

Abstracts

Selected Papers

FOOD AND AGRICULTURAL POLICY (Dale Carley, University of Georgia)

“Effects of Removal of the Peanut Program on Georgia Production and Distribution of Selected Fresh Produce.” J. E. Epperson and H. L. Tyan, University of Georgia.

The impact of eliminating the U.S. peanut program in Georgia on the production and distribution of fresh produce is examined, utilizing a quadratic programming model encompassing 13 U.S. produce markets, activity analysis, and risk. Tentative results show a substantial reduction in produce supplies from Georgia and an increase in peanut supplies.

“An Economic Analysis of Geographic Wage Differentials in U.S. Agriculture.” Ann Vandeman, University of California-Berkeley and Lewell Gunter, University of Georgia.

The determinants of geographical wage differentials for hired farm labor in the U.S. are analyzed through a single equation pooled wage determination model. Differences in the cost of living, local manufacturing wages, capital labor ratios in agriculture, and rural population were found to contribute to the observed differentials in nominal wages. Differences in average wages for the four census regions are examined and partially explained by the model.

“The New Regulatory Environment and the Food and Agricultural System.” By James A. Zellner, National Economics Division, Economic Research Service, U.S. Department of Agriculture.

The issuance of Executive Order 12291 by President Reagan may signal a major shift in the regulatory environment, with significant repercussions on the food and agricultural sectors. New requirements that regulators carefully assess and compare the benefits and costs of proposals have substantially shifted the burden of proof from the regulated to the regulators, and to others who would interfere with the marketplace. Traditional regulatory matters, including price supports, market orders, food safety and quality issues, will be subjected to the scrutiny of benefit/cost analyses and the attendant difficulties of making accurate benefit/cost assessment.

MANAGEMENT DECISIONS INVOLVING CREDIT, TAXES AND REAL ESTATE VALUES (Brent Spaulding, University of Arkansas)

“Net Returns and All Gilt Versus Conventional Sow Herd Systems: Tax Considerations.” Ken-

neth Baum, ERS/USDA, and Larry Johnson, Gold-Kist, Inc.

The after-tax net returns are much more favorable for a low investment, pasture, all gilt feeder pig operation than for a conventional system using sows in Georgia. The after-tax net return advantage is primarily the result of the treatment of income from the sale of one-litter gilts as capital gain. The after-tax returns were calculated to be as much as twice as large for the all gilt system, depending on several price alternatives, and the producer's marginal tax rates (20 to 50 percent).

“The Relationship of Farmer Goals and Other Factors to Credit Use.” James O. Wise and Robert L. Brannen, University of Georgia.

The analysis indicates that farmers are motivated by multiple goals. Overall, the goals of “stay in business” and “improve family's living” ranked the highest. Goals varied among age groups, with the younger group tending to place more emphasis on goals related to increasing the size of their farms. The main variable related to short-term credit use was the amount of cropland; none of the goals was significant. “Avoid low profits” was significantly related to less intermediate term credit use. “Control more acreage” and the value of machinery and equipment were significantly associated with more credit for this purpose. The goals of “improve family's living” and “make the most profit” were significant and positively related to long-term credit. Other significant positive variables were labor used, total land owned, value of the farm, and use of an irrigation system. Negative variables were the presence of non-farm income, the acres of pasture and the percentage of land inherited. Overall there were some negative feelings about credit, but they did not always result in less credit use.

“An Analysis of Loan Evaluation Criteria.” Robert L. Beck, University of Kentucky.

Agricultural lending agencies have a difficult task of evaluating repayment potential of borrowers. The following criteria are used by Production Credit Association loan appraisers in evaluating applications of dairy farmers in central Kentucky: debt load per cow; debt/equity ratio; number of creditors; and security/equity ratio.

Results indicate that debt load per cow, debt/equity ratio, and security/equity ratio can be useful in evaluating repayment potential. The number of creditors apparently serves no useful purpose in the evaluation process.

“Inflationary Expectations and the Value of U.S. Farm Real Estate: Some Consistent Estimates.” W. J. Martin and E. O. Heady, Iowa State University.

In a number of recent papers, Martin Feldstein has hypothesized that expected inflation may increase the real value of assets such as farm real estate. In this paper, simple models of the value of U.S. farm real estate were developed to test this hypothesis. Both adaptive expectations and "rational" interest rate-based expectations of future inflation were considered. Adaptive expectations measures for expected inflation generally suggested a negative impact of inflation on real estate value. The interest rate-based expectation measures had a positive coefficient in all cases, but only in one case out of six was this coefficient significant.

ECONOMICS OF REGULATION AND TECHNOLOGY IN THE PROCESSING OF MILK AND MEAT (Melvin Walker, Fort Valley State College)

"State Regulation of Fluid Milk and the Processor-Retailer Margin." Anthony J. Greco, University of South Alabama.

This paper focuses on comparative economic effects of the various types of state regulation of the processor and retailing stages of the fluid milk industry. A sixfold classification scheme is used to categorize such regulation.

The distributors' gross margin is used as the performance criterion. Various analyses were conducted to determine the effect of regulation and processor and retailer concentration on such margins for 76 cities for 1965–69.

Results suggest that specific antitrust regulation performs better in terms of minimizing margins than both the more direct types and the less encompassing general antitrust types.

"The Impact of Product Cost of Increasing the Minimum Standards for Nonfat Solids in Fluid Milk Products." Daniel A. Ballard, Chase Econometrics, and Peter Vitaliano, Virginia Polytechnic Institute.

The impact on the cost of processing fluid milk products of increasing the minimum standards for nonfat solids in such products to facilitate the operation of multiple-component pricing systems for raw milk is evaluated using an economic-engineering approach. Such a change is determined to increase the cost of processing fluid milk products between 7 and 12 cents per gallon, depending primarily on the fortification method used.

"Characterization of Technology in Food Processing: The Meat Products Industry." V. Eldon Ball, ESS/USDA.

The cost function is an appropriate reduced form to use in investigating substitution relationships, tests for homotheticity, etc. A nonhomo-

thetic dual cost function was used to derive the system of input demand equations (capital, labor, energy, intermediate materials, and structures) using time series data for the period 1954–76. Estimates of compensated demand elasticities and of the Allen elasticities of substitution are provided. By implicit differentiation of the equality $C^* = C(P, Y)$, a measure of the output effect (the analogue in producer theory of the income effect in consumer theory) is obtained. Estimates of the market elasticities of demand may be compiled without further econometric analysis.

"A Benchmark Study of the Southern United States Meat Packing Plant Industry." Gregory M. Sullivan, Auburn University, and James R. Simpson, University of Florida.

Meat packing plants in fourteen southern states were surveyed in 1980. Two-thirds of the packing plants slaughtered both cattle and hogs, allowing flexibility in acquiring available supplies of animals. More than 70 percent of the plants reported further processing of the carcass to capture value-added in the product. Packing plants had an average of 45 percent unused capacity in 1979. If shifts in the livestock-meat subsector in the United States should occur because of rising transportation costs or grain prices, slaughter capacity in the southern packing plant industry will not be a limiting factor.

PRICE ANALYSIS—LIVESTOCK AND POULTRY. (Carl Shafer, Texas A&M University).

"Feeder Steer Price Variations: Cyclical, Seasonal, Weight, Grade and Ration Cost Interrelationships." Marion F. Simon and James N. Trapp, Oklahoma State University.

Feeder steer prices are characterized by cyclical and seasonal price variations over time, and by distinct variations resulting from weight and grade characteristics of the animal. The article focuses upon describing and explaining these relationships.

Monthly data indicated significant seasonal and cyclical patterns. Weight, grade, and feed ration prices significantly influenced feeder steer prices.

"The Changing Demand Structure for Pork and Beef in the 1970s—Implications for the 1980s." Curtis Braschler, University of Missouri-Columbia.

This study hypothesized a major structural change in the demand for pork and beef during the 31-year period, 1950–80. This hypothesis was formulated on the observation that demand equations estimated from data generated during the

period, 1950–70 were resulting in increasingly inaccurate estimates of price and consumption for both pork and beef, particularly for the period after 1973.

There is substantial statistical evidence to support the conclusion that a major decline occurred in the demand for beef during the 1970s; the evidence of a decline in the demand for pork is less compelling.

“Variable Length Harmonic Analysis of the Hog Cycle.” Ronald L. Plain, University of Missouri-Columbia, and Joseph E. Williams, Oklahoma State University.

Market hog prices historically have shown great variation and have often followed a cyclical pattern. This paper presents the results of attempts to fit harmonic regression equations to market hog prices. A harmonic model incorporating trend, a six-month seasonality factor, a short cycle of 2.75 years, and a long cycle of 9 years does a good job of tracking prices during the 1970s. A technique that allows variable cycle length was developed and tested using the same data. The variable cycle model more accurately tracked price movements, but relies upon trial and error to optimize control variables.

“A Probabilistic Approach to Estimating Aggregate Regional Demand for Broiler Meat.” Chung Liang Huang and Robert Raunika, University of Georgia.

The objective of the study is to develop estimates of the aggregate regional market demand for broiler meat. An alternative approach that incorporates estimation of probability change in allocating regional demand for broiler meat is developed and its application is illustrated.

Probable changes in market participation with respect to demand for whole broilers and broiler parts resulting from changes in income and socioeconomic characteristics of the U.S. population are estimated via probit procedure, using the 1972–73 BLS Consumer Expenditure Diary Survey. Results suggest that the procedure is a viable alternative and has potential for application to other food commodities.

“Structural Stability and Specification in Linear Demand Models with Specific Reference to the U.S. Quarterly Retail Demand for Meats.” J. C. O. Nuankori and George Miller, Clemson University.

The use of multiple regression procedure in the estimation of consumer demand in general is restrictive because of the assumption of constant coefficients. This is particularly serious when time series data are used. The failure to explicitly permit parameter variations in demand models

may be associated with undue rejection of the linear relationships between consumption, price, and income variables. The alternative specification of the demand relationships in nonlinear terms, while statistically superior in several instances, is nonetheless limited by the inherent constant coefficient assumption. To explicitly incorporate parameter variation in a linear functional form, quarterly retail demand for four meat items is specified in the form of varying parameter models, and the points of changes in the coefficients are determined. Over the sample observation, there are consequently definite segments within which the relationships between the variables are simple, more easily estimable, and have straightforward interpretations.

ECONOMICS OF RECREATION AND POLLUTION CONTROL (Herbert Stoevener, Virginia Polytechnic Institute and State University)

“Recreation as a Commodity: What Do We Attempt to Value?” John R. Stoll, Texas A&M University.

This paper discusses the conceptual framework that is usually offered when viewing recreational assessment. An alternative framework is offered, based on work in household production theory and the “new theory of demand”. Implications of this framework and its usefulness for future research is addressed. A brief discussion of the basis for travel cost and contingent valuation methodologies is also presented. This is a conceptual paper which attempts to stimulate additional thought regarding what recreational assessment actually encompasses.

“Economic Impact of Recreation Expenditures: An Interregional Input-Output Approach.” Tesfa G. Ghebremedhin, Southern University, and Dean F. Schreiner, Oklahoma State University.

Oklahoma has more than 550,000 surface acres of water available for recreation. Estimated recreation expenditures on Oklahoma’s portion of the McClellan-Kerr Arkansas River Navigation System amounts to more than \$200,000,000 annually. An interregional input-output model was used to measure the economic impact of recreation expenditures in the MKARNS on the state. The direct and indirect employment impact associated with these recreation expenditures is estimated at more than \$100,000,000. Approximately 61 percent of these economic impacts accrues in Oklahoma, with the remainder accruing in the rest of the U.S. through interregional trade. Recreation impacts of this magnitude should be considered, along with the other impacts of such a multi-purpose, water-based system.

“Pooling Time Series and Cross-Section Data: A Stein-Rule Application to Recreational Demand.” Rod F. Ziemer, Texas A&M University, and Michael E. Wetzstein, University of Georgia.

A Stein-like estimator is discussed as an alternative to the traditional statistical approaches to pooling time-series and cross-section data. Ex post forecasts of the Stein-like estimators applied to a recreation demand model were compared to that of the conventional unrestricted estimators. Results indicated the Stein-like estimator to be superior to more conventional estimators in terms of forecasting performance.

“Elasticity and Substitution Among California Wilderness Areas.” Michael E. Wetzstein, University of Georgia.

A model designed for estimating the elasticity of substitution for imports in international trade is applied to outdoor recreation activities. The results from applying the model indicates that there does exist significant substitution among wilderness outdoor recreation activities. Therefore, land-use planners should address this problem when considering additions to the wilderness system.

“The Economic Value of Coastal Wetlands in Nonpoint Pollution Control.” Sandra S. Batie, Virginia Polytechnic Institute and State University, and William M. Park, University of Tennessee.

Improved decision making in wetlands management requires information on the economic value of the environmental services of wetlands, for example, water quality improvement. Tentative physical evidence for the existence of two wetlands' functions with regard to nonpoint pollution control—long-term nutrient accumulation and short-term nutrient buffering—is presented. The proper application of the alternative cost technique, a useful approach where data limitations preclude a demand-based approach to valuation of nonmarket services, is illustrated in estimation of the economic value of these functions.

ECONOMICS OF FOOD MARKETING AND CONSUMPTION (Lanny Bateman, Mississippi State University)

The Structural Stability of the Concentration-Performance Relationship in Food Manufacturing.” Stephen E. Miller, Clemson University.

The objective of this paper is to determine whether there is a “critical” concentration ratio in the food manufacturing sector. The statistical techniques employed offer advantages over the methods used in previous analyses of this sort.

The results of CUSUM, CUSUMSQ, and log-likelihood tests applied to food manufacturing firm data indicate a change in the relationship between concentration and profitability when four-firm concentration is 64%. There is only very weak evidence of a “critical” 8-firm concentration ratio.

“The Influence of Food Expenditures, Number of Meals, and Other Socioeconomic Variables on At-Home Nutrient Intake.” Joyce E. Allen and Kenneth E. Gadson, ERS/USDA.

Data from the 1977–78 USDA Nationwide Food Consumption Survey are utilized to examine the influence of selected socioeconomic variables on nutrients available for consumption. Regression analysis indicates that food expenditures and the number of meals consumed at home are significant factors affecting nutrient intake. Other factors found to influence at-home nutrient intake include location of residence, race, educational level, and stage of the household in the family life cycle.

“A Further Examination of Household Production Model: The Case of Baking Products Expenditure Patterns.” Stanley M. Fletcher, University of Georgia.

A household production model is an alternative in cross-sectional analysis of food consumption. Data from the 1972–73 BLS Consumer Expenditure Diary Survey were used to empirically investigate a household's baking products expenditures. A key element in a household's decision making in food purchases appears to be the substitutability between a number of marketing services and home food preparation time. Thus, the implication from the findings is that the future purchases of food items relatively intensive in marketing services may not continue to follow the trend of the 60s and 70s.

“Empirical Comparison of Alternative Qualitative Choice Models: The Case of Food Stamp Participation in the South.” Oral Capps, Jr., and Randall A. Kramer, Virginia Polytechnic Institute and State University.

An empirical comparison of probit analysis vis-à-vis logit analysis is provided on the basis of the same set of data. The criteria for the comparison encompass the use of estimated parameter values, signs, magnitudes, test statistics, goodness-of-fit to sample data, and predictive ability to independent data samples. To judge the empirical performance of the alternative qualitative choice models, factors that influence household participation in the food stamp program in the South are investigated.

ISSUES AND TECHNIQUES IN EXTENSION AND TEACHING (Dewitt Jones, Southern University)

“Teaching Practicum in Agricultural Economics.” Fred White, Josef Broder, and Michael Wetzstein, University of Georgia.

Many doctoral students in agricultural economics receive little formal teaching training in graduate school and seldom have adequate documentation of their teaching effectiveness. This paper discusses the need for a teacher training program in agricultural economics. The implementation of a teaching practicum at the University of Georgia is discussed. Potential weaknesses in specific teaching skills among graduate students were identified by contrasting student evaluations of graduate students and faculty instructors. Graduate student instructors received over all student evaluations equal to those of faculty instructors, indicating that graduate student instructors may be utilized without diminishing overall instructional quality.

“Taste Panel Applications of Consumer Economics for the Classroom.” John W. McClelland and Josef M. Broder, University of Georgia.

The use of alternative teaching techniques has been widely examined in the economics education literature. This paper discusses the theoretical justification for using alternative teaching techniques via the production function concept of economics education. The use of the consumer taste panel is introduced as an alternative method for teaching some of the basic assumptions of perfect competition and indifference curve analysis. More specifically, the taste panel is used to illustrate consistency and transitivity in consumer preferences and the effects of advertising on consumer choice. Empirical results of a taste panel application to an economics class are presented and evaluated.

“Tailoring Extension Programs to Audience Needs and Interests: An Application to Kentucky’s Youth Program.” Ella Kay Carl and Steven K. Riggins, University of Kentucky.

Successful extension programs must be, and remain, attuned to audience needs and characteristics. Surveys of program participants are one way of assessing whether or not current programs are meeting these goals. Analysis of a survey of Kentucky’s youth program participants revealed areas in which the program was strong, what exogenous factors were influencing participant’s test scores, and pointed out some areas requiring further investigation to determine if changes in the program are desirable. In general, the program appears to be influenced by socio-economic background factors of participants and

school-related activities, more than how or by whom it is administered.

“Obstacles to Carcass-Based Livestock Marketing and Implications for Extension Programs.” A. Lee Meyer, University of Kentucky, and Mahlon Lang, Purdue University.

Carcass-based marketing permits the value of slaughter livestock to be more accurately reflected in price than in the live-weight method because meat value indicators can be observed rather than estimated. While past research has indicated that the method improves pricing accuracy, a relatively small proportion of livestock is traded on a carcass-basis. This study surveyed packers and livestock producers to determine the obstacles to increased use of the method. The major obstacles are described, and extension programs designed to reduce the obstacles are suggested.

“Rural Development Needs in West Tennessee: An Analysis of a Survey of County Leaders.” Surrendra P. Singh and Handy Williamson, Jr., Tennessee State University.

The paper reports the analyses of a survey of county leaders in 20 counties of western Tennessee. The major purpose of this investigation is to determine prime rural development needs as perceived by local leaders in western Tennessee counties, and to determine if these needs differ between large and small counties: no significant difference was found. Also, no significant difference was found in the choice of coordinative and exchange needs by the local leaders surveyed. Thirty developmental activities were divided into three major groups for further analyses. Some practical implications for the study are discussed.

OPTIMIZATION IN MACHINERY AND IRRIGATION DECISIONS (Odell Walker, Oklahoma State University)

“An Econometric Analysis of Qualitative Choice Among Performance Characteristics of Agricultural Tractors.” Angelos Pagoulatos, William Johnson, and David Debertin, University of Kentucky.

A heterogeneous hedonic approach is used to analyze the qualitative choices of buyers and sellers in the market for agricultural tractors in the United States. Empirical results suggest that, of the performance variables examined in this study, only take-off horsepower is reflected in the adjusted list prices of new agricultural tractors between 1968 and 1980. No evidence was found relating prices to either the ratio of drawbar horsepower to power take-off or fuel efficiency.

“A Simulation Modeling Approach to Deriving Optimal Irrigation Strategies for “Valencia” Citrus in Central Florida.” J. A. Anaman, G. D. Lynn, Clyde F. Kiker, and William G. Boggess, University of Florida.

Experimental data on citrus are used within an irrigation simulation model to determine optimal strategies. The intra-seasonal time period is considered. A 70-percent “trigger point” with a 1” application rate is shown to be optimal to the grower, based on daily rainfall patterns over the past 50 years.

“Agricultural Labor Availability and Optimum Machinery Size on a Representative Farm in Georgia.” Chia-Jen Chou, Wesley N. Musser, and Bill R. Miller, University of Georgia.

Agricultural economists have been devoting considerable attention to the structural changes in the agricultural sector arising from energy costs increases. However, changes in the agricultural labor market which constrain management have not been considered. This paper presents research that addresses this labor availability issue. A mixed integer programming model of machinery selection for a row crop farm in southern Georgia is used in this research. Alternative labor availability scenarios included in the research are hourly labor and full-time labor. The solution for full-time labor includes larger machinery and much excess labor and machinery capacity, which illustrates current labor management dilemmas.

“Optimal Replacement of Farm Tractors: Effects of Alternative Remaining Value Estimators.” Donald Reid and Garnett Bradford, University of Kentucky.

Previous studies have demonstrated that the remaining market value (RV) of a farm tractor has a pronounced effect on its optimal replacement age. However, previous RV formulas do not account for variables other than the tractor’s age or condition. This study presents a generalized RV formula that accounts for the tractor’s horsepower and make, net farm income, and technological change. This formula is compared with previous formulas, particularly the formula’s efficacy in reliable optimal replacement forecasts.

PRICE ANALYSIS—METHODS AND APPLICATIONS (Barry Bobst, University of Kentucky)

“A Linked Model for Predicting New Mexico Alfalfa Hay Prices.” Martin J. Blake and Tom Clevenger, New Mexico State University.

This paper develops a model to predict both the initial season price for New Mexico alfalfa

hay and the subsequent seasonal monthly price pattern in advance of the first harvest. This is accomplished by linking an annual model, which predicts the initial May price, with a monthly model, which tracks the monthly seasonal price pattern, given the predicted May price.

“The Choice of Weights for Index Number Construction.” Lyle Solverson, Southern Illinois University, and Fred A. Vogel, ESS/USDA.

The objectives of this paper were to compare three methods of computing the Index of Prices Received by Farmers, and to answer the question, Does the weighting procedure make any difference?

The absolute size of the indexes, the year to year changes, and the relative variability show that the method of computation is important. Because of high correlations between prices and weights and the uneven dispersion in prices between commodities, the weighting procedure must be carefully considered.

“The U.S. Demand for Dried Distillers Grains.” Dargan H. Glaze, C. Stassen Thompson, and Stephen E. Miller, Clemson University.

The objective of this study was to obtain an estimate of the U.S. derived demand for DDG. This objective was obtained by deriving least cost rations for the major livestock categories that can consume DDG, as the price of DDG was allowed to vary, *ceteris paribus*. The resulting usage levels of DDG were aggregated to obtain an estimated annual national output-constant derived demand schedule for DDG. The estimated demand function reasonably describes current conditions in the DDG market. Based on the estimated demand function, projections of 1990 DDG prices range from 6.9 to 8.4 cents/lb.

“Determinants of Marketing Margins and Ex-Vessel Prices for Virginia Oysters.” Leonard Shabman and Oral Capps, Jr., Virginia Polytechnic Institute and State University.

The nature and the magnitude of factors that influence gross marketing margins of Virginia oysters for the processing sector and ex-vessel prices of Virginia oysters were investigated. The data base used consisted of annual observations for the period from 1960 to 1976. Processor price, transportation cost, and overhead cost in processing oysters, as well as the opportunity cost of oyster processor capital and management inputs explained trends in the marketing margin and the ex-vessel price of Virginia oysters. Oyster landings in the Chesapeake Bay and labor cost in the processing sector did not significantly affect either the marketing margin or the ex-vessel price.

“Evaluating the Pricing Performance of Vertical Exchange Mechanisms: An Implicit Price Approach.” Larry W. Kenny, University of Florida; Ella Kay Carl, University of Kentucky; and Richard L. Kilmer, University of Florida.

A conceptual framework for evaluating prices in and among different vertical exchange mechanisms is developed. A set of implicit prices can be estimated based on the exchange price. Estimation of implicit prices via regression analysis would provide evidence that the valuation of services was one influence on prices in contract.

ASSESSMENTS OF THE CONTRIBUTIONS OF RESEARCH, EDUCATION AND NEW TECHNOLOGY (Ed Faris, Clemson University)

“Productivity in U.S. Food and Agriculture: Implications for Research and Education.” B. R. Eddleman, Mississippi State University; Joseph C. Purcell, University of Georgia; and Lloyd D. Teigen, ERS/USDA.

Efforts to constrain the upward pressure on food costs and more efficient use of energy, land, water and other natural resources have emerged as motivating forces undergirding food and agricultural research and education in the 1970s. Productivity trends in the food and agricultural sector are examined. Factors constraining productivity growth in industries that supply farm inputs, in primary farm and forest production, and in farm-forest products processing, fabricating and distribution are discussed. Research and education programs for relaxing the constraints on increasing output, productivity and capacity of the food and agricultural sector are identified.

“An Economic Assessment of Corn, Soybean, and Wheat Research and Extension Investments in the Southern and North Central Regions.” Daniel M. Otto and Joseph Havlicek, Jr., Virginia Polytechnic Institute and State University.

A yield response function, based on cross-sectional time-series data, was used to evaluate separately research and extension investments in corn, soybeans, and wheat for the southern and north central regions. Estimated returns in the South ranged from 79 to 152 percent for own state research, 10 to 62 percent for outside research, and 13 to 30 percent for extension, versus 148 to 210 percent for in-state research, 28 to 49 percent for out-state research, and 73 percent for extension investments in the north central region.

“The Contribution of Pesticides and Other Technologies to Corn Production in the Corn Belt Region, 1964–1979.” David Schroder, J. Charles Headley, and Robert M. Finley, University of Missouri-Columbia.

This report attempts to identify the contributions of technology and weather to corn yield variation for the period 1964 to 1979 in the Corn Belt region with respect to three regression techniques. Technology variables included were genetic improvement, acres treated with herbicides, and fertilizers. A pooled cross-sectional time-series data base was used to estimate regression parameters for herbicides and other variables, using second-degree polynomial equations in estimating a regional yield equation. In addition, changes in predicted yields were partitioned with respect to weather and technologies. Annual benefits obtained from herbicide use on corn for the U.S. in 1979 were estimated at \$2.1 billion.

“Estimating the Returns to Agricultural Research, Extension, and Education at the State Level.” George W. Norton, Joseph D. Coffey, and E. Berrier Frye, Virginia Polytechnic Institute and State University.

This paper compares alternative approaches for measuring sources of agricultural productivity growth and estimating rates of return to research, extension, and education at the state level. Approaches include (1) making use of national production function coefficients and state data; (2) estimation of a state production function with a time trend; and (3) estimation of a state production function, including research, extension, and education as independent variables. Comparisons are made between ordinary least squares results and those from ridge regression and principal components regression using Virginia data.

ANALYSIS OF INVESTMENT DECISIONS (Bruce Hottel, Federal Crop Insurance, USDA)

“Lease vs. Purchase of a Center-Pivot Irrigation System in Georgia.” J. Douglas Robertson and Wesley N. Musser, University of Georgia.

Different methods of financing irrigation equipment in the southeast have not been considered, despite the large number of systems being installed. This paper presents a net present value analysis of the lease versus purchase decision under current market conditions. For a wide range of economic parameters, leasing is superior to purchasing. The potential reasons for the different outcome than developed in previous studies are considered in the conclusion.

“Leasing versus Conventional Methods of Finance of a Confinement Swine Facility.” Neil R. Martin, Jr., and J. Ronald Montgomery, Auburn University.

Leasing of swine facilities in the South is a new concept in need of evaluation at the present

phase of agricultural price relationships. Three lenders, including a leasing alternative, presented feasible plans of finance for a 260-sow confinement facility. Net present values for the three plans of finance are close enough that it is likely that some other factor will be of relatively greater importance to an individual farm situation. Leasing of capital facilities and equipment should be considered by producers planning to enter or expand capital intensive enterprises, such as confinement swine facilities.

“A Neoclassical Approach to Agricultural Investment Behavior.” Robert Dubman, University of Georgia.

Agricultural investment behavior was estimated using a neoclassical model in which the capital output ratio is influenced by the relative cost of capital. Minimum risk estimates were achieved by applying a Stein rule to the polynomial distributed lag and intercept. Annual aggregate data for the agricultural sector were used. The results show that policies which lower the price of capital relative to other inputs could increase investment expenditures.

“Risk-Return Assessment of Irrigation Decisions.” W. G. Boggess, G. D. Lynne, J. W. Jones and D. P. Swaney, University of Florida.

A simulation model is used to analyze soybean irrigation scheduling and investment decisions. Maximum net returns, maximum yield, and maximum return to irrigation water strategies are identified. The E-V frontier for alternative irrigation strategies is determined, and the total variability in net returns is partitioned between price, yield, pumping costs, and irrigation water components. Probability curve and convolution of risks techniques are used to quantify and interpret the risks associated with alternative irrigation strategies. Finally, the expected net present value and associated variability of investing in an irrigation system is briefly examined.

PERFORMANCE OF FUTURES MARKETS (John Adrian, Auburn University)

“The Pricing and Output Performance of Coordinated and Spot Markets.” Richard L. Kilmer and Ronald W. Ward, University of Florida.

Performance indices are developed and an analysis is made of the performance of a market coordinated by *spot exchange only* with a multiple mechanism market that has a combination of spot and nonspot firms. Performance of exchange mechanisms varies depending on its effect on product characteristics, transaction costs, and technology.

“Price-Forecasting Evaluation of the Futures Markets for Live Cattle and Hogs.” Matthew T.

Holt, Jon A. Brandt, and Steven P. Erickson, Purdue University.

In the period 1975–80, cattle futures prices were shown to forecast accurately closing prices from one to eight months prior to delivery, with the exceptions of months three and five. Hog futures prices forecast accurately only from one month before delivery. A second evaluation procedure indicated that mean square errors of cattle futures price forecasts were significantly lower than those of cash price forecasts from about the 15th through the 36th week prior to delivery. Hog futures prices were much poorer predictors. In some cases, cash prices generated lower mean square errors.

“Cash Price Stability in the Presence of Futures Markets: A Multivariate Casualty Test for Live Beef Cattle.” Robert D. Weaver and Aniruddha Banerjee, Pennsylvania State University.

The possibility that cash price behavior could be influenced by futures market trading of a commodity is considered in the context of a simple market model. It is shown that if the cash and futures market are linked by hedging and inventory arbitrage, then cash prices will be simultaneously determined with futures prices. Only when inventory arbitrage is infeasible and the futures price level introduces new information, not available in the absence of futures trading, will futures prices be exogenous determinants of cash prices. A multivariate causality test was conducted and evidence found to support the exogeneity of the relative futures price of slaughter cattle, cash price of feeder cattle, cash price of soybean meal, and cash price of broilers, with respect to the cash price of live cattle.

“Portfolio Analysis of Production Hedging in Feeder Calf Backgrounding Operations.” Barry W. Bobst, University of Kentucky; Orlen C. Grunewald, Kansas State University; Joe T. Davis, University of Kentucky.

Efficient portfolios consisting of hedged and unhedged feeder calf backgrounding enterprises are computed by quadratic programming. The maximum rate of return point on the efficient frontier of all portfolios is an unhedged enterprise, but all other points involved combinations of hedged and unhedged enterprises. No completely hedged operations are found on the efficient frontier. The efficient frontier provides necessary information to backgrounders wishing to make rational decisions about risks and rewards in their operations. However, the indivisibility of futures contracts makes hedging inaccessible to small operators.

ECONOMICS OF SOIL CONSERVATION (Gary Lynne, University of Florida)

“Soil Conservation under Uncertain Revenues and

Input Supplies.” Randall A. Kramer and William T. McSweeney, Virginia Polytechnic Institute and State University.

A normative model is employed to examine soil loss control strategies at the farm level. The quadratic programming model allows the consideration of uncertainty in both revenues and supplies. It is demonstrated that risk aversion can influence the selection of soil conserving activities.

“An Economic Analysis of Controlling Soil Erosion in the Arkansas Delta.” Robert N. Shulstad, Alan D. McQueen, and C. Tim Osborn, University of Arkansas.

Soil erosion in the Arkansas delta has little effect on cropland productivity, but does have an enormous impact on the water quality of area lakes and streams. Lake Chicot, an oxbow lake in southeastern Arkansas, is a dramatic example of the impact of soil erosion. Results from a linear programming model of the watershed feeding the lake indicate that soil erosion can be significantly reduced, while increasing net returns for farmers. Significant reductions in soil loss beyond the point of profit maximization can additionally be made with very little affect on farm income.

“Facts Affecting the Use of Soil Conservation Practices: Hypothesis, Evidence, and Policy Implications.” David E. Ervin and Christine Ervin, University of Missouri-Columbia.

Emphasis on soil erosion control has increased recently. Information concerning who uses erosion control practices and why is needed to improve the performance of soil conservation programs. A decision-making model is postulated with roles for personal, physical institutional, and economic factors. Empirical tests show that personal factors are most important in explaining the diversity of practices used, but economic factors play more important roles in explaining soil conservation effort. Participation in existing governmental education and technical assistance conservation programs showed no significant effects. Targeting different types of assistance to different types of farmers would appear to enhance program effectiveness.

“Program Cost Effectiveness and Alternative Subsidy Schemes for Soil Erosion Control.” William M. Park, University of Tennessee.

The use of uniform subsidies to induce voluntary soil erosion control results in rent payments accruing to many BMP adopters. Subsidy schemes that offer payments per ton of erosion reduction and per acre of BMP application are compared with cost sharing in regard to program cost effectiveness for terracing in a case study area. The magnitude of rents as a component of

program costs and, thus, relative cost effectiveness among subsidy schemes is found to be sensitive to the variance in gross cost, erosion reduction, and yield improvement among land groups. Policy and research implications are outlined.

PRODUCTION AND MARKETING ON SMALL- TO MODERATE-SIZE FAMILY FARMS (Harry Hall, University of Kentucky)

“Alternative Feeder Pig Production Systems and Optimal Sale Weights on Limited Resource Farms in Virginia.” Peter Fisher, Virginia Polytechnic Institute and State University; and Kenneth Baum, ERS/USDA.

Alternative types of feeder pig production systems and related optimal sale weights for limited resource farms in Virginia are analyzed from 1975 to 1979. Marketing heavier weight pigs (60–65 lbs.) in the pasture, pasture-partial confinement, partial confinement-dirt, and intensive partial confinement systems usually resulted in higher incomes than if lower weight, forty-pound pigs were sold. The observed mean monthly market weight was found to be related to several cost, price, and competitive labor factors that apparently led to lower feeder pig weights for limited resource farmers.

“An Economic Analysis of the Earnings Potential of Small Farm Families in South Central Louisiana.” Dewitt Jones and Phillip J. Cormier, Southern University.

A linear programming model has been developed to demonstrate the earnings potential of small farm families through optimum allocation of the resources at their command. The initial model constrains all resources at their current level, prohibits the renting out or in of land, and restricts labor to on-farm use only. Subsequent models relax various combinations of the initial constraints, with the exception of the amount of land owned.

An important concept built into the model is an adjustment factor to account for differences in productivity between an adult male (operator) and adult female (spouse) performing farm work.

“The Limited Market Access Problem of Small-Scale Fruit and Vegetable Growers to Terminal Wholesalers and Brokers—A Louisiana Case Study.” John E. Ellerman and Jerry M. Law, Louisiana State University.

The purpose of this paper is to determine potential barriers to the direct marketing of fresh fruit and vegetables to terminal wholesale markets and brokers. More precisely, it addresses the question of what fruit or vegetable growers must do to gain entry into the mass merchandising system.

It was found that there are several potential barriers to entry into these markets, especially for small-scale producers. Minimum volumes, grading and packing equipment, as well as refrigeration facilities are cited as potential barriers. Also, a producer's reputation is his best asset if he wishes to continue marketing to these outlets.

“An Economic Analysis of Irrigated Multiple Crop Production in the Coastal Plain of Georgia: Some Preliminary Results.” Bernard V. Tew, Wesley N. Musser, and J. Douglas Robertson, University of Georgia.

Irrigation has become an increasingly prevalent production practice in the southeast. This paper utilizes data from an irrigated multiple-crop research project at the Coastal Plain Experiment Station, Tifton, Georgia, for development of enterprise budgets on irrigated crops. Agronomic, vegetable, and combination sequences are analyzed. The cropping sequences are replicated on two different soil types and using six tillage methods. Tentatively, most cropping sequences are profitable, with profits from the vegetable systems exceeding profits from the agronomic systems. The optimal tillage method varies among crops and soils. Some implications for potential adoption of the irrigated systems analyzed in this paper are presented.

“A Typical Farm Series: Development and an Application to a Mississippi Farm.” Thomas C. Hatch, Cole Gustafson, Kenneth Baum, and David Harrington, NED/USDA.

Evaluating the farm-level impacts of alternative economic environments and agricultural policies can be accomplished through the use of Typical Farm Analyses. Although the Typical Farm situations may not be representative of every farming situation, their geographical and technological homogeneity, and derivation from census data provide adequate assurance of their usefulness in applied agricultural research. Twenty typical farms are presented that will be monitored as an ongoing research function in ERS/USDA.

ISSUES IN THEORY AND METHODOLOGY (Max Langham, University of Florida)

“An Integrated Programming Approach to Spatial Studies.” Steve R. Meyer and Joseph E. Williams, Oklahoma State University.

The integrated model consists of a sequential employment of reactive programming and a linear programming formulation of a transshipment problem. By using the integrated model, the researcher may consider more than one level of a marketing system, while still considering the

basic functions of the system—retail demand and raw product supply. Information is provided by the solution concerning spatial equilibrium final product demands, prices, and interregional trade flows and cost-minimizing production, raw product shipment, and processing patterns.

“What Determines the Elasticity of Industry Demand?” Emilio Pagoulatos, University of Florida, and Robert Storenson, University of Missouri-St. Louis.

This paper develops estimates of price elasticity of demand for a sample of U.S. food and tobacco industry and tests a model explaining differences in intra-industry elasticity. The empirical results are consistent with the hypothesis that demand elasticity is in part determined by the competitive behavior of firms in an industry. In particular, high advertising expenditures result in lower elasticities of demand. Other important variables influencing demand elasticity are the geographical dispersion of production, the stage of production, the existence of protection from foreign entry, and the extent of brand proliferation and new-product introduction in a particular market.

“Duality Theory in Output Supply and Factor Demand Analysis in a Multiple Product Firm.” William T. McSweeney, Virginia Polytechnic Institute and State University.

This paper demonstrates a method for deriving a consistent model of producer choice, with the calculation of price elasticities of supply and factor demand as the primary objective. Various authors have worked on the theory, but only within the last decade has the method been used by applied economists.

The theory underlying the procedure is discussed first, followed by a discussion on data requirements. Tackling the pitfalls of empirical implementation of the method is discussed largely with the use of an application, the results of which are presented and discussed briefly.

“Another Look at Tradeoffs Associated with Water Rate Structures.” Dorothy Comer and Richard Beilock, University of Florida.

The costs and benefits to society of adopting alternative pricing strategies for water are examined. While equity and distributional issues are touched upon, major emphasis is devoted to identifying inefficiency losses attendant on multiple pricing schemes, such as inclining or declining price structures, which are commonly employed to price water. It is argued that such losses have been overlooked both in the literature and in practice because they are not as obvious or politically controversial as equity and distributional issues.

**INTERNATIONAL TRADE AND ANALYSES
OF EXPORT DEMAND (Joe Free, Tennessee
Valley Authority)**

“Microeconomic Aspects of Export Marketing: Issues and a Framework for Empirical Investigation.” Mark D. Newman, Kansas State University.

Insufficient research effort addresses export marketing functions that affect competitive positions of agricultural exporters and export market structure. This paper discusses the theoretical importance of understanding microeconomic export-related issues, and presents a functional export marketing framework through which scale economies and market coordination issues can be addressed.

“The Import Demand for U.S. Burley Tobacco in European Markets.” Michael R. Reed, University of Kentucky, and Randall D. Schnepf, Clayton Brokerage.

An econometric model investigates the degree of price competition that exists in European markets for U.S. burley tobacco. The results indicate the U.S. burley exports to some European countries are price responsive; however, the import demand elasticity for these countries may be less than unity. Therefore, domestic policies that lead to price decreases may result in reductions in U.S. burley tobacco export earnings from European markets.

“Implications of Income Growth in the LDCs for U.S. Grain Exports.” Donald O. Mitchell, Michigan State University.

The importance of wheat and coarse grain imports to the world market is reviewed and the changing nature of these imports is shown. The contribution of income growth to the level and nature of these imports is theoretically and empirically explored. A cross-section analysis of 62 LDCs imports for 1978 is presented. The income-import relationship is shown to change with the level of income both for wheat and coarse grains. Implications for future LDC imports of wheat and coarse grain are given along with the implications for U.S. exports.

“U.S. Grain Exports and Exchange Rates.” James J. Ball and Lowell B. Catlett, New Mexico State University.

An investigation into the impact of dollar devaluation on the real terms of trade for U.S. grain exports in an era of floating exchange rates was conducted using Ordinary Least Squares (OLS) techniques. An index of the geometrically averaged, trade-weighted annual exchange value of

the dollar was regressed on the total volume of corn, soybean, wheat, rice, oats, barley, and grain sorghum exported annually during the period 1967–79. Ninety-two percent of the variation in U.S. grain exports can be explained by the shifts in the real (non-monetary) terms of trade for American food and feed grains during the period 1967–79. The results of the analysis indicate that U.S. agricultural products were overpriced; and, therefore, under-utilized in the world market before 1971, because of the fixed exchange rates and gold standard then in existence. The realignment of major world currencies resulting from dollar devaluation in 1971 and 1973, along with the institution of floating exchange rates, thereafter permitted the explosion in U.S. grain exports that occurred during the seventies.

**ESTIMATES OF PRODUCTION FUNCTION
RELATIONSHIPS (Fred Saunders, University of
Georgia)**

“Corn Yield Response: A Micro Analysis.” Steven K. Riggins and Michael R. Reed, University of Kentucky.

A micro-oriented approach was used to estimate yield response functions for corn in Kentucky. This model used first differences to focus attention on weather and economic variables. The study found no evidence that producers have reacted to changing input and output prices in recent years. Variations in corn yields are explicable through weather and technological factors.

“Production Functions for Potatoes in West Texas Under Varying Levels of Irrigation.” John Downes and Bob Davis, Texas Tech University.

In the extremely hot and dry 1980 growing season in west Texas, Norgold Russet and Viking potatoes were grown in a factorial experiment involving three levels each of irrigation, seeding rate, and nitrogen fertilizer and two levels of P_2O_5 .

Production functions were estimated for two grades—U.S. No. 1 and marketable grade. Norgold yields were reduced by nitrogen fertilizer and increased by seeding rate and irrigation level. There was no response to P_2O_5 . All variables influenced yields of Viking potatoes, but the extent and direction of influence depended upon grade and the levels of the variables used in combination with each other. For both varieties, optimum irrigation levels were relatively high when compared to water requirements for traditional field crops, but the vegetables returned enough per acre to pay for the cost of the water and other inputs.

“Yield Response of Soybeans to Monthly Rainfall During the Growing Season in the Mississippi Delta.” James G. Hammill and Ying-Nan Lin, Mississippi State University.

The yield response of soybeans to rainfall was analyzed by a regression model. The fitted regression equation showed that soybean yields could be increased by additional rainfall, above the mean, in May, June, July, and August during the study period, 1957–80. In September, yields would not be increased by any additional rainfall above the mean. It also showed that soybean yields would have decreased at increasing rates following an increase in September rainfall.

The marginal response function with respect to June rainfall shows that soybean yields would have increased at an increasing rate because of the increase in June rainfall. However, this can be inferred only within the range of the June rainfall variable.

“An Empirical Model to Determine the Frequency and Quantity of Limestone Applications.” Ernest Bentley, Virginia Polytechnic Institute and State University.

A multi-year response function is used to estimate the effects of limestone on corn yields on Goldsboro Sandy Loam soil in southeastern Virginia. The profit-maximizing quantity and frequency of limestone application is determined, using asset replacement principals. The results indicate that a liming program is relatively insensitive to a wide range of crop prices, with the optimal quantity of limestone ranging from 3.8 to 4.1 tons per acre. The value-marginal productivity of limestone greatly exceeds its cost when used with recommended levels of N, P, and K. Similar analyses are being conducted for other crops and soil types in Virginia.

“Estimating the Economic Demand for Irrigation Water in Southwest Georgia.” Anthony L. Joseph, Ivery D. Clifton, and Fred C. White, University of Georgia.

A modification of the approaches suggested by Ruttan and Lynne in estimating the demand for irrigation water is applied to a southwest Georgia area. The estimated values are biased upward due to data problems. However, the economic researcher can overcome these problems with more explicit data. Other problems inherent in the guiding approaches were considerably reduced.

PRICE DISCOVERY-USEFULNESS OF INFORMATION AND VARIOUS PRICING SYSTEMS (Gene Mathia, NED, ERS, USDA)

“Impacts of the USDA Crop Production Reports on Corn and Soybean Price Variability: A Test of

the Efficient Market Hypothesis.” Mike Belongia, ERS/USDA, and Walter Spilka, Smith, Barney, Harris Upham Co., Inc.

USDA’s estimates of crop production represent new market information and could affect futures prices, if these supply estimates differ substantially from expectations held by market participants. The efficient markets hypothesis is tested with respect to soybean and corn futures prices by comparing the average price changes on days when the USDA report is released to average price changes on other trading days. Tests for equality of group means suggest no significant price effect resulting from the information in the crop production reports.

“Cost Analysis of Alternative Computerized Systems for the Marketing of Multiple Agricultural Commodities.” J. E. Epperson, D. H. Carley, C. L. Huang, S. M. Fletcher and S. C. Turner, University of Georgia.

Alternative computer systems were compared for use in a multiple commodity exchange. A time-sharing network was shown to be least expensive, most flexible, and to hold the greatest growth potential when compared with owned and leased systems. Only the time-sharing alternative consistently resulted in savings over a telephone exchange.

“Producer Attitudes Toward Electronic Marketing—An Application of Multivariate Probit Analysis.” S. C. Turner, J. E. Epperson and S. M. Fletcher, University of Georgia.

A crucial condition for the success of an electronic marketing system is producer acceptance and adoption. Using the probit technique to analyze data from a survey of primary producers in southwest Georgia, selected factors were examined with regard to their impact on individual producer attitudes toward electronic marketing. Results provide pertinent information to those contemplating or concerned with innovations in agricultural marketing. Some influential factors were age, intentions to expand farm operation, perception of fair farm prices, use of trade magazines as a source of production information, and use of other farmers as a source of marketing information.

“Hog Price Discovery in Florida Auction Markets: A Quantitative Analysis.” James R. Simpson and J. Scott Shonkwiler, University of Florida.

A statistical analysis on hog prices in four north Florida auction markets was carried out to determine differences between them. Distances regressed on the price differences indicated that price differentials are functionally related to spatial location.

TRANSPORTATION AND ENERGY ISSUES IN AGRICULTURE (Joe Musick, Louisiana State University)

“Rail Deregulation, Efficiency and Peak-Load Pricing: A Theoretical Analysis.” Lynn W. Robbins and Michael R. Reed, University of Kentucky.

Rail pricing schemes that would allow the grain marketing system to operate more efficiently are theoretically analyzed. It is found that a scheme of perfect regulation, through the use of a two-part tariff, is the most efficient, because of the existence of increasing returns to traffic density for rail freight. However, when one considers the problems with regulatory agencies, a non-regulated environment may be preferred. The key element is the competition among railroads and between various transportation modes as reflected in the elasticity of demand for rail services of an individual rail firm.

“The Effect of Increasing Fuel Prices on the Feeder Cattle Marketing System in Florida.” Gwen S. Shonkwiler and Thomas H. Spreen, University of Florida.

In 1979, nearly 80 percent of Florida's feeder calf crop was shipped from the state, all via truck. Thus the current marketing system is highly dependent upon trucking services and is vulnerable to increases in the cost of diesel fuel.

Statistical analysis discerned a positive relationship between the spatial differential for Kansas City and Florida feeder cattle prices and the price of diesel fuel.

An analysis of feedlot finishing in Florida was performed as a marketing alternative for Florida feeder cattle. Results indicated that the costs of production in Florida feedlots compared favorably with those in the western Corn Belt.

“Methodological Analysis of the Feasibility of Trailer-on-Flatcar Transportation in the South: Fresh Fruits and Vegetables.” Richard Beilock and Forrest Stegelin, University of Florida.

Energy cost and modal efficiency concerns among fresh fruit and vegetable (FFV) producers and shippers emphasize the need for analysis of alternative produce delivery systems, such as intermodal transportation, using trailers-on-flatcar (TOFC). Assuming approximate equality of service between trucks and TOFC, trucking

costs and TOFC costs are generated over a spectrum of fuel prices and TOFC equipment utilization levels. This spectrum includes back-hauls, to determine the combinations of these energy prices and usage levels necessary to make TOFC competitive with trucking for transporting fresh fruits and vegetables from the southern growing areas to the consuming markets in the Northeast and upper Midwest.

“Feasibility of On-Farm Ethanol Production in South Carolina.” Mark L. Arnette, Michael D. Hammig, and Michael L. Wise, Clemson University.

The feasibility of producing ethanol as part of a typical dairy enterprise in South Carolina was tested by a linear programming model. The LP model allowed 400 acres of cropping activities, and crops could be sold, used as cattle feed or used as feedstock for ethanol production. All production activities could use either purchased gasoline or ethanol produced on the farm. Ethanol production by-products could be sold or fed to the dairy herd. Model results indicate that, at 1981 prices, ethanol production is not profitable. However, sensitivity testing revealed that some slight price shifts can induce profitable ethanol production.

“BTU Energy Input Demand by Crop Producers.” James B. Kliebenstein and Francis P. McCamley, University of Missouri-Columbia.

This study used a quadratic programming model to generate farm firm level BTU demand surfaces. The model allowed for changing input and output prices along with changing risk aversion levels. Linear, quadratic, and cubic approximations of the BTU response surface were estimated. The ordinary least squares quadratic and cubic estimates were superior to the linear estimate. Elasticities with respect to respective output prices were generally larger than for the input price. Increases in corn and sorghum prices increased BTU demand, while increases in soybean or wheat prices reduced BTU demand. As risk aversion levels decreased, BTU demand increased. In terms of BTUs, it required 13,800 BTUs (1/10 gallon diesel or \$.10 with \$1.00 per gallon diesel) to increase expected net income by \$1.00. In terms of BTU efficiency, lower risk averse producers were more efficient than higher risk averse producers.