, strategic, and some basic research within its mandate. The end products of such research are knowledge, technologies, and products useful to public agencies and private businesses in the agricultural sectors of high- and low-income countries.

a) Mandate

Two sections of ICRISAT's mandate are of importance in relation to intellectual property rights. The first of the four statements in the mandate requires ICRISAT to:

> *Serve as* a *world center for the improvement of grain yield and quality of sorghum, millet, chickpea, pigeon pea, and groundnut and to act* as a *world repository for the genetic resources of these crops.*

This statement is justification for our concern with the development of intellectual property rights for plants world-wide and not just in our low-income client countries.

The fourth mandate statement obliges ICRISAT to:

> *Assist in the development and transfer of technology to the farmer through cooperation with national and regional research programs.*

The term *national programs* in this statement tended to be interpreted as *government research organizations.* More recently, however, a wider interpretation is favored that includes also private firms conducting research, as long as the private firms are registered in one of ICRISAT's client countries

b) Doctrines

ICRISAT's conduct and activities are guided and constrained by six doctrines that are in part derived from TAC's priorities and in part self-imposed:

(i)Activities must be research or research related;

(ii)activities must be international in character;

(iii)eligible research agencies from client countries have free access to ICRISAT's research results and products;

(iv)ICRISAT respects the research interests of client countries, accepts national governments' interpretation of these interests, and operates within the organizational framework of national agricultural research systems, and

(v)ICRISAT strives for excellence and problem-orientation in its own research;

(vi)ICRISAT's activities should result in benefits to small farmers in client countries.

Of these, the free access doctrine and the doctrine of compliance with national interests could conflict with IPRs.

c) Modus operandi

Within the domain delimited by its mandate and its doctrines, ICRISAT fosters research conducted by national research programs in low-income countries and to a lesser extent in high-income countries through:

(i) collaboration in research projects of national agricultural research systems;

(ii) training of national research staff;

(iii) provision of germplasm;

(iv) development of research techniques and methods;

(v) organizing workshops and conferences;

(vi) publication of research reports and research newsletters, and

(vii) operating research networks.

ICRISAT serves as a research middle man between research

institutions in high- and low-income countries. In this role, ICRISAT facilitates the transfer of research that is embodied in seeds of new cultivars, publications, techniques and methods, collections of experiment and survey data, and computer programs for processing and analyzing data. ICRISAT provides these services free of charge for the research embodied in the products or for the middle man services. The free exchange between the research industries was possible because most or all the research products were provided by public research organizations in both the high- and low-income countries and markets for research products are underdeveloped in low-income countries.

ICRISAT has established procedures for the distribution of seed and publications. Access to techniques and methods, to data and software programs is, however, largely unregulated and is best obtained through personal contact with the scientists who produce the outputs and maintain control over them.

Intellectual property rights and ICRISAT's external relations in the agricultural research industry

An appreciation of the consequences of IPRs should consider how changes in the geographical domain and powers of IPRs affect the intercourse of ICRISAT with other players in the industry in four arenas:

(i) acquisition of intellectual inputs to research;

(ii) research cooperation;

(iii) exchange of intermediate research products, and

(iv) transfer of research results.

a) The players in the industry

The segment of the international agricultural research industry in which ICRISAT operates used to be dominated by national-public and international-nonprofit research organizations and private companies were of only local importance. The population is changing.

Biotechnology drew transnational agrochemical concerns into the plant breeding camp. These concerns combine substantial in-house research capabilities, access to university research, and equity interests in genetic engineering ventures firms with seed production and marketing capacities of acquired seed companies. In contrast to the research by earlier agroindustries, which focused on invention and adaptive research, research by new biogenetic research companies includes applied and strategic research. Basic research is, however, largely unattractive to the industry and is done by universities.

The public sector will remain the major producer and distributor of certified seed in most low-income countries and will continue to dominate biogenetic research. But, private plant breeding companies are emerging in low-income countries, such as India, Thailand, and Mexico with or without assistance from private foreign partners. There also appears to be increasing interest by transnational seed companies to establish subsidiaries in low-income countries such as India.

Current trends suggest a partial erosion of public agricultural research capacity in the UK and the USA, a substantially .increased in interest of public research organizations in collecting research revenues to replenish squeezed research budgets.

Finally, ICRISAT has repeatedly been encouraged by TAC and donors to withdraw from applied research and the breeding of finished cultivars wherever national research capacity is sufficient to assume these tasks.

b. Aquisition of intellectual inputs to research

ICRISAT, like other IARCs, used to draw heavily on public research in high-income countries, mainly in the United States and the United Kingdom, but acquired very few research inputs from private research organizations. IPRs are likely to have both beneficial and detrimental impacts on the transfer of research inputs from one research organization to the other. Access is enhanced where an inventor can confidently share research products with others without worrying that its investment will be misappropriated. Accordingly, increased international enforceability of IPRs should improve access. Access to the outputs from public research in high-income countries by national-public organizations from low-income countries or nonprofit international organizations will not necessarily be reduced, but it will become more formal and require more burdensome administration. Exchanges of research materials between scientists will be delayed as institutional administrators negotiate material transfer agreements.

Access to research outputs may be significantly reduced if organizations overuse exclusive licensing as a means of technology transfer. There are legitimate reasons for granting exclusive licences: inventions which require substantial developmental costs may otherwise never reach society. Or, when a nonexclusive license is held by a dominant firm in a market, its competitors are unlikely to attempt to compete. Without the spur of competition, however, the dominant firm has reduced incentive to rush a product to market; accordingly, transfer of the innovation may be delayed. Careful use of exclusive licensing can avoid such delay. Incorporation of due diligence provisions and march-in rights can offer it the protection needed to withstand otherwise unbearable pressure from a dominant firm. (National Science Foundation 1981).

Even researchers in private industry exchange material and results, although they may not be encouraged to do so (von Hippel 1988). The impact of IPRs on research exchange, in contrast to market exchange, depends on the type of right and the conditions under which it is granted.

Plant breeders' rights of the UPOV or PVP kind provide for a breeders' exemption which permits breeders to use protected material for experimental purposes. Patent laws of most countries include an experimental use exemption. U.S. courts have held that its patent law includes an implied exemption for non-commercial experimental use.

What is not at all clear to us at this time, is whether innovations protected by different laws, e.g. a variety protected under UPOV-type breeders' rights that contains a gene protected by a patent, would be available for experimentation. Nevertheless, it would appear that the extension of IPRs would not seriously impede the exchange of research materials and information between ICRISAT and other research organizations and ICRISAT would be unlikely to suffer more from impediments to free exchange than other public and nonprofit players in the industry.

c) Publication of Research Results

Patents are certainly not intended to have a detrimental impact on publication; the exclusive right is granted only after public description of the invention. Patenting, may, however, result in publication delays to permit filing of patent applications. The effect on the time of publication depends on the rule used for deciding conflicting patent application. Under the rule "first to file", the rule adopted by most countries outside the U.S.A., publication before patent filing prevents patenting, and publication delays can be expected,.

d) Research cooperation

In order to play its role as a middle man between the agricultural research industries in high- and low-income countries effectively, ICRISAT will have to continue to cooperate with the increasingly commercially minded public research institutions in high-income countries and it will have to extend its cooperation with private research organizations in high- and low-income countries. Cooperation may involve various arrangements:

- research harmonized under the umbrella of research networks;
- collaborative research projects and programs;
- seconding of personnel, e.g. sabbatical leave, and
- research contracted in or out.

With the exception of harmonized research, all cooperative a r ran elements are likely to be affected by IPR's.

In collaborative research projects the question of who will own the rights to inventions generated in the cooperation will arise. We are currently dealing with a problem of this nature. In this instance, ICRISAT virologists found a virus that might hold promise as a vector for gene transfer, we lacked the in-house facilities required for testing this hypothesis and asked a collaborator in the U.S. to do the research. After some positive preliminary experiments the collaborator informed us that continuation of the research would require our consent to patenting – with title to any resulting inventions vesting in the collaborating universit*y*.

Most of our scientific staff spend their study leaves at universities in the U.S., the U.K., or in Australia, we do not know what the patenting policies of universities in the U.K. and Australia are, but U.S. universities are quick to assert institutiona l rights to inventions. For administrative convenience, universities often require all faculty and professional research staff to disclose and assign rights to any inventions as a condition of employment, whether or not the individual works on sponsored projects requiring such disposition of intellectual property. In publicly funded state universities, such agreements are often required of all employees by state statute. Some universities subject visiting scientists to the same policies governing their own personnel on the theory that the visiting researcher has benefited from the access to laboratory/computer/library/office facilities provided, as well as to prevent the visitor or his institution from asserting intellectual property rights which may be in conflict with the university's policies or its contractual or statutory obligations.

In some instances the university's motivation is based on a desire to control the commercialization of the invention for the benefit of society. In such cases, it is likely that there will be sufficient commonality of interest to insure that a mutually acceptable disposition of intellectual property can be negotiated. Unfortunately, a quick review of the policies of a small but indicative sample of U.S. universities confirmed what others had observed before us (e.g. Korn 1987; Cyert 1985), *Motivated by the dream that someday a patent* will *enrich the university beyond its wildest expectations...* (Cyert 1985, p.7), many universities in the U.S. tend to have strict patenting policies which require staff to disclose protectable discoveries primarily so that the university can collect licensing royalties.

We would find it disturbing if an institution hosting one of our staff should seek financial gain based on years of ICRISAT research, or if it pursued a licensing strategy contrary to the interests of farmers or consumers in our mandate area.

Specially funded projects, cooperative research agreements,

and ICRISAT's hiring of specialized laboratory or consulting services will raise a stream of intellectual property issues which must be resolved. The resolution of these issues, and negotiation of complex contractual terms require the assistance of trained professional staff to assure compliance with organizational policies and priorities.

e) Production and transfer of research products

One justification for IPRs is that they are a prerequisite for attracting private investment capital into research. This view was corroborated by the boost the soybean industry received after the introduction of PVP in the U.S. in 1970 (Butler and Marion 1983; Perrin et al. 1983). If India were to enact plant protection rights, we would expect more genetic material from international breeding concerns to flow into India, and we would get more competition in applied crop improvement research. Some of the new competitors would be national firms, others would be joint ventures with large foreign seed concerns. The introduction of plant breeders' rights would not affect our attitude toward the private seed industry, which has free access to breeding material, including parent lines for hybrids. We would hope, however, that IPRs would eventually allow us to trace and document the use of our material better than we are now able to do.

ELEMENTS OF AN INTELLECTUAL PROPERTY ADMINISTRATION STRATEGY

Research at ICRISAT generates several kinds of products with potential commercial value, not all of them protectable under any intellectual property law:

(1) Farming systems, that allow for sustain able increases in crop production are nowhere subject to IPRs;

(2) technologies, particularly in the field of biotechnology, that can be used in crop improvement and which could be protected by patent;

(3) breeding lines for use in crop improvement;

(4) breeders seed of open pollinated cultivars, and of parents and maintainer lines used in hybrid seed production, pro-

(5) modified computer software that could be protected under copyright law.

These products have so far been provided by ICRISAT to public research institutes and private businesses free of charge for their research components, we have little incentive to charge clients for our research products. However, because IPR's comprise several basic rights that can be unbundled, our lack of interest in earning income does not necessarily translate into a lack of interest in obtaining proprietary rights to our innovations and

discoveries. In some situations, control over the disposition of rights to an invention could be exercised for the benefit of farmers and consumers in our mandate area. Also, we would want to prevent others from unfairly claiming ownership rights in innovations produced by ICRISAT. Claiming and holding title may be less costly than challenging the claims made by others. Furthermore, as observed earlier, IPRs can sometimes be useful weapons in defending against infringement suits brought be others.

The question therefore is not whether ICRISAT should acquire IPRs wherever and whenever possible, but now to manage IPRs effectively in pursuit of our organizational mission.

Management of expectations

Perhaps the most fundamental aspect of management is the management of expectations. Some casual reading of the literature suggests that there is little difference between chasing rabbits and patents. Derek Bok, erstwhile President of Harvard University, is reported to have said: "...no sensible faculty member, anxious to maintain a high academic reputation, is likely to spend too much time chasing patents. It takes 1000 disclosures to yield 100 patents. It takes 100 patents to yield ten licenses. It takes ten licenses to yield one that earns over, say $50,000 a year." (Bok and Kennedy 1981, quoted in Korn 1987). The most financially successful U.S. university licensing program (Stanford University) brings in annual royalties of approximately one percent of the university's total budget. Remembering that we are, for the most part, dealing with semisubstance crops, it would seem that no large royalty earnings would have to be sent to the CGIAR.

Elements of an Institutional Patent Policy

An institution seeking to establish or clarify its position regarding rights to and disposition of patentable should develop a statement of patent policy. The statement should be broad enough to encompass all foreseeable patent situations, yet specific enough to allow administration of the policy without frequent recourse to policy deliberations by an advisory committee. At the same time, it is not possible to foresee all possible situations, nor to predict changes in the national and international legal environment. Accordingly, an adaptive strategy which allows learning is required.

The basis policies of ICRISAT should transcend ICRISAT's IPR strategy. The doctrine of free access to ICRISAT's research results and products for eligible research agencies from client countries could be threatened if ICRISAT would hold an IPR jointly with a partner who insists on royalty bearing licenses or favors exclusive licensing as a means of maximizing royalty revenues.

The following could serve as an institutional policy statement for ICRISAT:

1. ICRISAT will assert proprietary rights over innovations only when such protection is the most effective moans to transfer the technology or to prevent misappropriation of the rights by others.

2. ICRISAT will require its staff to disclose discoveries and inventions, and will not permit staff to assert proprietary rights over intellectual property without ICRISAT approval.

3. ICRISAT will normally issue nonexclusive licenses on a nondiscriminatory basis, Exclusive licensing will only be used where it is determined to be necessary in order to effectively transfer the technology, and will, in those cases, include terms and conditions that require diligent use of the innovation, and such other terms that may be necessary, to assist and protect farmers and consumers in client countries. March-in rights will be reserved to assure compliance with the terms of the license.

4. ICRISAT respects the right of its collaborators to patent products and processes resulting from collaborative research, where such action is not adverse to the pursuit of our mission. ICRISAT will, however, not contribute to the cost of obtaining patents and plant variety rights on behalf of collaborators.

5. Unless national government regulations rule otherwise, tangible research properties, such as germplasm, will be provided to private companies for research purposes under the same terms and conditions as to public research institutions.

6. ICRISAT will not intermediate in the acquisition of PVP or patent licenses by individual clients in low-income countries from private or public research institutions in high-income countries. ICRISAT may, however, assume such a role when private or public research institutions from several client countries seek licenses for the same product or process.

7. In order to promote the widest possible dissemination of information, ICRISAT will not normally assert copyright to its publications or software. It will honor the rights of others.

Plant variety rights

Plant breeders' rights are not an important concern for us at this time. Only two of ICRISAT's client countries, Argentina and Zimbabwe, have adopted plant variety protection and India is

still considering its introduction. We have little business with Argentina and the law in Zimbabwe has not resulted in issues being raised for us. PVP protection of varieties of our mandate crops is rare in the U.S.: of a total of 2023 PVP certificates issued until June 1988, only 14 were for groundnut, two for sorghum, and none for millet, pigeonpea, and chickpea (ASGROW 1989).

Matters would be different should India choose to adapt plant variety protection. One major concern then would be to prevent leakage of protectable material from our premises, into the hands of a commercial breeder. The other concern would be to prevent breeders employed by ICRISAT from founding their own seed business based on protectable material misappropriated from ICRISAT. Leakage would be difficult to check given the large numbers of ICRISAT's visitors. Unethical spinoffs could be discouraged by adopting appropriate employment contracts, by requiring breeders to report to management any progress that led to protectable material, and close monitoring of breeding progress.

The nuts and bolts of acquiring protection for varieties could be managed by extending the brief of the plant release committee.

Patents

ICRISAT has been unconcerned with patenting historically, and no effort has yet been made to identify among ICRISAT's client countries those that have enacted patent legislation, we would not expect to find many as most of ICRISAT's client countries are among the poorest countries, and these tend to have no mechanisms to encourage indigenous invention of any kind. Patenting will therefore be of concern primarily in the management of research in connection with our dealings with organizations in high-income countries.

In order to administer issues surrounding intellectual property, it will be necessary to create new institutional structures. We envision a system incorporating the following elements:

- mandatory centralized reporting of discoveries and inventions, whether patentable or not;
- an IPA committee attached to the Office of the Deputy Director General (Research); the brief of the committee would include reviewing reports of discoveries and inventions, determining the need for any assertion of proprietary rights, initiating evaluations of innovations by a specialised patent management agency, and oversight over license management.
- allocation of responsibility for negotiations concerned with IPR matters and licenses to suitable senior administrative staff.

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