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## Abstracts of Selected Papers

### International Trade Issues

Session Chair: Charles W. Abdalla

**The Effect of Increased U.S. Paper Recycling on U.S. Import Demand for Canadian Paper**, Jeffrey Michael, North Carolina State University

The quantity of paper recycled in the U.S. has more than doubled since 1985. International trade theory predicts that this will lead to reduced imports of paper and a shift in domestic production toward waste-paper-intensive outputs (e.g., newsprint) and away from higher grade products (e.g.,

printing/writing paper). Import demand elasticities with respect to input prices were estimated for newsprint, printing/writing paper, and all paper utilizing twenty years of monthly data. The empirical results confirm the predictions of theory.

**Impacts of Japanese Rice Liberalization on World Rice Trade**, Carmen Liron-Espana and Tsoung-Chao Lee, University of Connecticut

This paper examines the consequences of Japanese rice liberalization on domestic and international markets. Although other researchers have made similar attempts, their results may be useful in some aspects but not entirely satisfactory in other aspects. In this study, an interdependent free trade model and an autarchy model for Japan are separately constructed and their parameters estimated.

Prices and trade flows are forecasted for the pre- and post-liberalization scenarios. Results show that China benefits the most from liberalization by increasing its total exports by 12.3%. The United States will benefit indirectly by exporting more to the rest of the world. The price of rice in exporting countries will rise, ranging from 1.6% to 3.93%. The Japanese rice price will drop 72%.

**Foreign Direct Investment in the Primary Sector of Mexico**, Dale Colyer, West Virginia University

Foreign direct investment (FDI) provides additional amounts of capital, which complement domestic investment, contributes to increased employment, and is accompanied by improved technologies. FDI in the Mexican economy has increased rapidly since economic reforms were implemented during the 1980s. The United States is the largest supplier of FDI to Mexico, but other countries have increased their contributions more rapidly. FDI in agriculture is relatively small, but

there have been significant increases in recent years; investments in agricultural processing activities have been more important than direct investment in agricultural production, although this has been important for some export products. NAFTA is strongly affecting the agricultural sector of Mexico and the United States. Free trade will induce additional changes as the agreement is implemented over a fifteen-year period.

### Food Industry Studies

Session Chair: Mario Teisl

**Asymmetric Behavior of Economic Time Series: The Consumer Prices Case**, Q. Zhou, P. Schaeffer, and W. Labys, West Virginia University

Asymmetric behavior of economic time series has long been claimed as a stylized fact; empirical work, however, casts doubts on the asymmetric property of some important economic indicators.

In the case of consumer prices, there are still no conclusive answers about its cyclical properties, although these indicators are used extensively for economic analysis and policy formulation. Using

the statistical theory of finite Markov processes, we tested the asymmetry of three consumer prices indexes (U.S. city average): all items, food and beverages, and medical care services. Results show

that consumer prices are asymmetric over the business cycle; they are procyclical rather than countercyclical. Policy implications of these findings are discussed.

**Mergers and Acquisition in the Food Industry**, Adesoji Adelaja, Rodolfo Nayga, and Zafar Farooq, Rutgers University

A two-stage framework is developed to explain merger and acquisition (M&A) activities in U.S. food manufacturing. Two logit models of M&A activity are estimated using firm level data for public firms: a target-model to predict the likelihood of a firm being targeted for M&A, and a takeover-model to predict the likelihood of a targeted firm being taken-over. Target-model results suggest the importance of firm liquidity, debt/leverage, profitability, growth in sales, stock earnings capacity, ratio of common shares traded, and market-to-book

ratio (Tobin's  $q$ ). Activity or turnover ratio, firm size, and price-earnings ratio were not statistically significant. Takeover-model results suggest the importance of degree of officer control, attitude surrounding the transaction, number of prior bids, existence of litigation, and involvement of the bidder or target in other bids during negotiations. With predictive accuracies of 74.5% and 62.9%, respectively, these models suggest the systematic nature of M&A activities.

**Determinants of Temporal Variations in Generic Advertising Effectiveness**, Chanjin Chung and Harry M. Kaiser, Cornell University

This article develops a varying-parameter advertising model specifying advertising parameters as a function of advertising strategies and market environments to explain the varying nature of advertising responses. Unlike prior models, this model allows researchers to examine the sources of change in advertising effectiveness over time. The model is applied to the New York City fluid milk market for the period from January 1986 through

June 1995. Results indicate that advertising strategies and market environments play important roles in determining advertising effectiveness. Particularly, demographic factors were more important than economic factors. The results also suggest that when a market is in an unfavorable or unsaturated condition, advertising generally becomes more important and effective.

**Seasonality of Broiler and Turkey Consumption and Prices**, Ronald A. Schrimper, North Carolina State University

Seasonal variability of turkey consumption continues to be much greater than that of broilers, but both products have had a considerable reduction in within-year variability over the last twenty years. Seasonal variability of retail prices of fryers and whole turkeys has not been as great as fluctuations in consumption. Opposite seasonality changes for broilers and turkeys in November and December

suggest a possible change in the willingness of consumers to substitute these two products in holiday consumption patterns. Changing seasonal variability also suggests potential problems when attempting to capture seasonal differences in demand in econometric analyses by seasonal or monthly dummy variables.

## Agricultural Production Studies

Session Chair: John Mackenzie

**Farm-Level Profitability Analysis of Alternative Tillage Systems on Clay Soils**, Emmanuel K. Yiridoe, Tony J. Vyn, Alfons Weersink, David C. Hooker, and Clarence Swanton, Nova Scotia Agricultural College

The profitability of seven alternative conservation tillage systems (including five reduced-tillage sys-

tems and two no-till systems) were compared with a conventional moldboard plow tillage system un-

der a corn-soybean rotation for two clay soils. Crop yields, production costs, and net returns to land and labor were evaluated for the eight tillage systems on two heavy soils from field experiments conducted in southwestern Ontario. There was no difference in corn and soybean yields between the conventional tillage system and the seven conservation tillage systems on both clay soils. Tillage systems that used a common set of machinery for corn and soybean production saved on annual machinery cost per crop. Variable costs were lowest

under the reduced-tillage systems and highest for two no-till systems because of higher no-till equipment costs and additional cost of herbicide as burn-down on the no-till systems. For a given location, there were no significant differences in net returns between the moldboard plow tillage system 1 and the five reduced-tillage systems 2 through 6, although actual average net returns for the corn-soybean cropping systems were highest with the moldboard plow tillage system.

#### **Economic Returns to Precision Agriculture, Mark Lynch and John Mackenzie, University of Delaware**

Precision agriculture technologies can enhance farm profitability via spatial optimization of nutrient and pesticide applications, where such applications are varied continuously within individual fields. This paper illustrates an empirical analysis of economic returns to precision agriculture on a representative field in central Indiana, using a simple production model to formalize the deriva-

tion of field management strategies from detailed soil test, nutrient and pesticide application and crop yield data. We address econometric issues of spatial autocorrelation in the data and discuss some complications inherent in estimating optimal micro-level management strategies on a field with heterogeneous soil types.

#### **Estimation of the Optimal Size of the Russian Plant Breeding System, Katrin Globe-Sethna and Carl E. Pray, Cook College, Rutgers University**

The Soviet Union had one of the biggest agricultural research systems in the world. In Russia research institutes have not adjusted the number of scientists to suit the new funding situation, and salaries are taking up an increasingly large part of their budget. The study used two different approaches to estimate how many scientists would be affordable in the future plant-breeding system. One approach used different threshold production lev-

els to determine the number of breeding programs that could be economically justified. Another approach assumed a percentage change similar to that for the East German transition. Both approaches resulted in a decrease from 6700 scientists in 1989 to 1700–2000 scientists at the end of the transition. Policy recommendations for Russia include privatization of hybrid-corn breeding and public funding for grain-breeding programs.

## **Environmental Policy**

**Session Chair: Greg Poe**

#### **Economic, Environmental, and Policy Impacts of Using Genetically Engineered Crops for Pest Management, Jorge Fernandez-Cornejo and Cassandra Klotz-Ingram, USDA/ERS**

This paper presents a summary of the impact of genetically engineered (GE) crops on domestic and European markets and discusses the regulatory framework. Specific subjects include consumer acceptance of GE crops, regulatory oversight, concerns of environmental groups, labeling of foods containing GE materials, and trade and policy implications. In addition, the paper presents preliminary empirical results on the diffusion path of GE cotton, corn, and soybeans using a logistic curve

and provides estimates on the effect of adoption of herbicide-tolerant corn on yields, farm profits, and herbicide use, using a model that corrects for self-selection and simultaneity. The diffusion of GE corn, cotton, and soybeans follows a logistic functional form, and if current conditions prevail, 75% adoption could be reached within three years. Adoption of herbicide-tolerant corn reduces herbicide use but slightly reduces yields. Profits are not significantly affected.

**Managing Forest Fragmentation: Integrating Landscape Ecology and Economics,** Joao C. Dos Santos, Peter J. Parks, and Richard G. Lathrop, Jr., Cook College, Rutgers University

This paper discusses the analytical strategy of an ongoing research initiative to modeling forest fragmentation in New Jersey's southern coastal plains. The framework developed integrates landscape ecology with economic policy analysis, within the spatial framework of a subwatershed-scale geographic information system (GIS). This is accomplished by developing an analytical system consisting of landscape ecology models that link use to fragmentation effects, and economic models that relate land use decisions to spatial and nonspatial land quality attributes. This integrated representa-

tion of forest habitats will allow changes in economic and environmental conditions to be translated into fragmentation effects and will permit the potential fragmentation impacts of alternative policies and economic conditions to be quantified. In addition, results of a preliminary economic land use model are reviewed. Variables including population, distance to roads, and a measure of the existing regulatory environment are all proven significant in explaining land conversion from forest to development.

**An Econometric Analysis of the Costs of Reducing Atmospheric Carbon Dioxide Concentrations through Afforestation,** Andrew Plantinga and Thomas Mauldin, University of Maine

Afforestation—the establishment of trees on unfor-  
ested land through tree planting or natural regen-  
eration—reduces carbon dioxide concentrations  
since trees convert carbon dioxide to carbon  
through photosynthesis. In this study, we use econ-  
ometric models of land use to estimate the mar-  
ginal costs of sequestering carbon in forests. The  
advantage of the econometric approach is that cost  
estimates are based on observed behavior—the ac-  
tual allocation decisions made by landowners fac-  
ing returns to alternative uses. We specify the  
shares of forest, agricultural, and urban/other land  
as a multinomial logistic function of rents, land

quality, and other land use determinants. Models  
are estimated for Maine, South Carolina, and Wis-  
consin using panel data on counties. Using the fit-  
ted models, we simulate the effects of forestry sub-  
sidies on forest area and carbon storage and use  
these results to derive marginal cost curves for car-  
bon sequestration. Sensitivity analyses examine the  
effects of timber harvesting, projected changes in  
land rents, and other program features on marginal  
costs. We find that Wisconsin offers the lowest  
cost opportunities for carbon sequestration, fol-  
lowed by South Carolina and Maine.

**An Assessment of the Impact of a Provincial Water Charge,** Steven Renzetti and Diane Dupont, Brock University, Ontario, Canada

Population and income growth, global warming,  
and declining regulatory budgets all have contrib-  
uted to a growing concern regarding the availabil-  
ity of potable water in Canada. At the same time a  
number of provinces have already introduced or  
are contemplating charges for direct water with-  
drawals. This paper considers the potential value of  
a provincial water charge (PWC) in order to pro-  
mote the efficient and sustainable use of water re-  
sources. The paper assesses the likely impacts of

such a charge on the water use and costs of major  
water-using sectors in Ontario. The numerical  
analysis is based on econometric models of water  
demands. It also incorporates the indirect effects of  
a PWC on electricity prices, since electrical utili-  
ties use large amounts of water. The analysis indi-  
cates that a PWC has the potential to encourage  
water conservation and bring in new revenues to  
the government while doing relatively little to raise  
industry's costs.

## Commercial Fisheries

Session Chair: Denise Jarvinen

**Sustaining the Atlantic Sea Scallop Fishery: An Economic Analysis of Consolidating Days-at-Sea,** Michael K. Price and Peter J. Parks, Cook College, Rutgers University

This paper develops a framework to measure elas-  
ticities of substitution in the limited-access Atlan-

tic sea-scallop (*Placopecten magellanicus*) fishery.  
A normalized, restricted translog profit function is

developed to reflect historical patterns of fishing effort. The paper is the first part of an ongoing project to measure the net economic impacts of various capital consolidation and/or leasing options currently under consideration for the fishery. Consolidation and/or leasing may provide the only means to sustain the economic viability of the fishery under the proposed schedule for Days-at-Sea

Reductions mandated by the Sustainable Fisheries Act. Preliminary estimates have shown that input substitution alone cannot preserve the economic basis of the fishery under the proposed reductions in effort. The calibrated model will enable policymakers to evaluate and develop policies that are at the same time economically, biologically, and environmentally sustainable.

**Public Support for Technological Innovation: Strategic Incentives and Market Implications for North Atlantic Mariculture,** Denise Jarvinen, Woods Hole Oceanographic Institution

Like land-based agriculture, marine aquaculture (mariculture) benefits from publicly funded investments in research. Resources available to support technology development and diffusion differ across jurisdictions. This paper extends existing bioeconomic models of interaction between capture and mariculture production to predict the ef-

fects of public investments in mariculture innovation under differing market assumptions. Market structure assumptions address prototypical cases, with implications for some major (existing and potential) mariculture sectors in eastern Canada and the northeastern United States.

**Survival Rate Analysis of Fisheries Exit Behavior,** Adesoji Adelaja, Bonnie McCay, and David Weisman, Rutgers University

This paper investigates the determinants of survivability in an ITQ-regulated fishery by estimating hazard rate models of exit from the mid-Atlantic surf-clam and ocean-quahog (SCOQ) fishery. Hypothesized determinants include initial ITQ allocation, indicators of product market strategies of firms, and other variables. Results suggest the following: (1) longevity increases with ocean quahog ITQ allocation but is not affected by surf clam ITQ allocation; (2) as surf clam ITQ allocation in-

creases, the marginal contribution of quahog ITQ allocation to survivability declines; (3) longevity is enhanced by product market strategies (fishermen who sell to a broader group of buyers and to some of the larger buyers, and who are more specialized in the surf clam exhibit greater longevity); and (4) longevity is directly related to size (operator's catch and vessel horsepower). Results suggest that non-neutrality of ITQ distribution and the possibility of monopsony power.

## Trade of Agricultural Commodities

Session Chair: Tsoung-Chao Lee

**Technical Trade Barriers in U.S./Europe Agricultural Trade,** Silvia Weyerbrock and Tian Xia, University of Delaware

Technical barriers strongly affect U.S./European agricultural and food trade. A 1996 USDA survey identifies fifty-seven questionable European regulations affecting U.S. agricultural exports, with an estimated trade impact of \$899.55 million. This paper identifies European and U.S. technical regulations that impede bilateral agricultural and food

trade. The paper provides a background for case studies and permits conclusions regarding the future role of technical barriers. Technical barriers in U.S./Europe trade will proliferate in the future because of changes in trade rules, higher demand for food safety and various food quality attributes, and EU membership of Eastern European countries.

**The Future of U.S. Exports in International Poultry Trade: Current Status and Projected Trends,** Kristin Michel, Courtney S. Biery and Conrado M. Gempesaw, University of Delaware

The general objective of this study is to analyze the comparative advantages and future prospects of the

U.S. poultry industry in the international arena. The domestic resource cost (DRC) ratio was esti-

mated for the five largest poultry exporters in the world. The DRC ratio allowed for the comparison of economic advantages/disadvantages in poultry trade. In addition, an analysis of the future of international poultry trade was conducted based on published forecasts.

The study found that poultry production and consumption are expected to increase in most

countries. The United States, having one of the better DRC ratios, is predicted to retain its majority position in international poultry trade as export growth slows in the European Union and Thailand. However, domestic production in Hong Kong/China will pose a threat to U.S. exports, as will the expected growth in the Brazilian poultry industry.

**Forecasting Regional Demand, Supply, and Trade of Eggs**, Ning Xu and Tsoung-Chao Lee, University of Connecticut

A 36% decline in the New England production of eggs since 1974 raises the question of whether the egg industry is facing a fate similar to that of the broiler industry, which became extinct in the mid 1970s. This paper examines regional competition in the egg market by estimating the regional demand for and supply of eggs, and the trade flows among regions. The model forecasts changes in trade patterns, prices, and others. The results show

that the East Coast regions are gradually losing their competitiveness relative to the rest of the United States. In the next decade, annual egg consumption in New England will be about 260 million dozens, and egg production will decline to less than 110 million dozens. The Midwest region, where the feed grains are produced, will supply the deficit of eggs.

## Rural Land Preservation

**Session Chair: Andrew Plantinga**

**The Effect of Agricultural Zoning on Farmland Values and Development in Lancaster County, Pennsylvania**, David W. Shideler, Charles W. Abdalla, and Timothy W. Kelsey, Penn State University

In light of the growth of many urban areas of the Northeast, farmland preservation has become a priority for local government officials. Communities along the rural-urban fringe have implemented various policies, such as agricultural zoning, to protect their agricultural communities. While these measures are designed to protect farmers and farming, some farmers and other citizens are concerned about the economic impacts of such zoning policies. They suggest that agricultural zoning restricts the potential uses of the land and thereby reduces its value.

This research attempts to identify the economic impacts of agricultural zoning policies on farmland in Lancaster County, Pennsylvania. Hedonic price modeling was used to isolate the effect of agricultural zoning on farm sales price using data provided by local government agencies regarding farm sales within the county. It is anticipated that the insights from these models will benefit farmers and officials in understanding agricultural zoning impacts.

**Estimation of Development Pressures on Agricultural Lands**, Andrew Plantinga, University of Maine, and Douglas Miller, Iowa State University

This paper quantifies the influence of development pressures on agricultural lands. In contrast to earlier studies, the specification of our econometric model is dictated by theoretical results in terms of both variable choice and model structure. Based on Capozza and Helsley's model of land prices and urban expansion, we specify agricultural land values as a linear function of annual agricultural rents

(the agricultural value component) and a nonlinear function of location, population change in metropolitan areas, interest rates, conversion costs, and agricultural rents) the developmental value component). Land value data based on self-reported estimates of the current market value of farmland are assembled from the Census of Agriculture. Consistent with theoretical results, we estimate a semi-

linear model of land values using panel data on New York counties for the years 1982, 1987, and 1992. Estimates of agricultural and development value components are derived for all counties and

time periods. The results identify the incentives required by landowners to retain in agricultural uses in rapidly developing counties.

**A Comparison of Public Versus Agriculture Professional's Preferences for Farmland Protection via PDR,**  
J. Mackenzie, J. Pesek, R. Bacon, and A. Madiraju, University of Delaware

We administered a conjoint survey of preferences for farmland protection under a purchase of development rights (PDR) program to two samples of respondents in order to test the consistency of preferences between samples. The first sample represents the general public, the second represents agriculture professionals, including administrators of Delaware's PDR program. Each respondent rated various hypothetical farms, presented via iconized color graphics and text descriptions, as candidates for PDR. Preference models estimated from the

pooled ratings data suggest that public support for Delaware's agricultural PDR program reflects a general demand for protection of open space, landscape diversity, and scenic quality. In contrast, agriculture professionals are more concerned with maintaining agriculture as a viable industry. However, the evident disconnect between public and agriculture professionals' perceptions of the PDR program appears unlikely to affect overall political support for it.

## Issues in Community Development

**Session Chair: Jim McConnen**

**Manufacturing Success in the Nonmetropolitan Northeast,** Stephen M. Smith, Penn State University, and Kathleen K. Miller, University of Missouri

This paper examines the relationship between success in generating manufacturing employment and local economic development activeness and a set of county economic characteristics. The Northeast nonmetro counties that experienced manufacturing employment growth were the most rural, largely nonadjacent to metro counties, with the smallest population and employment bases, and the highest unemployment rates. They experienced relatively large service sector employment increases, but this did not positively affect the manufacturing em-

ployment. Manufacturing growth was primarily in the routine, lower-skill industries and the traditional resource-based manufacturing. These counties also experienced growth in high-skill high-tech industries that was higher than in the other types of nonmetro counties. Such growth, however, likely was in the more routine, assembly operations of these industries. Finally, local economic development activeness positively influenced manufacturing employment change.

**Analyzing the Economic Health of a Community's Retail Trade Sector,** James C. McConnon, Jr., and Georgeanne M. Morgan, University of Maine

Faced with significant changes in population and employment structure, many rural communities in the Northeast are attempting to implement economic development initiatives in their towns or regions. While an understanding of the retail trade sector is an important component of the economic development process, there are few well-defined

programs that target this sector in the Northeast. This paper describes an applied research-outreach program that uses the tools of trade area analysis in determining the economic health of a community's retail trade sector and that serves as a catalyst for local involvement in economic development initiatives.



**An Analysis of Human Resource Development in West Virginia,** Brian Lego and Tesfa Gebremedhin, West Virginia University

This study focuses on total educational expenditures of the public elementary and secondary school systems in West Virginia. A three-stage least squares regression method is used to determine the relationships between investment in education, educational attainment, and economic development. Time series data from 1983 to 1995 across West Virginia's fifty-five school districts are used in the estimation procedure. Measures of district financial ability and community efforts are used in the empirical work and exhibit effects in

the hypothesized directions. The results confirm that increased investments in education permit improvements in educational attainment and employment opportunities. Findings are consistent with human capital formation theory, which states that investment in education improves the labor force's productivity and thereby enhances economic development. Thus, educators need to examine how school funds are spent to best achieve the highest possible levels of student educational performance and economic development.

**Assessing Rural Housing Policy in West Virginia,** Brian Lego and Scott Loveridge, West Virginia University

This study uses 1990 Census of Population and Housing Public Use Microdata Sample data and regression analysis to analyze the relationship between selected demographic characteristics and affordability problems of owners and renters in regions of West Virginia. The data display geographic concentrations of households with affordability

issues for both renters and owners. A survey of the state's affordable housing nonprofits shows a spatial mismatch between needs and services. The state's housing nonprofits also appear to produce fewer units per employee than in the national average.

## Contingent Valuation Topics

Session Chair: Diane Dupont

**An Experiment in Perception: Can CVM Respondents Really Discern the Changes in Environmental Quality We Ask Them to Value?** John Halstead, Wendy Harper, Thomas Stevens, and L. Bruce Hill, University of New Hampshire

Often, contingent valuation surveys use visual cues to elicit willingness to pay estimates for changes in environmental quality. The usefulness of these survey results is predicated on the assumption that respondents can differentiate between the various levels of environmental quality pictured and can accurately identify improvements in quality. This paper examines whether respondents are able to correctly identify increments and decrements to visibility.

Using experiments that confront respondents with numerous photographs of the same scene with

varied levels of visibility, it was determined that individuals were able to correctly "rank" these pictures in order of descending visibility (as defined by physical measures such as light scattering). The results of this study are of interest to those initiating studies that implicitly assume that respondents can consistently and correctly rank visibility changes; if individuals are unable to correctly rank these visibility levels, consumer surplus estimates generated by this type of study are suspect.

**Distance, Option Value, and Willingness to Pay: Evidence from the Canaan Valley National Wildlife Refuge Study,** Christopher Klocke and Jerald J. Fletcher, West Virginia University

Existence values for well-known resources such as the Grand Canyon and Yellowstone National Park are widely accepted. However, places such as Canaan Valley, West Virginia, also have unique and important ecological features, although on a

smaller and less spectacular scale. It is not clear to what extent individuals have existence values for these smaller natural resources. The Canaan Valley study used a nationwide sample to estimate household willingness to pay for this national wildlife

refuge. In addition to estimating willingness to pay, the study considered the effect of distance on such values. While the sign of distance is negative as expected, the coefficient is not statistically significant; what is significant is the respondent's re-

ported likelihood of visiting. These results leave open the question of the appropriate scope of the market for natural resources for which individuals have significant existence values.

**Protest Bids: An Analysis of Respondents to a Survey Using Contingent Valuation,** Donald J. Epp and Willard A. Delavan, Penn State University

We analyze the characteristics of three respondent groups to a CV survey of groundwater protection from nitrate contamination—those who submitted protest zero bids, true zero bids, and positive bids. Logit regression showed that both information about water quality/safety and respondent confidence that the program increases water safety decreased the likelihood of protesting and increased the likelihood of a positive bid. Respondents with lower perceptions of water safety were less likely to protest or to give positive bids. Older respon-

dents protested more often, while gender played no role in determining either protests or positive bidders. Higher income increases the likelihood of offering a positive bid but does not distinguish protest zero bidders from those who submitted non-protest zero bids. Multinomial regression analysis showed few differences between the characteristics of respondents who submit protest and true zero bids, but several significant differences between protest bidders and positive bidders.

**Does Order Matter? An Analysis of the Impacts of Question Sequence upon WTP for Environmental Improvements,** Diane P. Dupont, Brock University, Ontario, Canada

The efficacy of the dichotomous choice contingent valuation methodology for eliciting the public's values for environmental improvements has been under scrutiny. This paper uses alternative versions of a survey to examine the role of question sequence upon both marginal willingness-to-pay for an improvement to a public good and for the total willingness-to-pay associated with improvements to more than one public good. The results of this research partially support the hypothesis that when a public good appears first in a sequence, it obtains

a higher marginal willingness-to-pay estimate than when it appears later.

Separate marginal willingness-to-pay values are summed to obtain an estimate for the total willingness-to-pay for a group of public good improvements. These sums are found to be dependent upon the order in which public goods improvements are presented to survey respondents. This research points out the important role of context in the development of the contingent valuation survey instrument.

## Water Regulation

Session Chair—Dale Colyer

**Documenting the Status of Dairy Manure Management in New York: Current Practices and Willingness to Participate in Voluntary Programs,** Gregory L. Poe, Nelson L. Bills, Barbara Bellows, Patricia Crosscombe, Rick Koelsch, and Peter Wright, Cornell University

In spite of the intense policy interest in dairy manure management and water quality, only anecdotal evidence exists regarding actual manure management practices on dairy farms. This paper discusses the results of a unique mail survey of 470 New York dairy farms that links manure management practices, financial characteristics, and atti-

tudes. Analysis of this data set indicates a wide divergence between the need for improved manure management on individual dairy farms (high), the apparent ability of farms to divert financial resources to environmental practices (mixed), and the willingness to participate in voluntary programs at various annual costs per cow (low).

**Controlling Groundwater Quality with Endogenous Regulatory Instruments**, C.S. Kim, C. Sandretto, and Donna Lee, USDA/ERS

This research presents a competitive dynamic model that endogenously evaluates the economics of regulatory tax-policy options. The model is then applied to an irrigated corn production area west of Kearney, Nebraska, where the average groundwater contamination level from nitrates is reported to be 8.7 ppm. Results indicate that no regulatory policies are necessary to maintaining potable

groundwater quality with either a surge-flow irrigation system or a sprinkler irrigation system. In areas where conventional furrow irrigation technology is being used, net economic benefits with a constant-unit tax are nearly 21% and more than 9% greater than those with a pollution tax and a variable-unit tax, respectively.

**Constraining Phosphorus in Surface Water: Dairy farm Resource Use and Profitability**, John J. Hanchar, Wayne A. Knoblauch, and Robert A. Milligan, Cornell University

The New York City Watershed Agricultural Program (NYCWAP) seeks to reduce the potential for phosphorus movement from farms to surface water. Toward this objective, a Phosphorus Index for Site Evaluation (P-index) provides planners in the NYCWAP with a tool for identifying problems and evaluating solutions. A linear programming model was used to examine dairy farm resource use and profitability given resource constraints and constraints on the P-index. Results indicate dramatic

differences in expected effects on resource use and returns above variable costs between less restrictive targets in the upper end of the "medium" (for example, 24 and 17) and more restrictive targets in the lower end of the range (for example, 13 through 10). The differences have implications for choosing a target to guide planning on farms—regarding expected effects on profitability, the target within the "medium" range matters.

**Analysis of Water Conservation in Casablanca, Morocco**, Mohamed Lahlou and Dale Colyer, West Virginia University

This study examines water consumption characteristics in Casablanca and develops approaches for a sustainable water demand management system. Research procedures used were the development and estimation of water demand models for the residential, commercial, industrial, and institutional sectors; forecasts of water demand to 2010; and simulation of the effects of a complex of water conservation methods on the forecasted demands. The results indicate that residential/commercial water demand is relatively inelastic ( $-0.448$ ). Institutional water demand is also price inelastic

( $-0.648$ ). Price and temperature were statistically significant in the industrial water demand model, although both had unexpected signs. The conservation approaches used in the simulations include public education, plumbing code revisions to require use of water conservation devices, leak detection and repair, pricing policy, metering, and pressure reduction. The results indicate that considerable saving in water use can be attained through a comprehensive water demand management program.

## Dairy Production

Session Chair: Loren Tauer

**Toward Differentiating Dairy Grazing Systems in the Northeast**, Jonathan R. Winsten, Gregory D. Hanson, and Robert L. Parsons, Penn State University

This analysis uses a large sample of dairy farms randomly drawn from three states—Pennsylvania, Vermont, and Virginia—in early 1997 to compare important aspects of the farming operations for

four distinct grazing systems. Statistically significant differences between the systems are identified. Additionally, three logit regressions are run to estimate the importance of certain farm and farmer

characteristics in determining the probability of (1) using intensive grazing; (2) increasing milking

herd size in the next three years; and (3) increasing reliance on grazing in the next three years.

**Estimates of Individual and Pooled Dairy Farm Supply Elasticities, Loren Tauer, Cornell University**

Milk supply elasticities were estimated for seventy farms that participated in the New York Dairy Farm Business Summary Program from 1985 through 1993. Technology was modeled as a single output, single composite input Cobb-Douglas function. The resultant supply function is the natural log of milk quantity as a function of the log of milk price to prices paid for all inputs, with a time trend added. Since random output shocks to each farm may have occurred in any of the nine data years, a

dummy year variable was modeled sequentially for each year for each farm. Ignoring twelve negative estimates, elasticities averaged .65. Pooling the data with a fixed effects model produced an elasticity estimate of .47. A geometric lag pooled model produced a short-run elasticity of .2 and a long-run supply elasticity of 1.00 using instrumental variables, but an OLS short-run elasticity of .25 and long-run elasticity of .64.

**The Value of Livestock Improvement: The Case of Nova Scotia's Dairy Industry, Nigel D. Burns, J. Stephen Clark, and Glenn C. Fox, Nova Scotia Agricultural College**

Dairy genetic characteristics have economic values that herd managers capture through selective breeding programs. The method of estimating an economic value for a genetic characteristic has not been well defined or applied in recent academic literature. The improper specification of economic values can cause nonoptimal breeding patterns due to the improper weighting of genetic characteristics in selection indexes. The purpose of this analysis is to clarify the method of determining eco-

nomic values of genetic characteristics and to apply this theory to value Nova Scotia Holstein production characteristics. Results from this research can be used in specifying an economic index of genetic merit for sire selection that conforms to economic theory. Shadow values for Nova Scotian Holstein dairy cows are positive for milk fat, milk protein, and cow size; and negative for feet and legs, mammary system, bone quality, and rump.