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Cycles of Struggle in Biotechnology: Open Source Methods

Abstract:

The open source methodologies used in software are interrogated and then compared to the methods used in farmers' rights groups. The use of open source methods in other contexts illustrates increasing interest in grassroots democratic movements participating in the continuing process of balance between public and private interests. These efforts provide a possible alternate framework for policy decisions concerning intellectual property.

1. Introduction

The open source or free software movement[i] has a long history in software development. Beginning as the free software movement, it has grown to encompass many variations. The methodologies espoused by the open source community are now seen as far more than alternative software development methods and are increasingly being examined and used outside the realm of software. This use of open source methods in other contexts illustrates the continuation of the cycles of struggle between capital and grassroots organisations; and between the public and private sectors. This paper will examine the use of open source methodologies in the development of software and in the development of farmers' movements against seed patents and the increasing control of seed stock.

The open source methodologies used in software will be interrogated and then compared to the methods used in farmer's action groups using the following questions as a basis for discourse analysis:

- How are the methodologies used by farmers' action groups similar to those used by open source revolutionaries and how do they differ?
- How are groups organised and how do they resolve conflicts?
- How are leaders chosen and how do they help with organisation, planning and intergroup communication?
- How do groups ensure their collective works cannot be commodifed without their consent?

The first section of this paper will examine the history and methodologies of the open source software movement, with particular emphasis on the Linux operating system, and the growing interest in the use of open source methodologies in other contexts. The second section will examine the salient points of the history of farmers' rights groups protesting genetics patents with emphasis on the saving of seeds (historically and currently), choice of crops, the formation and organisation of groups, and the methodologies used in comparison to the open source movement. The third section will examine the use of open source methods as a specific example of a methodology used in the cycles of struggle between capital and grassroots organisations. Finally, this paper will advance some speculations for enhancing the scope of the cycles of struggle using open source methods within the farmer's action groups.

2. "Copyleft--all rights reversed."[ii]

2.1 A Brief History of Open Source

Open source software is not a new idea. The early history of computers was replete with the sharing of software in both binary and source code format. When computers first began to appear in universities and large research facilities in great numbers the source code to software was provided along with the binaries. “The idea of distributing source code freely was seen as a natural offshoot of standard research practice; indeed it was mostly taken for granted.” (Weber 2000, 6) Companies freely distributed their software in the hope that the researchers and computer scientists using their software would report problems (bugs) and even send in modifications. At the time, companies made money on hardware and did not consider software to be a product, so this collaboration with the programmer-users made sense. Since many of the major purchasers of these early computers were universities and research centres this code sharing all occurred “within the academic ethos of open information sharing.” (Dyer-Witheford 2002, 144) This state of affairs began to change as it became increasingly obvious that software was a valuable product. Soon, companies began to restrict access to the source and to demand that programmers sign non-disclosure agreements (NDA) before being allowed to work with their products.[iii] (Weber 2000, 7)

In the 1980s, IBM and other software companies began to campaign heavily for software copyrights (and later software patents) to protect their software from being copied. (Drahos 2002, 179) Software copyrights would protect the source code from being copied and distributed even if a programmer violated the NDA. Software copyright, however, only protects the actual expression of the idea: the source code. Programmers would still be free to use the ideas behind the software to generate similar products as long as they did not copy the code. Software patents create a stronger restriction as they enforce a monopoly on the idea. A number of computer industry players, such as Oracle and Autodesk, were opposed to software patents. (Boyle 1996, 133) They believed that patents would create more problems than they would solve. Patents would allow a company to ensure that, for example, no competitor could use their patented file format without paying a licensing fee. Such a patent would be the perfect exclusion mechanism.

Richard Stallman, then a programmer at MIT, became disenchanted with the growing commodification of software. Stallman expressed his feelings on the matter succinctly. “The rule made by the owners of proprietary software was, "If you share with your neighbor, you are a pirate. If you want any changes beg us to make them."” (Stallman 1999) Faced with what he considered a supreme moral dilemma, Stallman chose to start a revolution. In 1984, he wrote the GNU Manifesto in which he stated his refusal to break faith with other computer users by signing any agreement that might prohibit him from sharing source code or helping his fellow computer users. (Stallman 1985)

His revolution involved writing a new operating system based on UNIX.[iv] A free operating system which would do everything the commercial operating systems did without the restrictions. To ensure that his GNU operating system would remain freely modifiable, Stallman and others drafted the GNU General Public License (GPL) which became the basis of open source software and embodies the freedom to modify, freedom to copy, and freedom to distribute.[v]

> "You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program."[vi]

In an ironic twist, the GPL, which is intended to defeat the anti-sharing potentials of copyright, uses copyright and contract law as the basis for its enforcement. The GPL is a contract between the programmer(s) and the users (who may also be programmers) which explicitly sets aside the rights of the programmer to control distribution and encourages distribution within certain limits: namely that the source code must always be made available when the software is distributed. Stallman and many other software developers contributed to a number of open source projects in the GNU suite of tools until they had most of the tools necessary for an operating system except the kernel. The kernel for what was to become Linux was to come from another source entirely.

Linus Torvalds, then a computer science student in Finland, posted a message to Usenet in the early 1990s asking for help with the development of a UNIX-like kernel for Intel processor based computers. "He posted his kernel [on the Internet] and invited the world to help him turn it into an operating system." (Lessig 1999, 104) And they did. Combining GNU and this kernel created Linux, an operating system that has made increasing inroads into the software market. One of the best features of Linux is that it has been ported to many different computer systems. Linux will run on PCs, Macintoshes, Sun SPARCs, and many other platforms up to mainframes. (Torvalds 1999) This portability is unmatched by any of the major proprietary operating systems and allows an operating system developed largely outside the market to compete with market driven operating systems as it offers the potential for standardisation across platforms.

Linux is just one of many important open source projects. Other projects include the highly successful Apache webserver, Sendmail (mail server), Bind (Domain Name Server), and Perl (a scripting language). While Linux is one of the best known open source projects; Apache is already a major success commanding a huge following in its own right as the dominant webserver software in the world.[vii]

2.2 Principles of Open Source development

Open source methods form what Yochai Benkler refers to as commons-based peer production systems. (Benkler 2002, 1) He argues that the methodologies of the open source software movement serve as a new form of production distinct from the modes of production common within the corporate environment. Traditionally, it was thought that the most efficient form of production was via the firm with decisions made by a small group of executives or alternatively on the open market with decisions made based on economic factors. (Benkler 2002, 3) In contrast, commons-based peer production may have only a loose hierarchy or no hierarchy at all. Production decisions are made by participants and, perhaps, organised loosely into an overall direction by participants who have taken on addiontal responsibilities for co-ordinating or organising the work. Economic factors are less relevant as participants are responsible for small portions of the task and so there is only a small economic outlay on their parts.[viii]

Benkler considers the question of why peer production appears to work so well when contemporary economics suggests that it should fall into anarchy. He suggests that peer production works well because “it is better at identifying and assigning human capital to information and cultural production processes.” (Benkler 2002, 2) In a situation where the primary scarce resource is human creativity, it is crucial to be able to identify which person should be assigned to which task, and this system loses less of this information.

Benkler's description suggests important linkages between the open source methodologies and the scholarly research cycle in which participants effectively assign themselves to various research projects based on interest and skill set. Pekka Himanen discusses the connection between open source methods and the scholarly research cycle suggesting that the reason the model works so well is because it involves more minds contributing more ideas to the pool of knowledge. (Himanen 2001) The open source community is essentially engaged in a perpetual academic conference, constantly exchanging ideas and insights with colleagues around the world.

With the Internet as a low cost facilitator of commons-based peer production, it is possible to co-ordinate large scale projects without the need for the organisation of a large firm and its accoutrements, such as a headquarters building or a large staff to handle inventory, planning, and management. Steven Weber suggests that this flexibility is due to the scalability of Internet communications. Traditionally, effective communication between members of a group is inversely proportional to the number of members, but a mailing list reaches 25 people as easily as 250. (Weber 2000, 17) As an example, the Linux community is “geographically far flung, extremely large, and notably international.” (Weber 2000, 14)

Despite the notably democratic features of the open source community, individuals take on leadership positions in different projects. A good project manager can mean the difference between a failed project and success. Eric Raymond suggests that software project management has five functions: defining goals, monitoring progress, motivating participants, organising people's work, and marshalling resources for the project. (Raymond 1999, chapter 11) These functions are performed in the corporate world by project managers, who are not always programmers. In open source these decisions tend to be made by programmers themselves who work on what interests them, and such interests vary among different programmers. Motivations for participation in open source projects vary. Weber suggests that “[t]he fun, enjoyment and artistry of solving interesting programming problems clearly motivates open source software developers.” (Weber 2000, 25) This motivation is similar to that ascribed to creative artists such as painters or writers. Himanen refers to this desire to solve interesting problems as the “Hacker Ethic”. This hacker ethic is based rather heavily on the scientific ethic. “The scientific ethic entails a model in which theories are developed collectively and their flaws are perceived and gradually removed by means of criticism provided by the entire scientific community.” (Himanen 2001, 68) By releasing their code to the open source community, open source programmers gain a reputation based directly on the nature and quality of their contributions as they are passed through the open source peer review process.

Project leaders are chosen in a number of different ways. Weber notes that ownership of an open source project tends to be acquired in three ways: by founding the project, by having ownership passed to you by the founder, or by taking over a project which is no longer being maintained. (Weber 2000, 24) Once in charge of a project, the open source project leader must be able to maintain it and manage interactions with and between programmers. Raymond suggests that “[a] project coordinator or leader must have good people and communications skills.” (Raymond 1999, chapter 9)

Under the corporate model, decision making authority belongs to management and the programmers would have limited ability to resist the decisions. In the open source model, it is up to the project leader to convince developers of the rightness of any such decisions. In the case of Linux, developers submit change requests, bugs reports, and code. “A group consisting of Torvalds and a few other principal developers then decides which of these versions will be incorporated in the improved version of Linux.” (Himanen 2001, 65-6)

Weber suggests that some of the most important decisions in open source are: who gets credit for a new innovation, who can choose to fork (split) a project, and who makes the final decisions on what is or is not included in a project. (Weber 2000, 18) First, since many developers contribute to open source in order to build a reputation it is important that the developers feel that they are being credited appropriately. Second, Weber suggests that forking does not occur often because the value of the project is increased by its size and developer/user base as the reputation of the developers can only be enhanced by the size of their audience. (Weber 2000, 28-30)

One of the most commonly cited strengths of open source development is the release cycle: “release early, release often.” (Raymond 1999, chapter 3) Once a programme does something useful, the open source programmer will 'release it into the wild' thus allowing a development community to form around the project. Sourceforge[ix], a website dedicated to open source projects, has many thousands of projects listed. Some, just as in commercial development, have been virtually abandoned. However, many projects on Sourceforge are actively maintained by programmer-users who work with the software regularly.

By releasing a working product, programmers can ensure that potential users will be able to try the programme out right away and see if it is useful. Raymond, who has successfully used the open source method to produce software, says that “[i]f you treat your beta-testers as if they're your most valuable resource, they will respond by becoming your most valuable resource.” (Raymond 1999, chapter 5) His success story included large numbers of committed users who sent regular bug reports and patches. Raymond suggests that “given enough eyeballs all bugs are shallow.” (Raymond 1999, chapter 3) The experience of open source developers suggests that the more users an open source product has, the better the product will be.

The ideals and ideas behind open source methodologies are not new. The open source method was born out of the scholarly communication cycle and remains an example of this cycle at its best. What was most revolutionary about the open source method was its use across a much larger community and the fact that the barriers to entry were different. Entry to the community was simply a matter of producing good code; a skill which could be acquired without the need for formal credentials because all that is required is a computer, a compiler and willingness to learn.

In recent years the open source name and methodologies have become attached to a number of other projects outside the realm of computer software. GPL-like licenses have been written for other realms including the Creative Commons license for artistic works.[x] Writing for Wired, Thomas Goetz reports on an interesting example of the use of open source methodologies outside of computer programming. A cheap intravenous pump developed to try to halt the spread of cholera in developing countries was designed by a group of engineers and physicians working for a web-based design company using open source methods. This inexpensive pump could replace existing alternatives that cannot be deployed in large enough numbers due to cost or the skill level required to use them. (Goetz 2003) Other examples have come from the field of scholarly publishing involving such projects as the Public Library of Science.[xi]

What all of these projects have in common is the use of open source methodologies--or commons-based peer production--to achieve a mutual goal. Information is shared with all participants who each bring different strengths, weaknesses and educational backgrounds to the project. This mingling of different skill sets helps to stimulate creativity and aids in producing new and innovative ideas. The following section of this paper will examine the use of open source methods by farmers' rights groups fighting the increasing grasp of genetic patents on the genetic material of agricultural produce.

3 Biotechnology (tm) and Farmer's Rights

3.1 History and Background

Encyclopaedias place the dawn of agriculture sometime between 7000 and 10000 years ago.[xii] This important innovation made the difference between eking out a living as a hunter-gatherer and being able to remain in one place long enough to build permanent structures and preserve knowledge in written format since "[f]arming allows a much greater density of population than can be supported by hunting and gathering."[xiii] This "[c]ultivation of crops—notably grains such as wheat, rice, corn, rye, barley, and millet—encouraged settlement of stable farm communities, some of which grew to be towns and city-states in various parts of the world."[xiv] The growth of cities allowed the growth of manufacturing and ultimately of large corporations, but "[a]griculture is still the occupation of almost 50% of the world's population, but the numbers vary from less than 3% in industrialized countries to over 60% in Third World countries."[xv]

Traditional farming, often a form of subsistence farming, involves the production of a variety of crops, generally enough for the farmer and his (or her) family with, in good years, a surplus that can be sold or bartered for things the farmer does not make (e.g. metal work). Subsistence farming has been practised since the beginning of agriculture and continues to be practiced in many parts of the world. In order to keep market costs to a minimum, farmers have traditionally saved seeds from harvest to harvest ensuring that they will always have something to plant even if there is no surplus to generate extra cash.[xvi]

The growth of technology brought improvements to farmer's tools in the form of better ploughs, the use of animals as labour saving devices and improvements to farming methods including irrigation related technologies and seed breeding to produce higher yield crops. One of the earliest methods used to increase yield and hardiness was the domestication of plants. "Centuries of careful selection and breeding have had enormous effects on the characteristics of crop plants. Plant breeders use greenhouses and other techniques to get as many as three generations of plants per year, so that they can make improvements all the more quickly."[xvii] These improvements are initiated by careful breeding of the best plants, by hybridizing or most recently via genetic engineering.

The concept of breeder's rights--analogous to the concept of intellectual property rights in seeds--became an issue because, like software, seed production is a process which has a large fixed cost (Berlan and Lewontin 1986, 786) but which produces a product that can be cheaply distributed. In the case of the software the duplicability is electronic; in the case of seed it is by growing plants and saving the seeds, which are self-replicating.

There has always been some tension between farmers and seed breeders or distributors since farmers have traditionally saved seeds from the previous harvest to save money and ensure they will have something to plant for the next harvest. Seeds were thus generally outside the market and seed companies had to try to convince the farmer to buy seed more regularly. Berlan and Lewontin explain the two preferred methods of achieving this increase in demand: the first being to sell the seed at such a low price that the farmer could not produce seeds more cheaply, the second--to sell seeds that did not reproduce as well as the natural varieties. (Berland and Lewontin 1986, 785)

Plant hybridization involves the mingling of genetic material from similar species of plants to create a hardier plant with higher yields. This process requires no genetic engineering and the seeds from these hybrid crops tend not to germinate as well as regular seeds forcing farmers to buy seeds more regularly to ensure a good crop.[xviii] This limitation allowed seed companies to have more control over farmers. However, farmers could still do their own breeding and saving the best seeds from their crops for the next harvest was not illegal. Additionally, the hybridization process has not been successful on all seed varieties, so while farmers might feel obligated to purchase hybrids of some seeds, other seed stocks could still be maintained through seed saving.

Berlan and Lewontin question whether the hybridization process really improves yields as much as claimed. Their investigation in the mid 1980s discovered very little data comparing crop yields to crops with a similar popularity to that of corn. In fact, they question whether the extreme interest in hybrid research was based more on a desire to control the seed market by making seed saving less economical. (Berlan and Lewontin 1986, 37-38) But hybrid corn is no longer the biggest issue in the seed business. Genetic engineering of crops has raised many of the same questions as hybrid crops and some new ones. Genetically engineered plants are generally modified to withstand temperature variations, pesticides, droughts, disease and insect infestations. These modifications involve adding genetic material from some other organism that has the desired traits to the plant. The modified plant would then have the ability to withstand poor weather, better resist common pests, or even survive an otherwise lethal application of pesticides. Just as with hybridization, this process could offer advantages to farmers.

The increasing market for seeds has led to increasing demands for legal protection. Changes in the Patent Acts in some countries that allowed the patenting of software also allowed genes and even life forms to be patented. (Drahos 2002 158-9) Like software patents, genetic patents have proven contentious because the patent holder has acquired a monopoly on the creation and distribution of the seed and thus can set the price and all the terms of use.[xix] Companies can license the seed instead of selling it and can write the license terms in such a way that it becomes illegal to save seeds for the next year's crops. In addition, companies can prosecute farmers who dare to "steal" their intellectual property by saving seeds. For example, Monsanto, one of the largest producers of genetically modified seed stock, is reputed to have sued more than 500 farmers who allegedly violated terms of their seed use license. (Philipkoski 2003) Thus seeds, like software, became a commodity wholly within the market by legal fiat as patents create an exclusion mechanism in the same way as copyright restrictions on source code. For example, the Monsanto licensing agreement for Roundup Ready canola states:

> “1. The Grower shall use any purchased Roudup Ready canola seed for planting one and only one crop for resale for consumption. The Grower agrees not to save seed produced from Roundup Ready canola seed for the purpose of replanting nor to sell, give, transfer or otherwise convey any such seeds for the purpose of replanting. ...
>
> 2. The Grower shall purchase and use only Roundup branded herbicide labelled for use on all Roundup Ready canola seed purchased. The Grower shall purchase both the Roundup branded herbicide and the Technology Use Agreement as a package from his retailer of choice. ...”

One farmer has decided to take a stand.[xx] Canadian farmer Percy Schmeiser[xxi] has decided to fight Monsanto in court after being sued for using their seed without a license. He claims he did not knowingly grow Monsanto seeds and that the seed must have blown into his field from a neighbour's field and contaminated his crop by cross-pollination or horizontal gene transfer. His farming practices for several decades tend to support this. “Unlike most other canola farmers, Schmeiser grew canola every year instead of rotating in another crop like wheat. He had developed his seed over four decades to grow well year after year on the same land. He was also a "seed saver," which means he keeps seeds from each crop to plant the next.” (Philipkoski 2003)

There is scientific evidence for the process of cross-pollination from genetically modified crops to non genetically modified crops. It is also not possible to guarantee that cross-pollination between genetically modified and non-genetically modified crops will not occur. Pollen dispersal from all crops is a natural phenomenon. Anthony Conner et al examine the possibility of gene transfer to non-GM crops and suggest that “the appearance of transgenic material within otherwise non-GM cultivars is unavoidable, except by fully prohibiting the cultivation of GM crops.” (Conner et al. 2003, 37) “The potential inadvertent mixing of GM and non-GM crop through pollen dispersal and seed is a particular concern for the organic farming industry” since the presence of genetically engineered genes would cause removal of the organic label from the resultant plants under existing regulations. (Conner et al. 2003, 36)[xxii] Additionally, J.A. Thomson examines research up to 2001 on the subject of horizontal gene transfer and states that while horizontal gene transfer to bacteria and mammalian cells is often considered to be a relatively rare phenomenon “even rare events may have an ecological impact, and thus genes encoded by DNA introduced into a GM plant should be the focus of biosafety considerations.” (Thomson 2001, 188)

In *Monsanto vs. Schmeiser*, the court ruled that the source of the contamination was irrelevant and that Schmeiser should have removed all plants contaminated by genetically modified material from his crops. Thus, it did not matter how the genetically modified plants ended up on Schmeiser's property, they became the property of Monsanto.[xxiii] Schmeiser in other words was found guilty of infringing Monsanto's patent even though the judge agreed that his crop was probably contaminated by cross-pollination. This is in keeping with the letter of the Patent Act, but seems somewhat unfair as it has been proven that cross-pollination or horizontal gene transfer can occur naturally. When it is agreed that contamination was accidental and that it is impossible to ensure that horizontal gene transfer or cross-pollination will not occur, the strict application of existing patent laws seems inappropriate.[xxiv]

Farming is an old profession and seed saving has been a common practice of farmers since the early days of agriculture. With the rise of genetic engineering and the inability to ensure that such genetically engineered material will not cross-pollinate, the issue of GM contamination becomes of crucial importance, especially in the developing world where many farmers cannot afford to farm unless they practice seed saving.

3.2 Farmer's Rights Movements and Open Source Methods

There are many commonalities between the open source movement and the various farmer's rights movements around the world. They are both large international movements with the broadly similar goals of ensuring open access to a segment of society that has been heavily commodified under the guise of intellectual property.

Like the open source community, farmer's rights groups often have strong international ties. Similarly, the farmer's rights movement consists of many smaller groups of farmers and environmental activists who sometimes work together; just like the open source community where developers work on a variety of different projects which are brought together to make a larger product. In this sense, the farmer's rights groups are evolving a form of commons-based peer production in the realm of protests and information sharing. Using the Internet, these groups can co-ordinate protests and share information about the activities of multinational seed corporations that affect them and other farmers around the world. Joint projects can be carried out as well. For example, Nick Dyer-Witheford mentions the activities of the Canada based Rural Advancement Foundation International (now the Etcgroup) in gathering and disseminating information on pending corporate patent claims to the developing world via the Internet. (Dyer-Witheford 1999, 210)

Many farmers' groups focus on more than just seed gene patents, and include environmental issues and trade related issues in the scope of their work. They work to prevent the loss of biodiversity and organise protests against the loss of government subsidies due to WTO treaties requiring that barriers to trade between countries be eliminated. (Drahos 2002, 11)

One of the most active farmers' groups is MASIPAG,[xxv] *a "national network of* farmers, scientists, and non-government organizations (NGOs). Based in [the Phillippines]." The organisation is also engaged in agricultural research. (Araya 2000). Like Stallman on the subject of the problems with closed source software, many farmers are similarly outspoken about the problems with genetic patents. "Patents are incompatible with sustainable agriculture. 'If seeds are patented, it's like cutting off a farmer's arm since you are removing the farmer's freedom to choose seeds and preserve them,' says Leopoldo Guilaran, a rice farmer from Visayas, the Philippines [and a member of MASIPAG]."
(Kuyek 2002)

In response to the problem caused by patents, MASIPAG has produced a statement on farmers’ rights, which has many similarities to Stallman's GNU Manifesto.

Some of MASIPAG's list of rights are as follows:

- Use, save, exchange, multiply, sell and improve their genetic resources;
- Control seeds and planting materials including the right to refuse access to the seeds and knowledge where such access will be detrimental to farmers rights (such as to transnational corporations and international research institutions as appropriate);
- Prevent technologies, policies and institutions that destroy the watershed and otherwise negatively impact on the ability of farmers to produce food and conserve biodiversity (e.g. logging, mining, and chemical based farming). (MASIPAG 2002)

These are indeed very similar to some of the GNU Manifesto's rights:

- GNU is not in the public domain. Everyone will be permitted to modify and redistribute GNU, but no distributor will be allowed to restrict its further redistribution. That is to say, proprietary ... modifications will not be allowed. I want to make sure that all versions of GNU remain free.
- Copying all or parts of a program is as natural to a programmer as breathing, and as productive. It ought to be as free. (Stallman 1985)

Where Stallman and the Free Software Foundation seek to ensure that their GNU tools will always be available to programmers, MASIPAG demands that farmers be given the equivalent ability to save their seeds, trade seeds with neighbours, and work separately or together on developing better or different strains in their crops. While the motivations of many open source programmers are based on the scientific ethic, many farmer's rights activists are motivated by survival. A farmer who has been driven into debt by the crippling prices of genetically modified seeds could easily be motivated to protest against genetic patents and large multinational seed companies.

Leaders in the movement tend to be self-selected to a certain extent. It is often said in the open source movement that project leaders and programmers are motivated by the need to “scratch an itch” or, in other words, to fix a problem or add a feature. While proprietary software vendors may take comments from their customers, there is no guarantee that the comments will spark new functionality, or that any new functionality will be what the programmer wanted. Starting or joining an open source project and “doing it yourself” means the programmer can incorporate all the changes that are desired and be sure they work as expected. Similarly, in the case of farmer led protest groups, the leaders of such groups tend to spring up from individual farmers who are dissatisfied with the terms of licenses from large corporations or the terms of government grants which dictate how they can run their farm.

“Percy Schmeiser never dreamed he'd be the poster boy in what he calls a worldwide struggle for farmers' rights and autonomy.”[xxvi] Since the beginning of his legal fight with Monsanto, Schmeiser has also become something of an activist travelling all over the world to speak against genetic patents and for seed diversity and farmer's rights. Just like Torvalds, who never imagined his hobby operating system would develop a worldwide following and even cause Microsoft to label it a threat, Schmeiser had no intention of starting a revolution. While Schmeiser is not a leader of the movement in the same sense as Torvalds, he has become a symbol for the cause in his refusal to settle with Monsanto. Farmers' groups from all over the world have paid him to come speak to them and he has been granted an award for this work.[xxvii]

Farmers' rights groups choose projects in a similar manner to open source developers. Farmers choose to protest laws and treaties which will harm them or to work on projects to develop organic seeds; developers choose to write software to replace what doesn't work or to fill a gap in what is available commercially. An example of the former is MASIPAG's seed research work that is done to reduce dependence on pesticides and genetically enhanced seeds.

In terms of protests, farmers' rights groups, and the umbrella groups to which many belong, join together to organise rallies and protests of national and international laws and treaties which affect them. The People's Food Sovereignty Network, to which MASIPAG belongs, has helped to coordinate a number of protests including one at the WTO negotiations in Cancun, Mexico.[xxviii]Other famous protests and farmers' rights summits include the People's Caravan 2000 in India, Bangladesh and the Philippines which was attended by farmers from all over the world, including Percy Schmeiser who spoke about the dangers of contamination from genetically engineered crops.[xxix] Additionally, MASIPAG began a boycott of Monsanto products after wrapping up a hunger strike in the fall of 2003. MASIPAG joined this endeavour as a member of RESIST! (Resistance and Solidarity Against Agrochem TNCs), which includes women's rights groups, environmental groups, and anti-GMO groups.[xxx]

Both farmers' rights movements and the open source community seek to ensure that the basic information of their profession (seeds and software) remains available. Both tend to use democratic methods to organise their work and both tend to have relatively loose decentralised organisational structures which can nevertheless come together to work towards a common goal. While farmers rights groups tend to be heavily motivated by the threat to their survival as farmers, open source developers are generally more motivated by the artistic urge to create. Leaders of both movements tend to be self-selected individuals who become dissatisfied with the growing commodification of information and take a stand against it. In some cases, this stand is taken due to what they feel is an injustice perpetrated against them by large corporations, in others it is a desire to be able to make their own modifications of software or seeds.

4 Cycles of Struggle and Open Source Methods

The cycle of struggles between corporations and workers is not new. Early struggles in the developed world concerned unsafe working conditions, long hours, and low pay. Unions were organisations that could bargain on a more even footing. Dyer-Witherford quotes Negri who argued that the 1980s saw the beginnings of a new cycle of struggles “characterized by ‘the radically democratic form of organization, the transformed relation with the trade unions ... the social dimension of objectives ... the emergence of the feminist component.’” (Dyer-Witheford 1999, 83) At their base, these new grassroots organisations are involved in a global movement. This movement seeks to democratize decision making using an open source or commons-based peer production type methodology to ensure that all interested parties be involved in decision making and to have access to the information needed to make informed decisions.

In the field of biotechnology, farmers rights groups use open source methodologies such as information sharing and a loose organisation of individuals acting locally but cooperating globally to work against the increasing commodification of agricultural stocks. “Farmers are doing what they can to resist patents: protesting in the streets, safeguarding traditional seeds, refusing to comply with IPRs [Intellectual Property Rights]. But in the current political context transnationals wield enormous influence over decisions. There are no easy solutions, just tireless political struggle.” (Kuyek 2003)

Dyer-Witheford discusses the duality of technology as source of repression by capital and enabling force for worker struggles against capital. (Dyer-Witheford 1999, 210) In this sense, technology can be used to enable a continuation of the cycles of struggle between capital and workers by making it possible for a diverse group of grassroots organisations with similar goals to plan and organise globally in the same way that a multinational corporation or a government can plan globally. While economists often claim that “the volume and complexity of information required to coordinate a modern economy could never be processed in time to allow any exercise of democracy or participation ... the emergence of highly distributed, very fast information systems throws this rebuttal into question.” (Dyer-Witheford 1999, 210) The relatively low cost, scalable communications systems available via the Internet permit “highly decentralized forms of planning previously considered unwieldy.” (Dyer-Witheford 1999, 210)

A main threat to the cycle of struggles is the use of intellectual property laws to subsume collective knowledge into a few multinational companies. Boyle discusses the use of the romantic vision of the author to drive the creation of stronger and stronger intellectual property laws. (Boyle 1996, 142) Yet it is not the authors/creators who acquire the rights to their creations but the large corporations that employ them.

While open source methodologies, and especially the use of the GPL license, attempt to counteract this trend, there are some concerns raised by the increasing corporate interest in Linux. Dyer-Witheford looks at the growing corporate interest in Linux from rivals of Microsoft and asks, 'what keeps corporations from absorbing Linux?' The answer is the GPL. “The outcome of this interaction between commercialization and free software is, however, uncertain. One obvious prospect is the corruption of the open source movement.” (Dyer-Witheford 2002, 146) While a concern to some members of the open source community, the principles of open source as discussed earlier suggest that this corruption is unlikely to happen. A company trying to corrupt the open source movement would find itself in violation of the GPL. They would lose the goodwill of the open source community who would, in large part, immediately cease working with the company. This practice would destroy the open source process that has created the very thing that attracted the company's attention in the first place. In this way, open source methods are used to ensure that corporations cannot commodify the fruits of the open source movements’ labour.

Berlan and Lewontin ask the question of how to ensure the funding of public goods. “Breeding is a strategic activity that benefits the entire society. Should the cost be met by taxpayers or by a small group of enterprises, the small seed companies? And if the second, what steps can be taken to ensure that seed producers' profits will be sufficient to sustain such a crucial activity?” (Berlan and Lewontin 1986, 786) Perhaps the answer is to use open source methods in the same way as the open source software movement has used these methods to develop an entire operating system.[xxxi] Software developers have access to the necessary tools to develop software; farmers have access to the necessary tools to develop seed varieties. Schmeiser spent years developing his own variety of canola seed that grew well year after year on his land. Could he then have registered his seed under a GPL-like patent? (See Reichman and Ulrich) MASIPAG is also working on the development of organic seed varieties. Would a GPL-like patent help to ensure that their work remains available to farmers and can never be commodified by a multinational corporation, but only used by that corporation just as many corporations use and contribute to Linux? Corporations could still produce and market this seed, and even develop improvements to it, but they would be required to disclose exactly how this new seed was developed and would not be able to claim ownership of the genetic information. This type of "viral" license might not be possible under existing patent laws, but even a 20 year term under a GPL-like patent would aid in the spread of seeds which are free of multinational corporate licensing strings.

This marriage of open source methodologies and farmers groups could help provide another tool in the cycle of struggles. Boyle suggests that "[t]hose who are negatively affected by this language of entitlement--be they programmers, satirists, citizens of the developing world, or environmental activists--see only the impact within their narrow bailiwicks. Focusing on effects, they fail to see the structure underlying those effects. Thus they lose the possibility of both theoretical analysis and the practical recognition of common interests." (Boyle 1996, 173)

Following Boyle, this paper connects two seemingly disparate movements with apparently different goals and attempts to explain how a group of computer programmers working to create a free (as in freedom) operating system and a group of farmers fighting to retain the right to save, exchange and develop their own seed stocks are actually very similar at the core. Both groups seek to stem the rising tide of intellectual property laws that threaten to destroy the very scientific process that has brought about so much of the technological revolution of the past century.

Bibliography

Araya, Alfred A. 2000. Masipag farmers bring nature back to farming. *CyberDyaryo*. Available at http://www.codewan.com.ph/CyberDyaryo/features/f2000_0620_01.htm; (accessed April 9, 2004).

Benkler, Yochai. 2002. Coase's Penguin, or Linux and the Nature of the Firm. 112 *Yale Law Journal* (August 2002).

Berlan, Jean-Pierre and Richard Lewontin. 1986. The Political Economy of Hybrid Corn. *Monthly Review* 38: 35-47.

Berlan, Jean-Pierre and Richard Lewontin. 1986. Breeders' Rights and Patenting Life Forms. *Nature* 322: 785-788.

Boyle, James. 1996. *Shamans, Software and Spleens: Law and the Construction of the Information Society*. Cambridge, MA: Harvard University Press.

Conner, Anthony J., Glare, Travis R., and Nap, Jan-Peter. 2003. The release of genetically modified crops into the environment: Part II. Overview of ecological risk assessment. *The Plant Journal* 33: 19-46.

Dyer-Witheford, Nick. 1999. *Cyber Marx: Cycles and Circuits of Struggle*. Urbana and Chicago: University of Illinois Press.

Dyer-Witheford, Nick. 2002. E-Capital and the Many Headed Hydra. In G. Elmer (ed.), *Critical Perspectives on the Internet* (pp. 129-164). Lanham, MD: Rowman & Littlefield.

Goetz, Thomas. 2003. Open Source Everywhere. *Wired* 11.11(November 2003). Available at http://www.wired.com/wired/archive/11.11/opensource.html; (accessed April 9, 2004).

Himanen, Pekka. 2001. *The Hacker Ethic and the Spirit of the Information Age*. Toronto: Random House.

Kuyek, Devlin. 2002. Rice is Life. *New Internationalist* 349 (September 2002). Available at http://www.newint.org/issue349/rice.htm; (accessed April 9, 2004).

Lessig, Lawrence. 1999. *Code and Other Laws of Cyberspace*. New York: Basic Books.

MASIPAG. 2002. Statement on Farmer's Rights. Available at http://www.peoplesfoodsovereignty.org/new/statements/090502-02.htm; (accessed April 9, 2004).

Perelman, Michael. 2002. *Steal This Idea: Intellectual Property Rights and the Corporate Confiscation of Creativity*. New York: Palgrave.

Philipkoski, Kristen. 2003. Canola Case Tests GMO Patent. Wired News 02-12-2003. Available at http://www.wired.com/news/print/0,1294,61241,00.html; (accessed April 9, 2004).

Raymond, Eric S. 1999. *The Cathedral & the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*. Cambridge, Mass.: O'Reilly. Available at http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/; (accessed April 9, 2004).

Raymond, Eric S. 2000. *A Brief History of Hackerdom.* Available at http://www.catb.org/~esr/writings/hacker-history/hacker-history.html; (accessed April 9, 2004).

Siebrasse, Norman. 2004. A Remedial Benefit-Based Approach to the Innocent-User Problem in the Patenting of Higher Life Forms. 20(1) *Canadian Intellectual Property Review* 79-134.

Stallman, Richard. 1985, 1993. The GNU Manifesto. Available at http://www.gnu.org/gnu/manifesto.html; (accessed April 9, 2004).

Stallman, Richard. 1999. “The GNU Operating System and the Free Software Movement,” in *Open Sources: Voices from the Open Source Revolution,* Chris DiBona, Sam Ockman and Mark Stone (Eds.) O'Reilly. Available at http://www.oreilly.com/catalog/opensources/book/toc.html, (accessed April 9, 2004).

Thomson, J. A. 2001. “Horizontal Gene Transfer of DNA from GM Crops to Bacteria and to Mammalian Cells.” *Journal of Food Science* 66(2): 188-93.

Torvalds, Linus. 1999. “The Linux Edge,” in *Open Sources: Voices from the Open Source Revolution*, Chris DiBona, Sam Ockman and Mark Stone (Eds.) O'Reilly. Available at http://www.oreilly.com/catalog/opensources/book/toc.html, (accessed April 9, 2004).

Weber, Steven. 2000. *The Political Economy of Open Source Software. Berkeley Roundtable on the International Economy*. Available at http://repositories.cdlib.org/briel/BRIEWP140/; (accessed April 9, 2004). [Cited with permission of the author. Also see Weber, Steven. 2004. *The Success of Open Source*. Cambridge, MA: Harvard University Press.]

Williams, Sam. 2002. *Free as in Freedom: Richard Stallman's Crusade for Free Software*. O'Reilly. Available http://www.oreilly.com/openbook/freedom/ (accessed April 9, 2004)

Endnotes

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iThis paper will use the term open source to refer to both the open source and free software communities, but it is important to note that this terminology is not exact. The free software community is more heavily committed to the ideological aspects of free software or “software libre” whereas the open source community takes a more pragmatic approach to the subject and relies on promoting the stability of the end product, potential cost savings, and the speed of development possible with open source methods.

iiThis quotation, which summarises the intent of the GNU General Public license for open source software was sent to Stallman in the 1980s. See Stallman 1999.

iiiSee Weber 2004, Raymond 1999 and Stallman 1999 for more details on the history of software.

ivFor a more detailed history of the open source movement see Moody, Glyn. 2001. Rebel Code.

vStallman explains that in this context free refers to the user's freedom to modify the operating system software and not the price. “[Free] has nothing to do with price. It is about freedom.” See Stallman 1999.

viHhttp://www.gnu.org/copyleft/gpl.htmlH

viiApache commands 67% of the webserver market with its nearest competitor, Microsoft IIS, at only 21%. (Hhttp://news.netcraft.com/archives/web_server_survey.htmlH)

viiiSee Raymond 2000, chapter 7

ixHhttp://sourceforge.net/H

xHhttp://creativecommons.org/H

xiHhttp://www.publiclibraryofscience.com/H

xiiWikipedia s.v. agriculture, Hhttp://en2.wikipedia.org/wiki/AgricultureH

xiiiIbid.

xivColumbia Encyclopedia, 6th ed. 2001. s.v. Agriculture, Hhttp://www.bartleby.com/65/ag/agricult.htmlH

xvIbid.

xviEncyclopedia Britannica Online. s.v. subsistence farming, Hhttp://80-www.search.eb.com.proxy.lib.uwo.ca:2048/eb/article?eu=1315H

xviiWikipedia s.v. agriculture

xviiiBerlan and Lewontin report that “[t]he [second] generation of hybrid maize, if not biologically sterile, is economically unusable as seed, producing anywhere from 20 per cent to 40 per cent less than the [first generation] hybrid. For all practical purposes, such a loss of yield amounts to biological sterility.” (Berlan and Lewontin 1986, 787)

xixBerlan and Lewontin describe this problem. “Limiting the use of a good available in limitless quantities at no cost will not be socially useful, will limit the full use of biological potential only to what is patentable, will erect barriers to entry in branches of production where competition is necessary and will limit the free exchange of information between scientists so crucial to science." (Berlan and Lewontin 1986, 788)

xxIn another case in Saskatchewan, a group of organic farmers are suing Monsanto for polluting their grain with genetically modified genes via horizontal gene transfer or cross-pollination. Since this pollution would cause loss of organic status, this would involve a possibly substantial economic loss on their parts. Hhttp://www.organicconsumers.org/ge/122302_monsanto_lawsuit.cfmH

xxiHhttp://www.percyschmeiser.com/H

xxiiAlso see Kareiva, P. Morris, W., Jacobi C.M. 1994. Studying and managing the risk of cross-fertilization between transgenic crops and wild relatives. *Molecular Ecology* 3: 15-21.

xxiiiMonsanto Canada Inc. et al. v. Schmeiser et al. 2002 FCA 309.

xxiv Monsanto v. Schmeiser is currently pending in the Supreme Court. The lower court decisions leave open the question of how to treat innocent infringement of patents in genetic material. See Siebrasse 2003.

xxv"It started in 1986 and now involves 50 trial farms. Some 534 farmer-bred lines and 75 varieties of rice are currently being grown and further improved by well over 10,000 farmers throughout the archipelago." (Kuyek 2002) MASIPAG provides an alternative to genetically engineered crops in addition to working for farmer's rights.

xxviSask. farmer star of Biodevestation conference. 16-05-2003. CANOE.ca. Available from http://cnews.canoe.ca/CNEWS/World/2003/05/16/89132-cp.html; (accessed April 9, 2004).

xxviihttp://www.percyschmeiser.com/Gandhiaward.htm

xxviiiHhttp://www.peoplesfoodsovereignty.org/new/statements/I%27OMC.htmH

xxixHhttp://www.poptel.org.uk/panap/caravan/1.htmH

xxxHhttp://www.panna.org/resources/gpc/gpc_200308.13.2.06.dv.htmlH

xxxiSmith, Willy. 09-28-2003. [Costa Rica] Open Source Seeds? WorldWatch Available at http://worldwatch.linuxgazette.com/print.php?sid=120; (accessed April 9, 2004) and Montoya, Felipe. 11-09-2003. [Costa Rica] Linux and Seeds, Geeks and Farmers - A Spiritual Link. WorldWatch. Available at http://worldwatch.linuxgazette.com/print.php?sid=155; (accessed April 9, 2004).