

# Consortium on Law and Values in Health, Environment & the Life Sciences

## Consortium/JDP Proposal Cover Page

### Applicant Information

Applicant Name: Philip Pardey Date: 2-5-08

Project Title: An Economic Evaluation of Intellectual Property Rights in the U.S. Horticultural Sector

Dept./Center: Applied Economics / InSTePP Member of Consortium  Member of JDP

Dept./Center Head's Name: Robert P. King Dept./Center Head's email: rking@umn.edu

Dean's Name: Allen S. Levine Dean's email: aslevine@umn.edu

How did you hear about this funding opportunity? email

### Funding

Amount of funding requested: \$ 18,000  
*Explain how these funds will help the Consortium member or JDP partner program further their work on the societal implications of the life sciences. Indicate if more than one Consortium/JDP partner program is involved.]*

This research project, which examines the role of intellectual property rights pertaining to plant innovations and assesses their economic consequences by analyzing their impacts on varietal values, will advance InSTePP's work on developing quantitative perspectives on investments in plant science and technology. Insights that have eluded previous studies could be gained with this research which studies a plant subsector that accounts for much of the varietal-related property rights and where the price premiums are particularly pronounced rather than low-valued food and feed crops. These insights would contribute to the development of a functional knowledge, of intellectual property as an incentive for investments in plant innovation, with domestic and international applications.

### Approvals

*Check all appropriate approvals required for your proposal. Approvals must be obtained prior to receipt of funding. If you have applied for approval but have not yet received it, indicate that approval is pending.*

IRB Date submitted: \_\_\_\_\_ Number: \_\_\_\_\_

IACUC Date submitted: \_\_\_\_\_ Number: \_\_\_\_\_

Other Explain: \_\_\_\_\_

### For Use by the Consortium Office

The proposal is 2000 words or less excluding budget, biographies, references & citations.  
The proposal includes a work plan with a timeline using months or quarters to identify work to be done and completion dates.

The budget form is complete including the funds sought for this project, other pending applications for this project, and the amount/source of matching or other funds.

Faculty descriptions and roles on the project are included.  
A biographical sketch for each investigator or project leader (limited to one page per investigator or leader) is included.

Approval (via email) from the administrator with fiscal responsibility for the department, program, or center is included.

All necessary approvals are pending or received.

February 3, 2008

## **Application for Consortium Grant on the Societal Implications of the Life Sciences**

**Project Title:** An Economic Evaluation of Intellectual Property Rights in the U.S. Horticultural Sector

**Sponsoring Center:** International Science and Technology Practice and Policy Center (InSTePP)

**Amount Requested:** \$ 18,000

**Approvals Documentation:** None required

**Applicant:** Philip Pardey, Director, International Science and Technology Practice and Policy Center (InSTePP)  
Email: ppardey@umn.edu; Phone: 612 625 2766

### **Project's Nature and Importance**

There continues to be considerable controversy surrounding the comparatively recent expansion in the scope of intellectual property protection of plant varieties in the United States (and elsewhere in the world). Much, but by no means all, of the controversy centers on the implications of legal forms of intellectual property rights for continued varietal innovation in U.S. agriculture, access to and use rights for improved crop varieties in the United States, and the access consequences for other, especially developing countries, regarding improved crop varieties. A good deal of these intellectual property rights concerns reach back to more fundamental concerns about our collective ability to sustain the substantial past rates of productivity gains in food production attributable to crop varietal innovations, especially in the face of continued increases in the global demand for food and animal feed population and per capita incomes continue to grow.

No doubt motivated, at least in part, by these concerns, the limited prior literature on the varietal innovation consequences of intellectual property protection focuses almost exclusively on food and feed crops.<sup>1</sup> Moreover, most of these studies deal with the effects of plant breeders rights, with much less attention being paid to plant patents, and the more recently introduced, utility patents pertaining to plants. The take home message from these past studies is that intellectual property protection has had little measurable effect on the rate and nature of innovation in agriculture and especially on the rate of productivity (yield) gains in the crops subject to study.

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<sup>1</sup> These studies include Perrin, Kunnings, and L.A. Ihnen. (1983), Butler and Marion (1985), Stallman (1986), Knutson and Pray (1991), Penna (1994), Hansen and Knutson (1996), Lesser (1997), Alston and Venner (2002), Diez (2002), Rangnekar (2002), and Janis and Kesan (2002).

However, as Koo, Nottenburg and Pardey (2004) and, more recently, Koo et al. (2008) show, there have been big structural changes in the pattern of intellectual property protection for plants in the United States: specifically with respect to the form of protection being sought—be it plant patents, utility patents, or plant breeders rights—the agent (e.g., individuals vs firms vs universities vs government agencies) seeking protection; and the plant species being protected. In fact the lion's share of the plant protection in the United States concerns high-valued horticultural (fruit and vegetable) and ornamental (including turf grasses) plants, not cereal crops with low unit values. Moreover, plant breeders' rights, the focus of most prior studies, are but one form of relevant property protection. In addition to plant and utility patents there is a substantial and rapidly growing effort to brand these high-valued crops and gain value from protection of varietal innovations via other forms of legal protection such as trademarks.

Perhaps the failure to empirically reveal any significant economic or innovation effects of intellectual property rights in past studies was because these studies focused on the wrong crops or were unduly circumscribed in the types of intellectual property under consideration.<sup>2</sup> In addition, other plant-specific attributes such as the type of plant, their color, form, growth habit, hybrid vs non-hybrid and sexual (seed) vs asexual (vegetatively) propagated properties, resistance to biotic and abiotic stresses, and so forth may affect the magnitude of the varietal premiums to be realized, thereby confounding or masking any price premium effects from seeking and exercising legal property right protection.

The overarching objective of this study is to carefully re-examine the role of intellectual property rights pertaining to plant innovations and to assess their economic consequences by analyzing their impacts on varietal values. We do this by compiling and econometrically assessing new, detailed, varietal-specific information on plant attributes and a range of intellectual property forms for a number of economically important ornamental crops. Studying a plant subsector that accounts for much of the varietal-related property rights and where the price premiums are particularly pronounced may well reveal economically important insights that have eluded the few previous studies on this topic, which focused almost exclusively on low-valued food and feed crops.

To conduct this study, a hedonic pricing model will be adapted to the particulars of the plant sector, wherein plant varietal prices will be econometrically decomposed into the various attributes giving rise to these plant prices. In particular, the hedonic method will make it possible to establish if intellectual property rights (including trademarks as well as more obvious forms of plant protection) are associated with any price premiums

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<sup>2</sup> Notably, Singh (1999), Lee and Blank (2004) and Jerardo (2006) provide evidence of the now substantial and still rapidly growing economic value of the ornamental plant sector, particularly the bedding plant and nursery plant components of that sector. Alston et al. (2008) and Koo et al. (2008) elaborate in more detail on these little appreciated economic developments reshaping the U.S. food and agriculture sector.

separate from, or in addition to, particular plant and market attributes that may also account for price differences among the important ornamental plant varieties included in our study.

Thus a main objective for this research is to determine the sources of economic value for ornamental plants, and in particular to:

- Identify plant and industry differences that affect pricing and the appropriability of expected revenues from new plant varieties.
- Identify other, often unobserved, non-plant characteristics that contribute to price premiums, such as firm reputation, trademarks, branding, and registration of varieties with plant societies.
- Assess if different types of intellectual property protection contribute more or less to the variation in (wholesale) plant prices, and especially to assess if those types of intellectual protection most closely associated with plant innovation effort (e.g., plant and utility patents and plant breeders rights) account for a larger share of the varietal premium than other forms of property protection (e.g., trademarks) more closely related to marketing plant varieties.
- Reveal any complex and subtle interaction effects among the different forms of property protection that may affect price premiums. To the extent possible, the interplay between marketing- vs innovating-oriented forms of property rights will be investigated.

We expect the results of this research to be of interest to individuals and agencies well beyond conventional academic circles and also span those with professional interests in the horticultural, legal and economic areas. For example, senior personnel from the World Intellectual Property Organization (WIPO) have expressed strong interest in the results of this study in relation to the policy and legal recommendations they are shaping (especially regarding developing country markets in which plant-related intellectual policies and practices are under active development). In addition, we envisage policy makers and those affected by and seeking intellectual property protection on plant varieties in the United States will be especially interested in these results, and efforts will be made to develop outreach material for those audiences. Finally, and closer to home, the University of Minnesota continues to struggle with appropriate policies regarding the intellectual property protection of its varietal innovations, especially those concerning horticultural plants, and so university officials should also find this work of direct interest.

## Work Plan and Time Line

- **Final rounds of data collection, checking and cleaning [April 2008 to June 2008]**

Three years of varietal specific price data have already been collected and entered into a database [February 2007 to September 2007].<sup>3</sup> Currently characteristic data for each variety for which prices have been collected are being coded and entered in an integrated fashion into these same databases [September 2007 to May 2008].<sup>4</sup>

Once the data are entered and organized, a good deal of cross-tabulation, graphing, and other techniques will be deployed to weed out data entry errors and check for consistency, completeness, and so forth [conclude by early June 2008].

- **Data analysis [May 2008 to July 2008]**

The methodology to be deployed by this study is drawing from the hedonic equilibrium framework for factors of production developed by Rosen (1974) and extended by Lad and Martin (1976). More recent developments by Pakes (2002) to include market power and mark-ups for innovative products into a hedonic framework are also being taken into account.

Once the model is finalized over the coming months, an intensive round of econometric work will be undertaken during the period May-July 2008. Hopefully the substantive effort that has gone in to cleaning and standardizing the structure of the primary data will streamline the construction of the empirical variables and the conduct of the econometric analysis.

- **Finalize thesis writing [August 2008 to December 2008]**

During this phase the econometric results will be written up and integrated with other material pertaining to the data construction, descriptive analysis and model development.

- **Dissertation defense and report preparation [Early and mid Spring 2009]**

Once the thesis is defended [target date early Spring 2009] summary forms of the work will be prepared for professional and other outlets.

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<sup>3</sup> The total number of varietal cum firm cum time-period observations in the data set total around 20,000.

<sup>4</sup> The total number of distinct varieties included in the data set is about 2,000 varieties. The plant types included in this study are *Clematis*, *Coreopsis*, *Echinacea*, daylily (*Hemerocallis*), *Heuchera*, *Hosta*, *Phlox*, maple (*Acer*), *Azalea* (*Rhododendron*), *Hibiscus*, *Hydrangea*, holly (*Ilex*), Juniper (*Juniperus*), rose (*Rosa*), and *Spirea*, and the data set spans three years from 2005 to 2007. All the data have been compiled by hand from wholesale plant catalogues obtained from 9 firms with significant market positions in ornamental sector in the United States.

## Funding

Most of the funding sought via this grant is for the time of the graduate research assistant, Jennifer Drew. Funding by way of a Siehl Endowment Research Fellowship and very limited unencumbered (and now spent) funds from the InSTePP center has covered Jennifer's time until this point. However, the additional time and resources being sought here will be required to bring this research to conclusion. The original data being compiled for this study, plus the subject matter, evaluating the price premium effects of intellectual property rights for horticultural crops, is an entirely new departure for the PI, and the graduate RA. It has thus taken more time and effort to undertake this new line of work than was guesstimated at its inception.

No funding for the PI's time is being sought via this proposal, nor is funding for the time of project collaborator Dr. Neil Anderson (Horticultural Department, St Paul campus) and project advisor Carol Nottenburg (Cougar Patent Law, Seattle). Some modest travel funds are being sought to facilitate links with Dr. Jennifer James (PhD reader and project econometrics consultant) who is based at California Polytechnic State University, San Luis Obispo.

## Budget

Category	Description & justification	Requested funding
		<b>Amount</b>
Personnel		
The departmental rate for Ph.D. research assistants is \$18.64 per hour	Salary = 495 hrs x 18.64 hrly wage	<b>9,225</b>
	Fringe rate 78.6%	<b>7,250</b>
	Data collection and analysis, and thesis and report writing.	
	<b>Subtotal</b>	<b>16,475</b>
Travel		
<i>Travel costs must include a description of the purpose of the travel, start and stop dates of travel, transportation costs, housing costs, and allowable per diem (use University rates found at <a href="http://travel/umn.edu">http://travel/umn.edu</a>).</i>	Travel costs for Dr. James to travel to Minnesota from San Luis Obispo. Estimated air fare of \$500 roundtrip, plus airport shuttle, lodging and meals per diem in the Twin Cities at \$185 for 4-5 days.	<b>1,525</b>
	<b>Subtotal research supplies, equipment, travel, other</b>	<b>18,000</b>
<b>TOTAL BUDGET</b>		<b>18,000</b>

## References

- Alston, J. M. and R. J. Venner. "The Effects of the US Plant Variety Protection Act on Wheat Genetic Improvement." *Research Policy* **31**(2002): 527-542.
- Butler, L. J. and B. W. Marion. *The Impacts of Patent Protection on the U.S. Seed Industry and Public Plant Breeding*. North Central Regional Research Publication no. 304, College of Agricultural and Life Sciences, University of Wisconsin-Madison, 1985.
- Diez, M. C. F. "The Impact of Plant Varieties Rights on Research: The Case of Spain." *Food Policy* **27**(2002): 171-183.
- Hansen, L. and M. Knudson. "Property Right Protection of Reproducible Genetic Material." *Review of Agricultural Economics* **18**(3)(1996): 403-414.
- Janis, M. D. and J. P. Kesan. "U.S. Plant Variety Protection: Sound and Fury...?" *Houston Law Review* **39**(3)(2002): 727-788.
- Jerardo, A. *Floriculture and Nursery Crops Situation and Outlook Yearbook*. Washington D.C., U.S. Department of Agriculture, 2006, p. 120.
- Knudson, M. and C. E. Pray. "Plant variety protection, private funding, and public sector research priorities." *American Journal of Agricultural Economics* **73**(3)(1991): 882-886.
- Koo, B., P.G. Pardey, J. Drew and C. Nottenburg. "Protecting plant Varieties in the United States: Long-run Patterns of Growth and Tests of Structural Change." Working Paper, International Science and Technology Practice and Policy Center. St Paul: University of Minnesota, 2008 (in preparation).
- Koo, B., C. Nottenburg, and P.G. Pardey. "Plants and Intellectual Property: An International Appraisal." *Science* **306** (November 2004): 1295-1297.
- Ladd, G. W. and M. B. Martin "Prices and Demands for Input Characteristics." *American Journal of Agricultural Economics* **58**(1)(1976): 21-30.
- Lee, H. and S. C. Blank. *A Statistical Profile of Horticultural Crop Farm Industries in California*, University of California, Davis, 2004.
- Lesser, W.. "Assessing the Implications of Intellectual Property Rights on Plant and Animal Agriculture." *American Journal of Agricultural Economics* **79**(5) (1997): 1584-1591.
- Pakes, A. "A Reconsideration of Hedonic Price Indexes with an Application to PC's." *American Economic Review* **93**(5)(2003): 1578-1596.
- Penna, A. L. d. R. *An Analysis of the Impact of Plant Breeders' Rights Legislation on the Introduction of New Varieties in UK Horticulture*. Doctoral Thesis, Wye College. London, University of London, (1994).
- Perrin, R. K., K. A. Kunnings, and L.A. Ihnen. *Some effects of the US Plant Variety Act of 1970*. Economics Research Report no.46, North Carolina State University, Raleigh, NC, 1983.
- Rangnekar, D. "R&D Appropriability and Planned Obsolescence: Empirical Evidence from Wheat Breeding in the UK (1960-1995)." *Industrial and Corporate Change* **11**(5) (2002): 1011-1029.
- Rosen, S. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *The Journal of Political Economy* **82**(1)(1974): 34-55.
- Singh, S. P. "The Changing Structure of the U.S. Green Industry: Factors Influencing Opportunities and Issues." *Journal of International Food & Agribusiness Marketing* **10**(2)(1999): 65-83.
- Stallmann, J. I. *Impacts of the 1930 Plant Patent Act on Private Fruit Breeding Investment*. Doctoral Thesis, Department of Agricultural Economics. Ann Arbor, Michigan State University (1986): 287.

## Biosketch Principal Investigator (Philip Pardey)

### Education

University of Minnesota	Ph.D.	1986	Applied Economics
University of Adelaide	M.Agr.Sc.	1979	Agricultural Economics
University of Adelaide	B.Ec.	1979	Economics
University of Adelaide	B.Agr.Sc.	1975	Agricultural Science

### Positions and Honors

2002-	Professor, University of Minnesota and Director, University of Minnesota Center for International Science and Technology Practice and Policy (InSTePP)
1994-2002	International Food Policy Research Institute (IFPRI), Washington D.C.: 1994-1998, Research Fellow; 1999-2002, Senior Research Fellow (Leader, IFPRI Science and Technology Policy Program)
1984-1994	International Service for National Agricultural Research (ISNAR), The Hague: 1984, Consultant; 1985-1986, Research Fellow; 1986-1989, Research Officer; 1990-1994, Senior Research Officer
1979-1984	Graduate Research Assistant, University of Minnesota, Department of Agricultural and Applied Economics
1978-1979	Research Assistant, University of Adelaide, Department of Economics

### Honors and Awards (partial listing)

2007	Distinguished Fellow, Australian Agricultural and Resource Economics Society
2007	Quality of Communication award, Australian Agricultural and Resource Economics Society
2006	Fellow, American Agricultural Economics Association
2004	Quality of Communication award, American Agricultural Economics Association
2001	Outstanding Paper on plant genetic resources, Crop Science Society of America
2001	Distinguished Policy Contribution, American Agricultural Economics Association
2000	Outstanding Published Research award, Western Agricultural Economics Association

### Research Interests and Background

Pardey's research deals with the finance and conduct of R&D globally, methods for assessing the economic impacts of research, and the economic and policy (especially intellectual property) aspects of genetic resources and the biosciences. He has considerable international experience, leading regional projects in Asia, sub-Saharan Africa and Latin America and the Caribbean, and country projects in Argentina, Australia, Brazil, China, Indonesia, Kenya, Niger, and the United States. He is author of more than 215 books, articles, and papers, including, *Ending Hunger in Our Lifetime: Food Security and Globalization* (John Hopkins University Press, 2003), *Saving Seeds: The Economics of Conserving Crop Genetic Resources Ex Situ in the Future Harvest Centers of the CGIAR* (CAB International 2004), and *Agricultural R&D in the Developing World: Too Little, Too Late?* (International Food Policy Research Institute, 2006). He was recently commissioned by the World Bank to prepare the background paper on science and technology that was the core of the material used on this theme in preparing the Bank's recently released flagship publication the *World Development Report 2008*.

### **Biosketch of Student Investigator (Jennifer Drew)**

Jennifer Drew is a PhD. Candidate in applied economics with a minor in statistics at the University of Minnesota. In 2001, she received a Bachelor of Science degree in economics at the University of Minnesota. She was awarded a Siehl Endowment Research Fellowship that extended from 05/2003 to 05/2007. Drew's research interests are science and economic policy, industrial organization, consumer behavior, and econometrics. Her research experience outside this project includes: the socio-economic issues concerning genetic manipulation of crops; the evolution of intellectual property rights for plants in the United States in relation to crop and plant markets, and horticultural industries; and the technological and evolving structural realities of these crop and plant markets.

Drew's work experience prior to her graduate studies uniquely complements this research application in the ornamental plant industries. She owned and managed a cut flower production and retail business for ten years while serving as a board member for the St. Paul Growers and Buyers Association. As a founding member and president of the Friends of the St. Paul Farmers' Market, she helped plan and raise funds for the St. Paul Farmer's Market's renovation and indoor facility.

February 3, 2008

Professor Susan M. Wolf  
Director, Joint Degree Program in Law Health, Environment & the Life Sciences  
University of Minnesota  
N140 Mondale Hall  
229 19<sup>th</sup> Avenue South  
Minneapolis, MN, 55455  
190 Coffey Hall  
St Paul MN, 55108  
(Attention Audrey Boyle)

Dear Susan:

**RE: Consortium Grant on the Societal Implications of the Life Sciences**

I am writing to support Professor Pardey's application on behalf of the InSTePP center (which is administratively housed in the Department of Applied Economics) for a Consortium Grant.

The work Dr Pardey proposes to conduct with these funds extends his Center's research on the economics of intellectual property rights in the biosciences into new areas. It also draws in a range of collaborators from other disciplines and areas of expertise, including colleagues from the horticultural sciences at the University of Minnesota, legal expertise from a practicing patent attorney and specialized econometric expertise (from two additional collaborators who are external Research Fellows of InSTePP) in the cross-disciplinary spirit and intent of this grant program.

If this application is successful, the Department of Applied Economics will provide administrative and budget management support in accordance with the requirements of the Consortium.

Please let me know if there is any more information you need from my office in support of this grant application (email: [rking@umn.edu](mailto:rking@umn.edu); phone: (612) 625-0231)

Yours sincerely,



Robert P. King  
Professor and Head