

# What Does the “Open Source” Software Movement Have to Offer Plant Breeding?

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- (1) Overview of the “Open Source” Software Movement
- (2) Reasons why “Open Source” may be applicable to plant germplasm (7)
- (3) Reasons why “Open Source” may NOT be applicable to plant germplasm (4)
- (4) Conclusion

# Brief History and Outline of Open Source Software Model

Used for more than three decades

- Started in the “hacker” culture of U.S. computer science labs

Necessitated by needs of software developers to share code in the era prior to advent of the proprietary development (copyright) model

Based on “legal” software: General Public License

- “Copyleft: All Rights Reversed”
  - Contractual alternative to public copyright law

# What is the General Public License?

“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 this program.”

-Richard Stallman, GNU Manifesto, 1985

FREE SOFTWARE IS FREEDOM



# Open Source Software Movement

- In the late 1970s and early 1980s two groups emerged:
  - East Coast, Richard Stallman, formerly of MIT, launched the GNU project whose ultimate goal was to build a free operating system
    - Free software, NOT free beer
  - West Coast, The Computer Science Research Group at UC-Berkley with funding from DARPA contracts and with the help of a network of Unix hackers made progress in improving the Unix system.

# Open Source Software Movement

- 1980s and early 1990s open software developed in isolated groups
- Enter Linus Torvalds whose first versions of Linux kernel resulted in many programmers collaborating in adding functionalities and utilities that resulted in the complete GNU/Linux, a real operating system



# Open Source Principles

- Commons-based peer production systems
  - Loose hierarchy, democratically organized
  - Decisions by participants organized by project managers (democratically chosen) (Eric Raymond, 1999)
    - Define goals
    - Monitor progress
    - Motivate participants
    - Organizing people's work
    - Marshalling resources
  - Release early, release often

# Farmer's Rights and Open Source?

- Ensure open access to segment of society that has been heavily commodified by intellectual property
  - Int'l ties
  - Small groups (farmers & envt'l activists)
  - Use internet: coordinate and info sharing
  - MASIPAG: int'l network (based in Phillipines) of farmers, scientists and NGOs
    - “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.” Leopoldo Guilaran (rice farmer, MAIPAG member)

# Comparing Farmer's Rights and Open Source Software

- **MASIPAG's list of farmer's rights**

- Use, save, exchange, multiply, sell and improve genetic resources
- Control seeds, including the right to refuse access to seeds and knowledge where such access will be detrimental to farmers
- Prevent technologies, policies and institutions that destroy the watershed and [harm] the ability of farmers to produce food and conserve biodiversity

- **GNU Manifesto**

- Everyone will be permitted to modify and redistribute GNU, but no distributor will be allowed to restrict its further redistribution.
- . . . All versions of GNU [shall] remain free
- Copying all or parts of a program is as natural to a programmer as breathing, and as productive

# Contrasting the MTA with the GPL

## MTA

- Use permitted for “research purposes only”
- Should research purposes yield commercially viable end-results, then obligation to share royalties and profits.
- Obligation to share intellectual property rights
- Mutual Assistance

## GPL

- Not limited to “research purposes only”
- No obligation to share royalties
- Permission to copy and distribute programs in form received provided an acknowledgement is appended
- Obligation not to seek patents
- No obligation to share intellectual property rights
- Any patent received must be licensed for everyone’s free use or not licensed at all.
- No provisions for Mutual Assistance.

# Why Open Source May Work in the Plant Germplasm Area

## (1) Historical context

- Farmers have been seed selecting for centuries  
= not an alien of a concept

## (2) Leads to increased understanding of Plant Germplasm by building an

- inclusive user communit(ies) through which information may be freely exchanged  
(decentralized peer-production network)

# Why Open Source May Work in the Plant Germplasm Area

(3) May lead to quality improvements in a variety of ways:

- “Given enough eyes, all bugs are shallow” as demonstrated in
  - the software context?
  - the breeding context?
- Contributes to improved availability making the germplasm less vulnerable to misfortunes and/or intentions of individual entities.

# Why Open Source May Work in the Plant Germplasm Area

- (4) Costs of contribution as in software context could be low in the plant breeding context. Also capital costs (cost of acquiring seeds) may be comparatively low (free when in public domain?) akin to software
- (5) Replication/Production/Copying costs like copying in the software context (and unlike the open source hardware context) are also low

# Why Open Source May Work in the Plant Germplasm Area

- (6) A means of risk-spreading and cost-sharing among individuals and entities thus preserving the viability of smaller seed companies and individual plant breeders.
- May lead to redirection of efforts from areas of weakness to areas of strength
  - Helps overcome resource constraints and enables smaller entities to compete effectively with larger entities by lowering R & D overheads
  - Reduction in costs of acquiring seed compared with the costs of acquiring proprietary seeds from a corporate entity.

# Why Open Source May Work in the Plant Germplasm Area

(7) Motivations for using the “open source” model in the plant germplasm context are [arguably] more profound (farmers’ survival or preservation of plant genetic resources) than they are in the software context

# Why “Open Source” May NOT Work in the Plant Germplasm Area

(1) Difficulties in creating and managing the user communit(ies). In the software context the role of project leader of usually includes:

- Providing the basic intellectual content and continuing to supply the project with new contributions.
- Setup and maintenance of effective community structures that maximize users’ motivation to contribute
- Keeping up morale

# Why “Open Source” May NOT Work in the Plant Germplasm Area

(1) Difficulties in creating and managing the user community Communication issues

(cont'd)

- Information in the plant breeding context is far less codified and more dynamic than in the software context
- May be partially ameliorated by creating communication infrastructure of newsgroups, databases and improvement repositories

# Why “Open Source” May NOT Work in the Plant Germplasm Area

- (1) Difficulties in creating and managing the user community Communication issues (cont'd)
  - Quality Control issues
  - Qualities may not be as readily verifiable as in the software context
  - Dispute Resolution issues among contributors or between contributors and project leaders

# Why “Open Source” May NOT Work in the Plant Germplasm Area

## (2) Potential regulatory issues?

- In the international context: what is the effect different sovereigns restricting movement of plant genetic material?
  - CBD: informed consent?
- International Treaty on Plant Genetic Resources (for Food and Agriculture) [ITPGR, June 2004]
  - 66 crops and forages in a ‘public domain’
  - All others = sovereign national property

# Why “Open Source” May NOT Work in the Plant Germplasm Area

- (3) Patent/Antitrust Issues: In situations where the GPL (or MTA) license protects a core feature and users are permitted to seek proprietary rights only on the condition that they make the innovations available to all.
- Patent Misuse Issues?
    - Seeking to extend scope of patent beyond protected technology
  - Antitrust issues?

# Why “Open Source” May NOT Work in the Plant Germplasm Area

(4) Proliferation of GURTs pose challenges to an open source system

- Not only is the use of seeds protected by such technologies prohibited legally, but it may be impossible since such seeds are designed to not replicate (anti-germination technology).

# Conclusion

- Farmers have access to necessary tools to develop seed varieties
  - i.e., MASIPAG's organic seed varieties
  - Use GPL-like “legal” software re: MTAs
    - Ensure work remains available to farmers and may be produced and marketed by companies (in the same way as Linux)
    - BUT Companies would be legally bound to disclose how the new seed was developed AND not claim ownership of genetic information

# Conclusion

“Breeding is a strategic activity that benefits the entire society. Should the costs 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)



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