

Seed Sovereignty

The Promise of Open Source Biology

Jack Kloppenburg

The seed has become the site and symbol of freedom in an age of manipulation and monopoly of its diversity. It plays the role of Gandhi's spinning wheel in this period of recolonization through free trade. The *charkha* (spinning wheel) became an important symbol of freedom because it was small; it could come alive as a sign of resistance and creativity in the smallest of huts and poorest of families. —Vandana Shiva (1997: 126)

From the wheat plains of Saskatchewan to the soy fields of Brazil's Mato Grosso, from the millet plots of Mali's Nyéléni to the rice paddies of the Philippines' Pampangan, the seed has become a prominent symbol of the struggle against the neoliberal project of restructuring the social and natural worlds around the narrow logic of the market. More than a symbol, however, the seed is also the very object and substance of that contest. As both a foodstuff and means of production, the seed sits at a critical nexus where contemporary battles over the technical, social and environmental conditions of production and consumption converge and are made manifest. Who controls the seed gains a substantial measure of control over the shape of the entire food system.

It therefore follows that if true food sovereignty is to be achieved, control over genetic resources must be wrested from the corporations and governments that seek to monopolize them and be restored to, and permanently vested in, social groups and/or institutions with the mandate to sustain them and to facilitate their equitable use. La Vía Campesina has recognized this necessity, identifying "seeds as the fourth resource ... after land, water and air" (La Vía Campesina 2001: 48) and declaring that "sustainability is completely impossible if the right of the peoples to recover, defend, reproduce, exchange, improve and grow their own seed is not recognized. Seeds must be the heritage of the peoples to the service of human kind" (La Vía Campesina 2009). That is, full realization of food sovereignty must be predicated on the attainment of what we may term "seed sovereignty."

How, then, can seed sovereignty be achieved in the current global, political-economic conjuncture? Those who believe that "another world is possible" face the two strategic tasks implied by Vandana Shiva in the quote above: the deployment of resistance against the project of neoliberalism and the creation of viable

alternatives. On the one hand, a new set of global actors is beginning to resist the concentration of corporate power in the life sciences industry, the extension of intellectual property rights (IPRs), the privatization of public science, the spread of genetically modified crops, the development of "Terminator" technologies and the proliferation of bioprospecting/biopiracy. On the other hand, these global actors are also beginning to create spaces for the introduction and elaboration of alternatives such as farmers' rights, participatory plant breeding, a revitalized public science, the development of agroecology and support for decentralized and community-based seed distribution and marketing.

It is my contention that while resistance has often been effective, there is much more to be done in the realm of creating alternative spaces. This is especially important because the mechanisms that have been developed to address the inequities of such practices as bioprospecting have actually functioned to integrate farmers and indigenous peoples more closely into the existing market rather than to construct new and positive spaces for alternative action. Specifically, inasmuch as they have accepted the principle of exclusion — rather than sharing — as their constitutive basis, such arrangements have all proved inadequate even at defending, much less at reasserting or enlarging, peasant or community seed sovereignty. This chapter explores open source biology as a mechanism for simultaneously pursuing both effective resistance and the creation of a protected space into which practices and institutions with truly transformative capacity can be introduced and elaborated.

The Erosion of Farmers' Seed Sovereignty: The Privatization of Biodiversity

Until the 1930s, farmers worldwide enjoyed nearly complete sovereignty over their seeds, that is, they decided what seeds to plant, what seeds to save and who else might receive or be allocated their seed as either food or planting material. Such decisions were made within the overarching norms established by the cultures and communities of which they were members. While these customary arrangements often recognized some degrees of exclusivity in access to genetic resources, they were largely open systems that operated on the bases of reciprocity and gift exchange rather than the market. Indeed, these customary arrangements usually functioned to stimulate and facilitate — rather than restrict — the wide dissemination of seed (Zimmerer 1996; Brush 2004; Salazar et al. 2007). The sharing of seed resulted in the continuous recombination of genetic material, which in turn produced the agronomic resilience that is characteristic of peasant- and farmer-developed crop varieties and landraces. This historic creation and recreation of crop diversity not only fed particular communities and peoples but also collectively constitutes the genetic foundation on which future world food production can most sustainably and equitably be based.

Since the 1930s, farmers' sovereignty over seeds has been continuously and

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progressively eroded while the sovereignty of what is now a “life sciences industry” has been correspondingly enlarged. The development of inbreeding/hybridization in the 1930s first separated the farmer from the effective reproduction of planting material and created the opening needed for private capital to profit in the seed sector. Seed companies then used their increasing influence to obtain “plant breeders’ rights”: legislation that conferred exclusive control to them over varieties in crops in which hybridization was not possible (Kloppenborg 2004).

Subsequently, the seed industry has pursued both of these routes — technical and social — to further restrict farmers’ access to seed to the confines of an increasingly narrow set of market mechanisms. The structures of science have been used to develop “Terminator” and “Transcontainer” technologies, which genetically sterilize seed in order to prevent plant-back by farmers. Both national and international structures of governance — that is, institutions such as the World Trade Organization and the Convention on Biodiversity, as well as national legislatures — have been used for the global elaboration of a set of intellectual property rights based on the principle of *exclusion*. By making saving of patented seed illegal, these arrangements are effectively an enclosure of farmers’ practices as well as their seed.

These technical and social processes of commodification are enabled in important ways by two key features of the organization of knowledge production and accumulation in the plant sciences. First, the development of agronomically useful and novel (and therefore patentable) plant varieties has been predicated on access by breeders to the enormous pool of biodiversity that has been produced and reproduced by farmers and indigenous peoples. Systematic appropriation of landraces from farming communities by university and government scientists, their storage in genebanks controlled by governments, corporations and non-governmental organizations and their subsequent use in breeding programs is a long standing practice. This bioprospecting has increasingly been understood as “biopiracy” insofar as no or insufficient benefits flow reciprocally to the communities and peoples who freely shared the collected materials as the “common heritage of humankind” (Mgbeoji 2006; Mushita and Thompson 2007).

Second, the supplanting of classical crop breeding by transgenic methods, the progressive weakening of public research institutions such as universities, government and international facilities and the subordination of their work to corporate objectives has resulted in an overwhelming focus on the development of genetically modified varieties (Knight 2003; Gepts 2004). After twenty years and billions of dollars of expenditures, GMO cultivars incorporate only two traits (one being herbicide resistance) in only four crops (maize, soy, cotton and canola). The subsequent failure of public science to provide an alternative to this narrow range of patented, corporate seeds has permitted the global dissemination of crop varieties that do not meet the needs of most farmers, that often cannot be legally saved, that reinforce the expansion of unsustainable monocultures and that contaminate other varieties with proprietary transgenes (Quist and Chapela 2001; Rosset 2006).

Seed sovereignty has been gradually transferred from farmers and their communities to the boardrooms of the five transnational firms known as the “Gene Giants” for their domination of the U.S. \$20 billion annual global market for seeds. Once freely exchanged according to an ethic of sharing, access to seeds is now ruled by a set of legal mandates based on the principle of exclusion. Once bred by farmers to meet local needs, seeds are now genetically engineered by corporate scientists to the specifications of a globally distributed industrial agriculture geared not to feeding people but to feeding the corporate bottom line.

Resisting Exclusion, Creating Alternatives?

An encouraging feature of the past decade has been the emergence of a robust, globally distributed resistance to the ways in which capital has chosen to shape global agricultural markets, develop biotechnology and construct IPRs (Schurman and Kelso 2003). Widespread popular aversion to patents on life forms and to such pernicious applications as Terminator technology has been joined to concerns in the scientific community about growing limits on their own freedom to operate amongst the proliferating corporate patent thickets. Peasants, farmers, indigenous peoples and civil-society advocacy groups have been working as part of a diffuse but powerful social movement that has had success at slowing — though certainly not stopping — what has come to be broadly understood as the project of corporate globalization in agriculture. With the emerging crises in environment, energy and food production, we can anticipate growing resistance and the opening of space for the pursuit of “another world.”

Resistance activities have shown increasing numbers of people that another world is necessary; it is also critical to show them that another world is actually possible. It is this creative arena that needs to be strengthened. To date, three principal approaches to the protection of genetic resources have been pursued by farmers, indigenous peoples and advocacy groups. These are the establishment of farmers’ rights at the international level, attempts to embed traditional resource rights in national-level IPR legislation and the promulgation of a wide range of bilateral agreements between bioprospectors and target communities themselves.

Much of the affirmative action that has been pursued on genetic resources over the last twenty-five years has been undertaken under the rubric of the construct called farmers’ rights. Written into the 1989 agreed interpretation of the FAO International Undertaking on Plant Genetic Resources, farmers’ rights were to have balanced patent-like plant breeders’ rights by conferring on farmers and indigenous peoples a moral and material recognition of the utility and value of the labour they have expended, and continue to expend, in the development and regeneration of crop genetic diversity. Alas, farmers’ rights as they have appeared in international fora have been little more than a rhetorical sleight of hand, a means of diverting activist energies into prolonged discussions with the corporate/bureaucratic masters of passive-aggressive negotiation. For example, the final result

of twelve years of talks in the FAO was, in 2001, approval of an International Treaty on Plant Genetic Resources for Food and Agriculture (FAO 2001). The treaty acknowledges the rights of farmers to “save, use, exchange, and sell farm saved seed,” but renders this a privilege “subject to national legislation,” which is to say those rights are subordinated to — and thus negated by — conventional IPR rules such as patenting.

A second line of action has involved efforts to exploit an opening in the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Article 27.3(b) of TRIPS requires WTO member nations to offer some form of intellectual property rights in plants through patenting, plant breeders' rights or an effective *sui generis* system. In theory this option provides nation states with an opportunity to shape legislation to protect the interests and needs of farmers and indigenous peoples. In practice, many nations — often under pressure from the U.S. and other advanced capitalist nations — simply adopt a conventional plant breeders' rights framework that provides patent-like protection for plant breeders but fails to provide symmetrical rights for farmer-developed cultivars. Genetic Resources Action International (GRAIN 2003) has documented over twenty-five instances of such legislative action in countries of the Global South.

With international and national-level institutions insufficiently attentive to their needs and rights, communities of peasants, farmers and indigenous peoples have in many cases turned to a third mechanism — direct bilateral arrangements — in an effort to establish rights over crop biodiversity, manage bioprospecting and derive a flow of benefit from genetic materials. These have ranged from detailed and highly legalistic models typical of western patent law to frameworks that are more like a treaty than a contract (Posey and Dutfield 1996; Marin 2002). The evidence produced by a number of assessments of these arrangements shows that not only have they failed to deliver any significant benefits, they have also frequently caused considerable social disruption and too often actually actively damaged the contracting communities (Brown 2003).

Hayden (2003: 233) describes the “noisy demise” of the “debacle” of bioprospecting among the Maya of Chiapas, and Greene (2004: 104) documents the “rather extraordinary mess” that resulted from the dissolution of a similar project among the Aguaruna of Peru. Both projects floundered and ultimately failed due to the inability of the ethnobiologists doing the collecting to establish consent and compensation arrangements that were broadly acceptable to the indigenous communities involved. Among the Aguaruna, the pivotal issue had to do with the inadequacy of the contracted royalty rates, while among the Maya the central issue was the management and control of the NGO that was created to distribute possible royalties. In both cases, the multiple ethical, representational and financial dilemmas raised by these and other bioprospecting projects remain unresolved and perhaps unresolvable.

It should not be surprising that these three modalities discussed above have

failed at ensuring peasants, farmers and indigenous peoples' equitable rights to genetic resources. The existing IPR regime is a juridical construct shaped to serve corporate interests. Moreover, the collective character of the production of crop genetic resources and their wide distribution and exchange almost always makes appropriate allocation of “invention” to a person, persons, a community, communities or even a people or peoples an impracticable — and often divisive — task (Kloppenborg and Balick 1995; Brush 2004). Even if some legitimate partner can be identified, it is difficult to see how peasants and indigenous peoples can provide informed consent to bioprospecting activities and construct exchange agreements adequately sensitive to their own interests. Further, the indeterminacy of the value of any material at the point of collection, the difficulty of distinguishing the magnitude of value added in subsequent breeding and marketing and the imbalance of power between donor and collector render the flow of any material benefit via instruments such as access fees, licensing fees and royalties uncertain at best.

Beyond these practical difficulties, there is a larger issue. The nature of property is called into question when some farmers and indigenous peoples reject the very notion of owning seeds or plants, which they may regard as sacred or as a collective heritage (Hurtado 1999; Salazar et al. 2007). IPRs are actually a means of circumventing and obscuring the reality of *social* production and subsuming the products of social production under private ownership for the purposes of *excluding* others from use. How can they be anything but antagonistic towards social relations founded on cooperative, collective, multigenerational forms of knowledge production?

If food sovereignty is going to be possible, might its development not be facilitated more by the expansion of opportunities for humans to enact the principle of sharing than by the extension of the reach of the principle of exclusion? An alternative route to establishment of a just regime for managing flows of crop germplasm might involve creation of a mechanism for germplasm exchange that allows sharing among those who will reciprocally share, but excludes those who will not: a protected commons.

I suggest that “open source biology” offers the means to establish and elaborate such a protected commons for crop genetic resources. While it is no panacea, it represents a plausible mechanism for engaging in both resistance and creativity and for moving in concrete ways towards realization of seed sovereignty.

Open Source Movements: From Software to Wetware

Though to them it may seem so, farmers, peasants and indigenous peoples are not the only targets of what McMichael (1996: 31) calls “the globalization project” and what Hardt and Negri (2000) name as “Empire.” But peasants, farmers and indigenous peoples may find resources for their own struggles in the parallel experiences of others. And so it is with seeds and software.

Nowhere have the issues of commodification, ownership and exclusion of use

been played out more clearly than in the field of software development. Advances in hard and soft digital technologies have galvanized the rapid emergence of productive sectors of enormous power and value. Although creative capacity in software development is globally distributed among individuals, universities and variously sized firms, a few companies have attained a dominant market position from which they have used copyright and patent arrangements to reinforce their own hegemony by restricting the use of their proprietary software, especially of operating system code. Frustrated by these expanding constraints on their ability to add to, and to modify and to share as freely as seemed personally and socially desirable, software developers have sought ways to create space in which they can develop content and code that can be liberally exchanged and built upon by others.

The resultant emergence of a dynamic “free and open source software” (FOSS) movement has been widely documented and analyzed (Raymond 1999; Stallman 2002; Weber 2004). The FOSS movement is quite diverse, encompassing a considerable range of organizations and methods (e.g., Creative Commons, FOSSBazaar, Free Software Foundation, Open Source Initiative). What unifies these initiatives is a commitment to allowing software users to access and modify code and, critically, to implementing an enforceable legal framework that preserves access to the original source code and to any subsequent modifications and derivatives.

Software released under open source arrangements is copyrighted and made freely available through a licence that permits modification and distribution as long as the modified software is distributed under the same licence through which the source code was originally obtained. That is, source code and any modifications must be freely accessible to others (hence “open source”) as long as they in turn agree to the provisions of the open source licence. Note that the “viral” effect of such “copyleft” arrangements enforces continued sharing as the program is disseminated. Just as importantly, this form of licensing also prevents appropriation by companies that would make modifications for proprietary purposes since any software building on the licensed code is required to be openly accessible. Thus, software developed under open source arrangements is released not into an open access commons but into a protected commons populated by those who agree to share.

The FOSS movement has enjoyed considerable success. Thousands of open source programs are now available, the best known among them being the operating system Linux. The originator of this program is Linus Torvalds, whose express objective was to develop a functional computer operating system as an alternative to those offered by Microsoft and Apple. Realizing that he could not undertake so large a task on his own, he released the “kernel” code of the program under an open source licence and asked the global community of programmers to contribute their time and expertise to its elaboration, improvement and modification. He subsequently involved thousands of colleagues in an ongoing, interactive process

that has made Linux and its many iterations and flavours an operating system that competes with those of Microsoft and Apple.

The practical utility of this collective enterprise is captured in what is known as “Linus’ Law”: “Given enough eyeballs, all bugs are shallow” (Raymond 1999: 30). That is, the mobilization of large numbers of people working freely together in “decentralized/distributed peer review” generates what Eric Raymond (1999: 31) calls a “bazaar” — as opposed to a “cathedral-builder” — approach to innovation. Users are transformed from customers into co-developers, and the capacity for creative, rapid, site-specific problem solving is greatly multiplied. The social utility of such a collective enterprise is that, subsequent to the open source licensing arrangements under which work proceeds, the results of social labour remain largely socialized and cannot be monopolized.

That they cannot be monopolized does not mean that they cannot be commercialized. Many of the programmers working on open source projects are motivated by peer recognition and the opportunity to contribute to the community (Raymond 1999: 53). But labour can (and should) also be materially rewarded. As the Free Software Foundation (2008) has famously observed, “Free software is a matter of liberty, not price. To understand the concept, you should think of free as in free speech, not as in free beer.” Open source software need not be made available at no cost, but it must be available free of restrictions on further expression via derivative works.

A number of analysts have begun to look to the FOSS movement as a model for development of “open source biology” practices — “BioLinuxes” (Srinivas 2006) — that might be the basis for resisting enclosure of the genescape and for reasserting modalities for freer exchange of biological materials and information (Deibel 2006; Rai and Boyle 2007; Hope 2008). Efforts have been made to apply open source and copyleft principles to a variety of bioscience enterprises, including mapping of the haplotypes of the human genome (International HapMap Project), drug development for neglected diseases in the Global South (the Tropical Diseases Initiative), the standardization of the components of synthetic biology (BioBricks Foundation) and a database for grass genomics (Gramene).

By far the most substantial of such initiatives has been that undertaken by Richard Jefferson and his colleagues at the non-profit CAMBIA. Convinced of the utility of advanced genetics for improving agriculture in marginal and inadequately served communities, Jefferson had been frustrated by the narrow uses to which corporations have put genetic engineering and deeply critical of the constraints they place on the sharing of patented technology (Poynder 2006). With the explicit intent to extend the metaphor and concepts of open source to biotechnology, Jefferson has fostered the construction of Biological Open Source (BiOS), an “innovation ecosystem” designed to “ensure common access to the tools of innovation, to promote the development and improvement of those tools, and to make such developments and improvements freely accessible to both academic and com-

mercial parties" (BiOS 2009a). BiOS involves integrating cutting-edge biological research with open source licensing arrangements that "support both freedom to operate, and freedom to cooperate" in a "protected commons" (BiOS 2009b).

A BioLinux for Seeds?

The seed sector appears to offer some interesting potentials for elaboration of a "BioLinux" approach to open source innovation (Douthwaite 2002; Srinivas 2006; Aoki 2008). Millions of peasants, farmers and indigenous communities the world over are engaged in the recombination of plant genetic material and are constantly selecting for improvements. Even more massively than their software hacker counterparts, they are effectively participating in the process of distributed peer production that Eric Raymond has characterized as the "bazaar." Like programmers, farmers have found their traditions of creativity and free exchange being challenged by the IPRs of the hegemonic "permission culture" and have begun looking for ways not just to protect themselves from piracy or enclosure but also to reassert their own norms of reciprocity and innovation.

Moreover, peasants, farmers and indigenous communities have potential allies in this endeavour who themselves are capable of bringing useful knowledge and significant material resources to bear. Although its capacity is eroding, public plant breeding still offers an institutional platform for developing the technical kernels needed to galvanize recruitment to a protected commons. And in the practice of participatory plant breeding there is an extant vehicle for articulating the complementary capacities of farmers and scientists in the North as well as the South (Almekinders and Jongerden 2002; Murphy et al. 2004; Salazar et al. 2007). Could copyleft arrangements establish a space within which these elements might coalesce and unfold into something resembling seed sovereignty?

The recent appreciation of the potential utility of open source methods for the seed sector was preceded by a similar apprehension on the part of a member of the plant breeding community itself. At the 1999 Bean Improvement Conference, University of Guelph bean breeder Tom Michaels presented a paper titled "General Public License for Plant Germplasm." In it, he noted that as a result of

the opportunity to obtain more exclusive novel gene sequence and germplasm ownership and protection, the mindset of the public sector plant breeding community has become increasingly proprietary. This proprietary atmosphere is hostile to cooperation and free exchange of germplasm, and may hinder public sector crop improvement efforts in future by limiting information and germplasm flow. A new type of germplasm exchange mechanism is needed to promote the continued free exchange of ideas and germplasm. Such a mechanism would allow the public sector to continue its work to enhance the base genotype of economically important plant species without fear that these improvements, done in the spirit of the public good, will be appropriated as

part of another's proprietary germplasm and excluded from unrestricted use in other breeding programs. (1999: 1)

The specific mechanism Michaels goes on to propose is a general public license for plant germplasm (GPLPG) that is explicitly modelled on a type of licence common to open source arrangements in software. This mechanism is simple, elegant and effective. It can be used by many different actors (individual peasants, farmers, communities, indigenous peoples, plant scientists, universities, NGOs, government agencies and private companies) in many places and diverse circumstances. Properly deployed, it could be an effective mechanism for creating a protected commons for those who are willing to freely share continuous access to a pool of plant germplasm for the purposes of bazaar-style, distributed peer production.

Implementation of open source mechanisms such as the GPLPG could have significant effects consistent with both strategies of resistance and creativity. In terms of resistance, the GPLPG would:

Prevent or impede the patenting of plant genetic material. A GPLPG would not directly prohibit patenting (or any other form of IPR protection) of plant genetic material but would render such protection pointless. The GPLPG mandates sharing and free use of the subsequent generations and derivatives of the designated germplasm. In effect, this prevents patenting since there can be no income flow from the restricted access to subsequent generations and derivative lines that it is the function of a patent to generate. Further, the viral nature of the GPLPG means that as germplasm is made available under its provisions and used in recombination, there is a steadily enlarging the pool of material that is effectively insulated from patenting. Enforcing the GPLPG against possible violators would not be easy given the resources necessary. But even the mere revelation of violations would have the salutary effect of illuminating corporate malfeasance and eroding the legitimacy of industry and its practices.

Prevent or impede bioprospecting/biopiracy. The GPLPG could be similarly effective in deterring biopiracy. Faced with a request to collect germplasm, any individual, community or people could simply require use of a materials transfer agreement incorporating the GPLPG provisions. Few commercially oriented bioprospectors will be willing to collect under those open source conditions. Again, enforcing the GPLPG against possible violators would not be easy, but instances in which bioprospecting can be revealed to unambiguously be biopiracy would contribute to public awareness and strengthen popular and policy opposition to unethical appropriation of genetic resources.

Prevent or impede the use of peasant- and farmer-derived genetic resources in proprietary breeding programs. Because neither the germplasm received under a GPLPG

nor any lines subsequently derived from it can be use-restricted, such materials are of little utility to breeding programs oriented to developing proprietary cultivars. Any mixing of GPLPG germplasm with these IPR-protected lines potentially compromises their proprietary integrity. Application of the GPLPG to landraces could therefore effectively prevent their use in proprietary breeding programs.

Prevent or impede further development and deployment of GMOs. The development of transgenic cultivars almost universally involves multiple layers of patented and patent-licensed germplasm. Moreover, all of the critical enabling technologies employed in genetic engineering are patented and their use restricted by licences. Given the large investments that have been made and accompanying expectations of high financial returns, GMOs will not be developed if they cannot be IPR-protected. Any mixing of GPLPG germplasm with these IPR-protected materials and tools potentially compromises their proprietary status. Use of the GPLPG cannot itself stop the further development of GMOs, but it can impede it by preventing additional genetic resources from being drawn into the web of proprietary and IPR-protected materials.

In addition to its capacity for reinforcing resistance, the GPLPG may have even more potential for creativity, for the creation of effective space for the elaboration of transformative alternatives. For example, implementation of the GPLPG would help to:

Develop a legal/institutional framework that recognizes peasants', farmers' and indigenous peoples' collective sovereignty over seeds. A major advantage of the GPLPG is that it does not require the extensive development of new legal statutes and institutions for its implementation. It relies on the simple vehicle of the materials transfer agreement, which is already established and enforceable in conventional practice and existing law. It uses the extant property rights regime to establish rights over germplasm, but then uses those rights to assign sovereignty over seed to an open-ended collectivity whose membership is defined by the commitment to share the germplasm they now have and the germplasm they will develop. Those who do not agree to share are self-selected for exclusion from that protected commons.

Develop a legal/institutional framework that allows peasants, farmers and indigenous peoples to freely exchange, save, improve and sell seeds. For farmers, the feature of the space created by implementation of the GPLPG that is of principal importance is the freedom to plant, save, replant, adapt, improve, exchange, distribute and sell seeds. The flip side of these freedoms is responsibility (and under the GPLPG, the obligation) to grant others within the collectivity the same freedoms; no one is entitled to impose purposes on others or to restrict the range of uses to which seed might be put. In the face of increasing restrictions on their degrees of freedom to

access and use seed, application of the GPLPG offers a means for farmers to create a semi-autonomous, legally secured, protected commons in which they can once again work collectively to express the inventiveness that has historically so enriched the agronomic gene pool.

Develop an institutional framework in which peasants, farmers and indigenous peoples cooperate with plant scientists in the development of new plant varieties that contribute to a sustainable food system. The protected commons that could be engendered by the GPLPG can, and must, also encompass scientific plant breeders whose skills are different from, but complementary to, those of farmers. Many new cultivars will be needed to meet the challenges of sustainably and justly feeding an expanding global population in a time of energy competition and environmental instability. The open source arrangements that have undergirded the successes of distributed peer production in software could have a similar effect in plant improvement. If in software it is true that "to enough eyes, all bugs are shallow," it may follow that "to enough eyes, all agronomic traits are shallow." Participatory plant breeding offers a modality through which the labour power of millions of farmers can be synergistically combined with the skills of a much smaller set of plant breeders. The GPLPG offers plant scientists in public institutions a means of recovering the freedoms that they — no less than farmers — have lost to corporate penetration of their workplaces. Public universities, government agencies and the Consultative Group on International Agricultural Research (CGIAR) system should be the institutional platform for knowledge generation based on the principle of sharing rather than exclusion. Public plant breeders, too, can be beneficiaries of and advocates for the protected commons.

Develop a framework for marketing of seed that is not patented or use-restricted. The GPLPG is antagonistic not to the market but to the use of IPRs to extract excess profits and to constrain creativity through restrictions on derivative uses. Under the GPLPG, seed may be reproduced for sale and sold on commercial markets. By carving out a space from which companies focusing on proprietary lines are effectively excluded, the GPLPG creates a market niche that can be filled by a decentralized network of small-scale, peasant/farmer-owned and cooperative seed companies that do not require large margins and that serve the interests of seed users rather than investors.

Seed sovereignty need not involve peasants, farmers and indigenous peoples alone, nor can it be achieved solely by these social actors. Seed sovereignty will be manifested as a system encompassing peasants, farmers, indigenous peoples, plant scientists, public scientific institutions and seed marketers. GPLPG/BioLinux/open source/copyleft arrangements could plausibly constitute a legal/regulatory framework that could open an enabling space within which all these different social actors could be effectively affiliated.

Pursuing Seed Sovereignty

We should sit down with the legal people who drew up the Creative Commons licenses and see whether farmers could use a similar approach with seeds.

—José Bové (2005: 11)

If seed sovereignty is to be pursued as part of a larger conception of food sovereignty, what is to be done? José Bové is clear about what path should be taken. If germplasm had been made available by peasants, farmers and indigenous peoples under the public licensing of the kind described above since 1950, world agriculture would look very different today. At a minimum, the public agricultural research system would be far more robust than it is now, most seeds in most genebanks would be freely available to any breeders willing to share the results of their work and it would be Monsanto — not peasants farmers and indigenous peoples — that would be finding the international plant genetic resources regime to be unduly restrictive. With such potency, might a BioLinux approach be useful today?

A wide variety of analysts have grappled with what to do about the asymmetric and unjust character of plant germplasm use and exchange. Their counsel can be separated into three types. The first is to do nothing. Some are so overwhelmed by practical complexities and moral ambiguities that they simply don't know what to do and fail to provide any effective guidance at all (e.g., Brown 2003; Gepts 2004; Eyzaguirre and Dennis 2007). Others bemoan the problematics of existing arrangements but accept their inevitability (e.g., Wright 1998; Fowler 2003; Brush 2007). Dusting off an old seed industry apologia, for example, Brush (2007: 1511) concludes that existing mechanisms of development assistance and technology transfer represent sufficient means of ensuring reciprocity and benefit sharing. Fowler (2003: 3, 11) flatly declares that “for better or worse, the debate concerning whether the international community will sanction the existence and use of IPRs in relation to germplasm... is over” and that “anyone who is not happy will remain unhappy.”

The second and much larger group agrees that something needs to be done about the injustices but that the realities of corporate power and a dominant capitalism require a “situational pragmatism” (Brown 1998: 205) that involves cutting the best deal possible. So Mgbeoji (2006: 170) recommends that indigenous peoples consider a “more astute and pragmatic response” to patenting of sacred plants. Salazar et al. (2007) advise trying out the new and trendy “declaration of origin” as a means of preventing appropriation. This is the well worn terrain of all the bioprospecting contracts and the discoverer's rights and the geographic indications and the biopartnerships and the recognition funds and the royalty agreements and the exploration fees and the all the other arrangements that have been proposed and tried.

I have no objection to trying them out and am in no position to tell any peasant

communities or indigenous peoples what they should or should not do. I will point out, however, that none of these arrangements have yet worked, largely because of the erosive effects that inevitably accompany a compensationist, exclusionist articulation to the market. Darryl Posey observed that, as far as he was concerned, these deals were holding actions that would not enfranchise anyone but that would “at least buy some time” (cited in Hayden 2003: 38). But, buy time for what? Hurtado (1999: 7–8) warns of the dangers in the pressures to be pragmatic and to accept what he calls the “intermediate” solutions where

we must not go to extremes, but rather negotiate and arrive at a mid-point. And in this the INTERMEDIATES are the special or *sui generis* regimes, which seek to sit indigenous people at the negotiating tables, in order to talk us into submission. Because it is there where the banana skins are placed, it is there where we start to skid.

A BioLinux or other sharing arrangement may be a viable third option. The aggressions of the neoliberal project must, of course, be resisted whenever possible. However, resistance is a necessary but not sufficient condition for the realization of seed sovereignty (or, for that matter, of food sovereignty). Resistance, complemented by creative actions that are not just reactions to corporate/neoliberal conditions but which are offensive, affirmative, positive, pro-active undertakings designed to establish and maintain alternative, (relatively) autonomous spaces, has more potential for transformation.

Achieving seed sovereignty will not be easy. What is required is simultaneous and linked development of concepts and applications among peasants, farmers, indigenous communities, plant scientists, seed vendors, public institutions and civil-society advocacy groups in the face of corporate and state opposition. While open source biology is no cure-all, it may be a plausible vehicle for enacting the elements of resistance and creativity that La Vía Campesina and others suggest will be necessary for the achievement of seed sovereignty. Should we not, therefore, take the advice offered by José Bové? If there is to be food sovereignty, surely it will be facilitated and enabled by a struggle for seed sovereignty.

Note

A revised version of this chapter appears as “Impending Dispossession, Enabling Repossession: Biological Open Source and the Recovery of Seed Sovereignty” in *Journal of Agrarian Change* 10, 3 (2010).

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