THE BENEFITS AND COSTS OF ALTERNATIVE POLICIES FOR THE MANAGEMENT OF PIERCE'S DISEASE

Principal Investigator:
Julian M. Alston
Dept. Agric. & Res. Econ.
University of California
Davis, CA 95616
julian@primal.ucdavis.edu

Grad. Student Researcher:
Kate Fuller
Dept. Agric. & Res. Econ.
University of California
Davis, CA 95616
fuller@primal.ucdavis.edu

Cooperator:
M. Andrew Walker
Dept. Viticul. and Enology
University of California
Davis, CA 95616
awalker@ucdavis.edu

Cooperator:
Matthew Daugherty
Dept. of Entomology
University of California
Riverside, CA 92521
matt.daugherty@ucr.edu

Cooperator:
Barry Hill
Pierce's Disease Control Prog.
Calif. Dept. Food & Agric.
bhill@cdfa.ca.gov

Other Participant:
Kabir P. Tumber
Dept. Agric. & Res. Econ.
University of California
Davis, CA 95616
tumber@primal.ucdavis.edu

Other Participant:
Jonathan Kaplan
Dept. of Economics
California State University
Sacramento, CA 95819
kaplanj@saclink.csus.edu

Other Participant
James Sanchirico
Dept. of Envir. Sci. & Policy
University of California
Davis, CA 95616
jsanchirico@ucdavis.edu

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ABSTRACT
We address economic questions related to Pierce's disease (PD) by developing and applying a quantitative model of the supply and demand for California wine and wine grapes. The economic component of this model combines existing wine market models with some entirely new elements. The biophysical component draws on a range of technical information and, where appropriate, evidence from crop and disease simulation modeling. We have consulted with scientists who study the disease and its vectors. Drawing on their advice, combined with information gleaned from interviews with vineyard managers, we have modeled the problem of the blue green sharpshooter in Northern California. By doing so, we have gained a better understanding of how to model the statewide PD problem. During the past year, we have shifted our emphasis to the role of the glassy-winged sharpshooter and the problems it poses in the southern regions of the state, and incorporated both vectors into a model that is designed specifically to evaluate the likely expected benefits from investments in alternative R&D projects related to the management of PD.

LAYPERSON SUMMARY
Our initial learning and progress led us to revise some aspects of the research strategy, but the work has gone generally according to plan, albeit after a delayed start. In the first two years of the project we concentrated on gathering data and other information, learning about Pierce's disease and the sharpshooters that spread it, and building vineyard-level models. We began by creating a vineyard-level model of the economic impacts of the disease in the Napa Valley. More recently we have worked to extend that model so that it can reflect the varying situation across the state and to incorporate the role of the glassy-winged sharpshooter. In the past year, in particular, we have worked to combine elements from the vineyard-level model with other elements to develop a three-region, statewide simulation model that can be used to evaluate the benefits from investments in alternative R&D projects.

INTRODUCTION
It is widely accepted that Pierce's disease (PD), with its vectors, including the glassy-winged sharpshooter (GWSS, *Homalodisca vitripennis*), has large current and very large potential economic consequences. However, we are not aware of other studies that have modeled and measured the economic consequences. Siebert (2001) discussed the economics and he estimated that the value of lost wine grape production—in Temecula, Riverside County, alone, in 1988 and 1989—was worth $37.9 million to California. Echoing that sense of economic importance, the National Research Council of the National Academies (2004) undertook an extensive study and published a book on California research priorities focused on PD. That book does not contain estimates of the economic consequences of PD nor alternative management or control methods, but it does provide a comprehensive documentation of knowledge about the problem, as well as a useful classification of types of research, and priorities among them, including economic research. Further work is needed to develop a quantitative economic understanding of PD and alternative policies to address it.

OBJECTIVES
The overall objective of this project is to develop a detailed, practical, quantitative understanding of the economic consequences of PD and alternative management strategies. More specific objectives are to quantify the current and potential economic impact of the disease, to estimate the potential economic payoff to investments in PD R&D, to evaluate alternative management strategies including alternative research investments, and to guide policy decisions, including research priorities. Additionally, we aim to study the economic aspects of regional differences across California in PD and its associated vectors, allowing for a better economic understanding of the problem and a more precise evaluation of alternative management regimes. To pursue these objectives, we propose to develop an economic model of the California wine and wine-grape sector. The model will be structured to allow us to simulate market outcomes under alternative scenarios for the prevalence of PD, and alternative technologies and policies for its management, and to assess the economic consequences of these alternatives for various stakeholder groups. The model will be designed specifically with a view to evaluating the likely expected benefits from investments in alternative R&D projects related to the management of PD.

RESULTS AND DISCUSSION

Our project commenced formally on September 1, 2008. The project was originally due to end on June 30, 2011. In May 2011 we received approval for a 12-month no-cost extension to the project to allow us to complete the work and make best use of the expertise of the team to draw useful insights and publish (and publicize) the results. We are presently about six months behind the original schedule, reflecting the combination of a delayed start (while we waited for funding to be approved), a slow beginning (as we learned that we had to revise our modeling strategy), and some further delays as we sought to identify suitable assistance in view of the revised strategy. More recently, we have been making excellent progress having established a revised strategy and put together a very good team appropriate to that strategy, and being able to draw upon the necessary investment in learning about the issues. Kate Fuller has been employed as a Graduate Student Researcher to work on the project since the outset, and Kabir Tumber, Jonathan Kaplan, and Jim Sanchirico have been actively involved, especially during the current year. We have benefited on a continuing basis from advice from our co-operators and other experts, both in informal settings and in a half-day modelling workshop we held at Davis, in July 2011, including the project team members and other economists.

In the initial phases of work we emphasized investment in developing our own knowledge and information resources and creating preliminary models. One important element of this was to develop a detailed database on the economics of wine and wine grape production in California. We have completed the data-gathering phase, and are compiling the information into a report documenting by county and crush district for each important grape variety the area planted, yield, quantity produced (crush volume), and price over the past 30 years. We also made some investment in learning how to structure and use models of spatial-dynamic processes such as the spread of disease, through consulting with scientists and others and reviewing literature. As a result we have made significant progress in developing an understanding of the pest and disease problem, as well as an overview of the issues.

Having learned that the PD/GWSS problem would be difficult to model, we opted to focus initially on studying the issues as they arise in the north coastal valleys, where PD is spread by native sharpshooters (in particular, the blue green sharpshooter). To guide our efforts to understand the issue in that area, we conducted interviews with vineyard managers, utilizing a process known as "participatory mapping," in which managers were asked to sketch out PD incidence, controls, and associated costs onto aerial images of their vineyards. This approach enabled us to develop some economic data and insight into the problem, management strategies, and costs of prevention, control, and eradication strategies, which has helped us in designing approaches to study the more general problem, including the role of the GWSS. In December 2010, Kate Fuller traveled to Temecula to conduct a series of interviews similar to those conducted in Napa. These interviews with growers, buttressed with discussions with scientists and others, were helpful in understanding the problem and have been useful in designing and parameterizing models. We have recently completed the development of a dynamic simulation model of the production and pricing of winegrapes in California. This integrated three-region supply and demand model can be used to simulate 50-year forward projections of the production and prices of California winegrapes, by region, under various scenarios of pest and disease prevalence and policy, and the associated pattern of benefits and costs to growers and others. We expect to have a range of initial simulation results in hand for presentation at the annual workshop. We plan to spend the first quarter of 2012 conducting further simulations and analysis, in light of things learned from the workshop among other things, and to spend the second quarter of 2012 writing up the results and wrapping up the project.

Based on the work to date, Kate Fuller has written two research essays (as required by the Ph.D. program in Agricultural and Resource Economics at UC Davis). These essays entailed a review of relevant literature and the development of the framework for a general economic model of vector-borne disease as applicable to PD. As well as providing a useful reference document for our project, they formed the basis for Kate's oral qualifying examination and dissertation prospectus. Kate's dissertation, which will be completed within the next six months, entails elements related to the main objectives of the project. We have drafted papers on the modeling of PD/GWSS in the Napa Valley and the costs of PD in California, which we expect to have submitted for publication before the end of 2011.

CONCLUSIONS

None to date.

REFERENCES CITED

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