AREC 705 Agricultural Production and Technological Change

Instructor Information

Instructor: Alexandra Hill
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Communication Policy: Responses to emails will be provided within 24 hours during normal business hours (i.e. Monday-Friday 8am-5pm). Please do not expect prompt email responses in late evenings or on weekends.

Office Hours: Tuesday 3:30-4:30pm in Nutrien 213 (and by appointment)

Course Meeting Days and Times: T-Th, 11am – 12:15pm
Course Meeting Location: CHEM B305

Course Description & Objectives

This course will study and apply modern theoretical and empirical approaches to understand producer decision-making under uncertainty, technology adoption and effects of innovation, measurements of technical efficiency and productivity, and advanced models of agricultural markets.

Upon the completion of this course, students will be able to:

1. Identify the contributions of existing literature and explain the theoretical and empirical modeling techniques used in this literature.
2. Infer the appropriate modeling technique(s) to answer a research question related to agricultural production and technological change.
3. Implement modeling techniques to answer real-world problems within the field of production economics.
4. Generate novel research questions.
5. Articulate contributions and defend modeling choices and interpretation of results for novel research questions.
6. Critique research on the importance of a contribution, appropriateness of modeling techniques, accuracy in interpreting results, and presentation of information.

Participation/Behavioral Expectations

You are expected to participate in course discussions every week. This will require you to review 1-2 assigned readings each week and be prepared to discuss the readings, pose questions, etc. I anticipate that you will spend an average of 6-9 hours per week working on course assignments, including reading materials, and completing assignments.

Course Policies (late assignments, make-up exams, etc.)

Late assignments will receive a +/- letter grade lower per day the assignment is late. As an example, if your assignment would have earned an A submitted on time, you will receive a B+ if you submit it two days late. If you cannot submit an assignment on time due to illness or other unforeseen circumstances, please communicate with me at least two days prior to the due date and we can discuss options to reduce penalization.

Grading Policy

Grade	Range
A+	100% to 96.67%
A	<96.67% to 93.33%
A-	<93.33% to 90.0%
B+	<90.0% to 86.67%
B	<86.67% to 83.33%
B-	<83.33% to 80.0%
C+	<80.0% to 76.67%
C	<76.67% to 70.0%
D	<70.0% to 60.0%
F	<60.0% to 0.0%

As a student enrolled in this course, one of your responsibilities is to submit course work by the due dates listed in Canvas. With that said, I take my role as your instructor very seriously, and, in fact, I care about how well you do in this course and that you have a satisfying, rewarding experience.

To that end, it is my commitment to you to respond individually to the work you submit in this class and to return your work in a timely manner. Smaller, weekly assignments and quizzes will be returned within one week and major assignments, exams, and essays will be returned within two weeks. (If, however, due to unforeseeable circumstances, the grading of your work takes

longer than the times I have listed here, I will keep you informed of my progress and make every effort to return your work with feedback as soon as I can.)

Assignment	Grade Points	Grade Percentage
Discussions/Participation	30	10%
Problem Sets (three)	90	30%
Referee Report	30	10%
Research Paper	120	40%
Presentation	30	10%
Total:	**300**	**100 %**

Course Calendar and Assignment Due Dates

Week	date	Topic	Assigned work	Work Due**
1	8/23 & 8/25	Course overview	paper topics	
2	8/30 & 9/1	Advanced producer theory and analysis I		paper topics
3	9/6 & 9/8	Advanced producer theory and analysis II	paper proposal	
4	9/13 & 9/15	Advanced producer theory and analysis III	PS1	
5	9/20 & **9/22***	Advanced producer theory and analysis IV		paper proposal
6	9/27 & 9/29	Technology and Productivity		
7	10/4 & 10/6	Technology and Productivity	referee report	PS1
8	10/11 & 10/13	Metrics of efficiency and productivity I		referee report
9	10/18 & 10/20	Metrics of efficiency and productivity II		
10	10/25 & 10/27	Applications of efficiency and productivity analyses I	PS 2	paper draft 1
11	11/1 & 11/3	Applications of efficiency and productivity analyses II		
12	11/8 & 11/10	Contract theory I	PS3	PS2
13	11/15 & 11/17	Contract theory II		draft 1 peer review
Fall Recess				
14	11/29 & 12/1	Advanced market models I		
15	12/6 & 12/8	Advanced market models II		PS3
	12/12-12/16	Course paper presentations		paper and presentations

*No classes 9/22

**Unless otherwise noted, assignments are due by midnight on Friday of each indicated week. For example, paper topics are due by midnight on Friday, 9/2.

Course Materials & Equipment

You will be required to access some data analysis software – I will be teaching in STATA and Python, but you are welcome to use R instead (we can discuss if you have a different program

preference). I expect your homework to be typed in either LaTeX[1], Markdown[2], or Microsoft Word.[3]

You can access our course website at: https://csu-arec-705.github.io

I will post lectures and lectures notes on the course website prior to class (under the "Lectures" tab). At the end of each week I will also post the assigned readings for the following week (under the "Schedule" tab) along with any assignments that are due.

Your grades will be posted on google classroom. You can choose to submit assignments in person (in class on Thursday before they are due) or upload electronic versions (PDFs) to google classroom. I will share an invite link to join the classroom via email, but you can use this link to access the webpage: https://classroom.google.com/u/0/c/NDk3NjcxMTAxNjkw

You can also navigate to the google classroom site from the course webpage.

Textbook / Course Readings

Recommended Textbooks (not required):

There is no required textbook for this course and the lecture materials and discussions will largely draw from academic papers. That being said, there are a few books that might be helpful for you in this course and for your future work in the field:

Kumbhakar, S. C., Wang, H.-J., & Horncastle, A. P. (2015). *A Practitioner's Guide to Stochastic Frontier Analysis Using Stata. Cambridge*: Cambridge University Press.

Fried, H., Lovell, C., & Schmidt, S. (2008). *The Measurement of Productive Efficiency and Productivity Change*: Oxford University Press.

Thomson, W. (2011). *A Guide for the Young Economist*: The MIT Press.

Chaubey, V. (2017). *The Little Book of Research Writing*: CreateSpace Independent Publishing Platform.

[1] For those of you just starting with LaTeX, I recommend the program LyX, https://www.lyx.org. For those who are more experienced or want to just jump in, you will probably benefit from Texstudio, https://www.texstudio.org, or Overleaf, https://www.overleaf.com. Overleaf is particularly useful for collaborating!

[2] Some useful resources on markdown can be found at: https://www.markdownguide.org/getting-started/ and https://yihui.org/en/2018/07/latex-math-markdown/

[3] Note that if you plan to go into academia, I strongly recommend learning LaTeX. If you want to go into consulting or tech, I strongly recommend learning Markdown. If you are really opposed to both, stick with Word.

Course Readings:

This course will primarily draw from academic articles from top field journals. Below is a fairly comprehensive list of the journal articles we will be drawing from throughout the semester (organized by course topic), but it is plausible that readings will be added as the semester progresses. Also, please do not be intimidated by the length of this reading list. Many of these I will simply reference in our discussions, some you will be expected to only skim for the main points, and for only 1-2 readings each week you will be expected to read the papers in depth.

If you are accessing these articles from off campus you should access them through the CSU library website: https://lib.colostate.edu . I will provide links to the assigned articles on the course website.

Introduction and overview of topics:

Keshav, S. How to Read a Paper. Link: https://web.stanford.edu/class/ee384m/Handouts/HowtoReadPaper.pdf

Cochrane, John H. (2005). Writing Tips for Ph.D. Students. Link: https://faculty.chicagobooth.edu/john.cochrane/research/papers/phd_paper_writing.pdf

Gentzkow, M. & Shapiro, J.M. (2014). Code and Data for the Social Sciences: A Practitioner's Guide. Link: https://web.stanford.edu/~gentzkow/research/CodeAndData.pdf

Head, Keith. The Introduction Formula. Link: http://blogs.ubc.ca/khead/research/research-advice/formula

Berk, J.B., Harvey, C.R. & Hirshleifer, D. (2015). Preparing a Referee Report: Guidelines and Perspectives. Link: https://www.aeaweb.org/content/file?id=222

Andersen, M.A. et al. (2018). A Century of U.S. Farm Productivity Growth: A Surge then a Slowdown. *American Journal of Agricultural Economics*, 100(4): 1072-1090.

Devarajan, S. & Robinson, S. (2002). The influence of computable general equilibrium models on policy. TMD discussion papers 98, International Food Policy Research Institute (IFPRI).

Farrell, M.J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society*, 120(3), 253-290.

Hueth, B., Ligon, E. & Dimitri, C. (2007). Agricultural Contracts: Data and Research Needs. *American Journal of Agricultural Economics*, 89(5), 1276-1281.

Jones, J.W. et al. (2016). Brief History of Agricultural Systems Modeling. *Agricultural Systems*, 155: 240-254.

Just, R.E. & Pope, R.D. (2001). The Agricultural Producer: Theory and Statistical Measurement. In B. Gardner & G. Rausser (Eds.), *Handbook of Agricultural Economics*, Volume 1 (pp. 629-741). Elsevier Science B.V.

Advanced Producer Theory and Analysis:

Arak, M. (1968). The price responsiveness of Sao Paulo coffee growers. Food Research Institute Studies 8, 211–223.

Chavas, J.P., Cooper, J. & Wallander, S. (2019). The Impact of Input and Output Decisions on Agricultural Production Risk. *Journal of Agricultural and Resource Economics, 44(3):* 513-535.

Emerick, K., et al. (2016). Technological Innovations, Downside Risk, and the Modernization of Agriculture. *American Economic Review, 106(6)*: 1537-1561.

French, B.C. & Matthews, J.L. (1971). A Supply Response Model for Perennial Crops. *American Journal of Agricultural Economics, 53(3)*: 478-490.

Just, R.E. & Pope, R.D. (2001). The Agricultural Producer: Theory and Statistical Measurement. In B. Gardner & G. Rausser (Eds.), *Handbook of Agricultural Economics*, Volume 1 (pp. 629-741). Elsevier Science B.V.

Just, D.R., Khantachavana, S.V., & Just, R.E. (2010). Empirical Challenges for Risk Preferences and Production. *Annual Review of Resource Economics, 2*: 13- 31.

Kondouri, P., Nauges, C., & Tzouvelekes, V. (2006) Technology Adoption under Production Uncertainty: Theory and Application to Irrigation Technology. *American Journal of Agricultural Economics, 88(3)*: 657-670.

Livingston, M., Roberts, M.J., & Zhang, Y. (2014) Optimal Sequential Plantings of Corn and Soybeans Under Price Uncertainty. *American Journal of Agricultural Economics, 97(3)*: 855-878.

Moschini, G. & Hennessy, D.A. (2001). Uncertainty, Risk Aversion, and Risk Management for Agricultural Producers. In B. Gardner & G. Rausser (Eds.), *Handbook of Agricultural Economics*, Volume 1 (pp. 629-741). Elsevier Science B.V.

Nerlove, M. & Bessler, D.A. (2001). Expectations, Information, and Dynamics. In B. Gardner & G. Rausser (Eds.), *Handbook of Agricultural Economics*, Volume 1 (pp. 629-741). Elsevier Science B.V.

Salo, S. & Tahvonen, O. (2002). On Equilibrium Cycles and Normal Forests in Optimal Harvesting of Tree Vintages. *Journal of Environmental Economics and Management*, *44*: 1-22.

Wickens, M.R. & Greenfield, J.N. (1973). The Econometrics of Agricultural Supply: An Application to the World Coffee Market. *The Review of Economics and Statistics, 55(4)*: 433-440.

Technology and Productivity:

Alston, J.M. (2018). Reflections on Agricultural R&D, Productivity, and the Data Constraint: Unfinished Business, Unsettled Issues. *American Journal of Agricultural Economics, 100(2*): 392-413.

Andersen, M.A., Alston, J.M., Pardey, P.G., & Smith, A. (2018). A Century of U.S. Farm Productivity Growth: A Surge then a Slowdown. *American Journal of Agricultural Economics, 100(4)*: 1072-1090.

Conley, T.G. & Udry, C.R. (2010). Learning about a New Technology: Pineapple in Ghana. *The American Economic Review, 100(1)*: 35-69.

Hulten, C.R. (2001) Total Factor Productivity: A Short Biography. In Hulten, C.R., Dean, E.R., & Harper, M.J. (Eds.) *New Developments in Productivity Analysis.* University of Chicago Press. pp. 1-54.

Plastina, A. & Lence, S.H. (2018). A Parametric Estimation of Total Factor Productivity and Its Components in U.S. Agriculture*. American Journal of Agricultural Economics, 100(4)*: 1091-1119.

Sunding & Zilberman (2001). The Agricultural Innovation Process: Research and Technology Adoption in a Changing Agricultural Sector. In B. Gardner & G. Rausser (Eds.), *Handbook of Agricultural Economics*, Volume 1 (pp. 207-261). Elsevier Science B.V.

Technical Efficiency and Productivity:

Burchardi, K.B., Gulesci, S., Lerva, B., Sulaiman, M. (2018). Moral Hazard: Experimental Evidence from Tenancy Contracts. *The Quarterly Journal of Economics, 134(1)*: 287-347.

Chambers, R.G., Pieralli, S., & Sheng, Y. (2020). The Millennium Droughts and Australian Agricultural Productivity Performance: A Nonparametric Analysis*. American Journal of Agricultural Economics* (*Forthcoming)*.

Foster, L., Haltiwanger, J., Syverson, C. (2008). Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability? *American Economic Review 99(1)*: 394-425

Fried, H.O., Knox Lovell, C.A., & Schmidt, S.S. (2008). Efficiency and Productivity. In Fried, H.O., Knox Lovell, C.A., & Schmidt, S.S. (Eds.) *The Measurement of Productive Efficiency and Productivity Growth* (pp. 3-91), Oxford University Press.

Greene, W.H. (2008). The Econometric Approach to Efficiency Analysis. In Fried, H.O., Knox Lovell, C.A., & Schmidt, S.S. (Eds.) *The Measurement of Productive Efficiency and Productivity Growth* (pp. 92-250), Oxford University Press.

Kumbhakar, S. C., Wang, H.-J., & Horncastle, A. P. (2015). *A Practitioner's Guide to Stochastic Frontier Analysis Using Stata. Cambridge*: Cambridge University Press.

Lohr, L. & Park, T.A. (2006) Technical Efficiency of U.S. Organic Farmers: The Complementary Roles of Soil Management Techniques and Farm Experience. *Agricultural and Resource Economics Review, 35(2)*: 327-338.

Mayen, C.D., Balagtas, J.V., & Alexander, C.E. (2010) Technology Adoption and Technical Efficiency: Organic and Conventional in the United States. *American Journal of Agricultural Economics, 92(1)*: 181-195.

Metaxoglou, K. & Smith, A. (2019) Productivity Spillovers from Pollution Reduction: Reducing Coal use Increases Crop Yields. *American Journal of Agricultural Economics, 102(1)*: 1-23

Reinhard, S., Knox Lovell, C.A., & Thijseen, G. Analysis of Environmental Efficiency. *American Journal of Agricultural Economics, 84(4)*: 1054-1065.

Contract Theory in Agriculture:

Bandiera, O., Barkankay, I., & Rasul, I. (2005). Social Preferences and the Response to Incentives: Evidence from Personnel Data. *The Quarterly Journal of Economics, 120(3)*: 917-962.

Dohmen, T. & Falk, A. (2011). Performance Pay and Multidimensional Sorting: Productivity, Preferences, and Gender. *American Economics Review, 101*: 556-590.

Goodhue, R.E. et al. (2003). Contracts and Quality in the California Winegrape Industry. *Review of Industrial Organization, 23(3)*: 267-282.

Goodhue, R.E. et al. (2010). Interactions Between Incentive Instruments: Contracts and Quality in Processing Tomatoes. *American Journal of Agricultural Economics, 92(5)*: 1283-1293.

Goodhue, R.E. (2011). Food Quality: The Design of Incentive Contracts. *Annual Review of Resource Economics, 2011(3)*: 119-140.

Hueth, B., Ligon, E., & Dimitri, C. (2019). Agricultural Contracts: Data and Research Needs. *American Journal of Agricultural Economics, 89(5):* 1276-1281.

Key, N. & McBride, W. (2003). Production Contracts and Productivity in the U.S. Hog Sector. *American Journal of Agricultural Economics, 85(1)*: 121-133.

Lazear, E.P. (2018) Compensation and Incentives in the Workplace. *Journal of Economics Perspectives, 32(3)*: 195-214.

Levy, A. & Vukina, T. (2004). The League Composition Effect in Tournaments with Heterogeneous Players: An Empirical Analysis of Broiler Contracts. *Journal of Labor Economics, 22(2)*: 353-377.

Mas, A.& Enrico M. 2009. Peers at Work. *American Economic Review, 99 (1):* 112-45.

Paarsch, H.J. & Shearer, B.S. (1999). The Response of Worker Effort to Piece Rates: Evidence from the British Columbia Tree-Planting Industry. *The Journal of Human Resources, 34(4)*: 643-667.

Wu, S.Y. (2014). Adapting Contract Theory to Fit Contract Farming. *American Journal of Agricultural Economics, 96(5)*: 1241-1256.

Advanced Market Models:

Alston, J.M. & James, J.S. (2002). The Incidence of Agricultural Policy. Chapter 33 in B.. Gardner and G.C. Rausser, eds., *The Handbook of Agricultural Economics, 2:* 1689-1749.

Ardnt, C., Pauw, K. & Thurlow, J. (2015). The Economy-wide Impacts and Risks of Malawi's Farm Input Subsidy Program. *American Journal of Agricultural Economics, 98(3)*: 962-980.

Gardner, B. L. (1975). The Farm-Retail Price Spread in a Competitive Food Industry. *American Journal of Agricultural Economics, 57(3)*, 399–409.

Holloway, G. J. (1991). The Farm-Retail Price Spread in an Imperfectly Competitive Food Industry. *American Journal of Agricultural Economics, 73(4),* 979–989.

Jensen, H.T., Robinson, S., & Tarp, F. (2010). Measuring Agricultural Policy Bias: General Equilibrium Analysis of Fifteen Developing Countries. *American Journal of Agricultural Economics, 92(4)*: 1136-11148.

Lee, H. et al. (2018). Pollination Markets and the Coupled Futures of Almonds and Honey Bees: Simulating Impacts of Shifts in Demands and Costs. *American Journal of Agricultural Economics, 101(1)*: 230-249.

Li, A. and Reimer, J.J. (2021), The US Market for Agricultural Labor: Evidence from the National Agricultural Workers Survey. *Applied Economic Perspectives and Policy, 43*: 1125-1139.

Okrent, A.M. & Alston, J.M. (2011). The Effects of Farm Commodity and Retail Food Policies on Obesity and Economic Welfare in the United States. *American Journal of Agricultural Economics, 94(3)*: 611-646.

Richard, B.J. & Sumner, D.A. (2008) Domestic Support and Border Measures for Processed Horticultural Products. *American Journal of Agricultural Economics, 90(1)*: 55-68.

Richards, T.J. (2018). Immigration Reform and Farm Labor Markets. *American Journal of Agricultural Economics, 100(4)*: 1050-1071.

Sadoulet, E. & de Janvry, A. (1992). Agricultural Trade Liberalization and Low Income Countries: A General Equilibrium-Multimarket Approach. *American Journal of Agricultural Economics, 74*: 268-280.

Zahniser, S. et al. (2011). Immigration Policy and its Possible Effects on U.S. Agriculture and the Market for Hired Farm Labor: A Simulation Analysis. *American Journal of Agricultural Economics, 94(2)*: 477-482.

ECO Watch: Coronavirus Lockdowns Keep Bees at Home and Put Crops at Risk. Link: https://www.ecowatch.com/coronavirus-lockdowns-bees-2646042322.html?rebelltitem=3#rebelltitem3