

Establishing Best Practices for Germplasm Exchange, Intellectual Property Rights, and Revenue Return to Sustain Public Cultivar Development

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ABSTRACT

Intellectual property rights (IPRs) can play critical roles in protecting the genetic integrity of cultivars and generating revenue to support continued breeding. While private and public seed sectors share the goal of developing improved cultivars, important differences must be considered when using IPRs for publicly developed cultivars. A summit was held to discuss challenges and provide recommendations on IPRs and funding for public plant breeding programs. Recommendations on professional standards for germplasm exchange and best practices for revenue return to public breeding programs are discussed here.

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Abbreviations: IPR, intellectual property rights; MTA, Materials Transfer Agreement.

PUBLIC breeding programs depend on germplasm sharing among programs. As intellectual property rights (IPRs) become more restrictive, they limit public sector access to germplasm and potential for continued innovation (Myers, 2016). Public plant breeding often focuses on crops with high social value but low private returns, or longer term payoff (e.g., perennials, cover crops). Reductions in public grant funds for cultivar development make programs more dependent on royalties, leaving these beneficial (but less remunerative) public sector programs at risk (Brummer, 2016; Dillon, 2016; Francis, 2016; Sligh, 2016; Smith, 2016). When commercializing public cultivars, it is critical to use IPRs that not only produce royalties but also allow germplasm exchange and appropriately value the contributions of public plant breeders (Dever, 2016; Dillon, 2016).

BACKGROUND

A survey of public plant breeders conducted by Shelton and Tracy (2017) revealed that most new germplasm used by public cultivar development programs comes from the public sector, with 49.4% coming from other public breeding programs and 24.7% from the USDA National Plant Germplasm System. Only 5.6% came from private industry. Almost all public plant breeders (95%) regularly share germplasm with others in the public sector. Over half (61%) use a Materials Transfer Agreement (MTA) for these exchanges, and 68% say that these MTAs restrict their freedom to operate.

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Clonally propagated crops tend to have more restrictive MTAs, with 41% of exchanges restricting crossing and seed saving compared with 28% of exchanges for seed-propagated crops.

Findings and Recommendations

To address challenges and opportunities surrounding IPRs and funding for public cultivar development, a two-day conference was held before the National Association of Plant Breeders' annual meeting in Raleigh, NC, in August 2016. The findings and recommendations below are a result of the presentations and discussions at this conference.

Intellectual Property Rights for Public Sector Germplasm and Cultivars

Current germplasm exchange policies are inconsistent across public sector institutions and often restrict plant breeders' freedom to operate. More restrictive MTAs often originate from university technology transfer offices, rather than from breeders, and there is significant frustration with MTAs being sent by breeders' own institutions (Tracy, 2016).

Recommendation: *develop a professional standard like the Wheat Workers' Code of Ethics for public sector germplasm exchange and release.*

This professional standard would serve both for prerelease MTAs and to guide IPR protection on public cultivar release. This standard must make publicly developed cultivars immediately available for breeding and allow farmers to save seed of these cultivars. The Plant Variety Protection Act and licenses modeled after the Wheat Workers' Code of Ethics allow for continued use of germplasm for breeding (Colley, 2016; Romano, 2016; Sligh, 2016). If used, utility patents and licenses should be written so that the material can be used for breeding.

Funding Cultivar Development at the Institutional Level

Institutions have different royalty-sharing agreements that direct royalty money back to breeding programs to varying degrees. These inconsistencies reduce the ability of IPR to promote innovation through future cultivar development (Brummer, 2016; Endelman, 2016; Francis, 2016; Luby, 2016; Smith, 2016; Tracy, 2016).

Recommendation: *develop best practices for revenue sharing.*

Universities must provide a reasonable portion of revenues to breeding programs for continued cultivar development. Cultivar development may be considered a type of university-sponsored startup (Tillman, 2016). As university-owned IPRs are the primary asset of such startups, if

the university collected all the revenue from inventions and did not allow the start-up to reinvest this revenue in their business, they would quickly cease to exist. This is essentially what is happening to public cultivar development programs at some institutions, as royalties that formerly supported continued breeding efforts have been diverted to other university uses (Smith, 2016). Other institutions return a reasonable amount of revenue to cultivar development programs (Endelman, 2016; Tillman, 2016).

Capacity Funding for Public Cultivar Development

Royalties will not generate sufficient funds for most public breeding programs. Many conference attendees felt that cultivar development in the public interest can address crops and traits that are neglected in the private sector because they are not sufficiently profitable. Examples include perennial and cover crops for conservation, regionally important crops without large seed markets, and crops with consumer benefits such as increased nutritional content. Given that a major role of public plant breeding programs is to promote the public interest by filling less profitable niches, IPRs alone are unlikely to sufficiently fund public cultivar development (Brummer, 2016; Francis, 2016; Smith, 2016).

Recommendation: *increase Farm Bill authorization and appropriations to support public cultivar development. This includes increased base funding for programs and better targeting and availability of competitive grants (Brummer, 2016; Smith, 2016).*

CONCLUSION

The exchange of germplasm is critical for continued innovation and relevance of public plant breeding programs. To ensure continued germplasm exchange among public programs, we need a united professional voice to counter the increasing restrictions on germplasm sharing and reduced funding for public cultivar development.

Public cultivar development is critical for the future of agriculture, particularly to address the regional needs of farmers, and for long-arc breeding projects to make agriculture more resilient, productive, and sustainable. Implementing best practices for public sector IPRs and ensuring adequate funding for cultivar development are critical to maintaining vibrant public plant breeding programs.

Final Word on International Germplasm Exchange

The conference in Raleigh only addressed public plant breeding programs in the United States. International germplasm exchange faces even greater difficulties. Despite intense efforts to address the problems of conservation, exchange, usage, and fair returns, many collections are

little used and at great risk. It is critical that we find mechanisms to maximize the use of the genetic diversity and to return revenue to the collections and countries that developed and maintained the germplasm. For the full recommendations and proceedings, see Tracy et al. (2016).

Conflict of Interest

The authors declare that there is no conflict of interest.

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