

I. RESEARCH PROJECT TITLE

Impact of Kansas Ethanol Production on Kansas Transportation

II. GENERAL PROBLEM STATEMENT

The rapid expansion of the biofuel industry has driven the Kansas agricultural transportation market into a new era. Nationally, fuel alcohol production increased from 1,630 million gallons in 2000 to 6,485 million gallons in 2007, a 298% increase. The number of ethanol production plants rose from 54 in January 2000 to 134 in April 2008, a 148% increase. In addition, there are currently 77 plants under construction or expanding. The number of farmer owned plants rose from 18 in January 2000 to 49 currently, accounting for 28% of total U.S. ethanol production capacity.

Although many factors have contributed to the growth of the U.S. ethanol industry perhaps the most significant is the soaring price of oil. As a result, gasoline prices are at all time highs. Blending with ethanol reduces gasoline consumption to somewhat mitigate the high price of gasoline. Energy security and independence from unstable foreign countries also has increased U.S. ethanol output. Global warming caused in part by combustion of fossil fuels has encouraged consumption of ethanol. Rural economic development related to corn and ethanol production has contributed to biofuel expansion. Federal energy policy requires gasoline refineries to use 15 billion gallons of ethanol by 2015 and 36 billion gallons by 2022.

These national trends have occurred in Kansas as well. As of May 2008, there are 10 operational ethanol plants with a combined annual capacity of 465 million gallons, with two additional plants under construction with a capacity of 75 million gallons.

The growth of the ethanol industry in Kansas has affected the Kansas corn market in unknown ways with resulting implications for Kansas agricultural transportation. KDOT needs to know the impact of the ethanol industry on the configuration and number of trucks in the traffic stream on Kansas highways. This information will allow KDOT to better forecast road deterioration on specific Kansas highways. Also KDOT needs to know the potential for ethanol plant location on Kansas shortline railroads to ensure their future economic viability.

III. BACKGROUND

In 1990, wheat dominated Kansas crop production with a harvest of 472,000 bushels compared to corn production of 188,500 bushels. In the 1990-2000 period Kansas corn production increased from 188,500 to 412,100 bushels, a 119% gain. Corn production has exceeded wheat production since 2000 (except 2003) and in 2007 was 56% greater than wheat output (448,800 vs. 288,000 bushels). In 2007 about 54% of the Kansas corn crop was produced in the three western Kansas crop reporting districts (CRD) with the southwest CRD alone accounting for 31% of the state total. Other major Kansas corn growing areas are the South Central (about 12%) and the Northeast (about 13%).

Kansas corn is delivered by motor carrier at harvest to the nearest country elevator. Prior to expansion of ethanol production, the primary destination markets of country elevators were Kansas, Oklahoma, and Texas feedlots with motor carriers accounting for all of these shipments. In Kansas, most of these corn shipments were to the three western Kansas CRDs which account for 77% of the feedlots in Kansas. Some corn was shipped to alcohol plants from country elevators via motor carrier. About 15 to 20% of the corn was shipped from country elevators by truck to large terminal elevators in Hutchinson, Wichita, Salina, Topeka, and Kansas City and then subsequently shipped by railroad to the Texas Gulf of Mexico ports for export or to livestock feed locations in other states.

The growth of ethanol production in Kansas has the potential to alter, in unknown ways, the traditional Kansas corn logistics system. It seems certain that Kansas corn production will continue to increase given the inducement of all time high corn prices. The grain elevator system will need to adapt to changes in corn receipts. The outbound shipments to feedlots, ethanol production plants, and other markets will change in unknown ways. Will local markets develop for ethanol or will the main market continue to be the west coast? The answer will impact the demand for truck and rail transport of Kansas ethanol. Distillers grain is a co-product of ethanol production and can be used as animal feed. To what extent will distillers grain be exported or substituted for corn as animal feed, and what will be the effect on the demand for truck and rail transport in Kansas? The expansion of ethanol production will affect motor carrier road use on state and county roads in the vicinity of ethanol plants, and thus the rate of deterioration of these roads.

Research is needed to begin to answer these questions and others raised by booming ethanol production in Kansas.

IV. BENEFITS

The research will enable KDOT to assess the impact of ethanol production on the number and types (configuration) of trucks in the traffic stream on specific Kansas roads serving ethanol plants. This information will enable KDOT to better forecast the rate of deterioration of these roads, and the resulting cost of timely reconstruction or rehabilitation. In addition, this research will assess the potential for ethanol plant location on shortline railroads which operate 40% of Kansas track miles. It is expected that this would depend on the condition of the track and the road bed. Opportunities exist for using KDOT's shortline assistance programs to make shortlines more attractive as locations for ethanol plants. If this information enables KDOT to operate its road maintenance programs more efficiently the savings could be several million dollars.

V. WORK PLAN AND SCHEDULE

The work plan will accomplish the following objectives.

Objective A – Investigate the transport impact of Kansas ethanol production from the grain elevator industry point of view.

Objective B – Investigate the transport impact of Kansas ethanol production from the ethanol production industry point of view.

Objective C – Measure the transport impact of Kansas ethanol production from the motor carrier industry perspective.

Objective D – Measure the transport impact of Kansas ethanol production from the Kansas Class I and shortline railroad perspective.

Objective E – Investigate the impact of incremental truck traffic on state and county road condition in the vicinity of Kansas ethanol plants.

The accomplishment of these objectives is expected to require the completion of the following tasks.

Task 1. Meet with the project monitor to finalize the proposal.

Task 2. Conduct a literature review of transportation impacts of ethanol production.

Task 3. Develop a sample of grain elevators located in the same regions as ethanol plants. Currently there are 10 ethanol plants in Kansas and two under construction. See attached Table 1 for a list of Kansas ethanol production plants.

Task 4. Develop a survey that would be administered to managers of the sample grain elevators. The survey would request 2005-2007 information on corn and sorghum receipts, the type of trucking equipment used to deliver grain to the elevator, number of railcars per shipment, the quantities of corn and sorghum shipped by truck and railroad, the market destinations of rail and truck shipments, and the average distance hauled to each market by rail and truck. In addition, the questionnaire would have questions regarding the reasons for carrier selection as well as reasons for increased truck shipments of corn and sorghum with emphasis on the role of increased ethanol production. The managers will be asked to evaluate the condition of Kansas highways and rail lines, and identify any obstacles to more efficient marketing of grain.

Task 5. Develop a questionnaire to be administered to managers of Kansas ethanol plants. The survey will seek 2005-2007 information on the origins and amounts of inbound corn by truck and rail, the amount of corn processed annually, the percent of total revenue obtained from ethanol and co-product sales, and annual capacity of the plant. The questionnaire will also ask plant managers for the amounts, principal destinations, and average distances hauled to each market by truck and rail for outbound ethanol and byproduct shipments. The questionnaire will also seek information regarding the reasons for locating on a Class I or shortline railroad, reasons for selecting rail or truck for outbound shipments, plans for expansion, and any constraints or problems in their logistics system for ethanol and byproducts. Each of the plant managers will be asked to evaluate Kansas highways and rail lines, and identify any obstacles to more

efficient marketing of ethanol and co-products. Each of the plant managers will be interviewed by a member of the research team.

Task 6. Develop a questionnaire to be administered to motor carriers serving the grain elevator sample and the ethanol plants. The questionnaire would contain questions regarding 2005-2007 information on the amounts, origins, and destinations of corn and sorghum, and ethanol byproduct shipments. They also will be asked about types of trucks used, how their business has changed as a result of booming ethanol production, and what they expect to happen to their business in the future.

Task 7. For Kansas and shortline railroads that have ethanol plants on their lines (either in production or under construction), develop a questionnaire to measure the impact of ethanol production growth in Kansas on railroads in Kansas. The survey will ask railroad managers to provide 2005-2007 information (by month for Class I) regarding the number of annual carloads of corn, sorghum, and ethanol originated, terminated, local, and overhead. They will be requested to provide the origins and amounts of corn shipped to ethanol plants on their lines as well as amounts and destinations of outbound shipments of ethanol. The questionnaire will also seek information on the characteristics of the railcar fleet used to transport corn and ethanol on both Class I and shortline railroads. Rail personnel completing the surveys will be interviewed by one of the research team.

Task 8. Previous research by the Principal Investigator will be used to measure road damage on state highways resulting from increased heavy truck traffic on roads leading to ethanol plants. KDOT will need to furnish traffic counts from a year prior to 2005 to serve as a baseline. The previous research includes Impact of Kansas Grain Transportation on Kansas Highway Damage Costs (K-TRAN: KSU-01-5) March 2002, and Economic Impacts of Railroad Abandonment on Rural Kansas Communities (KS-03-4) July 2003.

To measure impacts on county roads of increased trucking of corn to ethanol plants, a questionnaire will be developed for county road supervisors of counties that have ethanol plants. The questionnaire will contain questions on the current condition of the counties' cement, asphalt, and unpaved roads. The county supervisor will be asked if the overall condition of the county's roads has changed since the ethanol plant began operating, and whether any county roads or bridges have been closed to heavy trucks. The questionnaire will seek information on the county's annual expenditure for road and bridge maintenance before the ethanol plant located in the county, and afterwards. If the overall condition of the county's roads has declined in recent years, the county road supervisor will be asked to provide his opinion regarding the reasons for the decline.

Task 9. Write the final report.

VI. PROPOSED BUDGET

The source of funds are \$44,000 from the University Transportation Center and \$35,000 from the Kansas Department of Transportation (K-TRAN). See attached detailed budget.

VII. STAFF AND FACILITIES AVAILABLE

Michael W. Babcock, Professor of Economics will be the Principal Investigator. He has been the Principal Investigator on 17 previous KDOT research projects. He has access to all computer and library facilities necessary to complete the project. A graduate student in Economics will be assisting Professor Babcock.

VIII. REPORTS/DELIVERABLES

A draft of the final report will be prepared for review by the KDOT monitor about a month before the end date of the project. After review by the KDOT monitor, corrections and revisions will be made if needed. A PowerPoint presentation will be prepared for use by KDOT staff. The research team will meet at least quarterly with the KDOT monitor to discuss any problems and assess research progress.

IX. RECOMMENDED IMPLEMENTATION PLAN

The research results should be distributed to all the major stakeholders including KDOT, grain elevator managers, ethanol plant managers, motor carriers, shortline and Class I railroad personnel, and the Kansas livestock industry. The results can be communicated to these groups through the final report and PowerPoint presentations to stakeholder groups.

Table 1
Kansas Ethanol Production Plants

Firm	City	County	Capacity (Millions of Gallons)
Abenoga Bioenergy Corp	Colwich	Sedgwick	25
Arkalon Energy, LLC	Liberal	Seward	110
Bonanza Energy, LLC	Garden City	Finney	55
E. Caruso (Goodland Energy Center)	Goodland	Sherman	20 (under const)
East Kansas Agri-Energy, LLC	Garnett	Anderson	35
Gateway Ethanol	Pratt	Pratt	55
Kansas Ethanol, LLC	Lyons	Rice	55 (under const)
MGP Ingredients Inc.	Atchison	Atchison	40
Prairie Horizon Agri-Energy	Phillipsburg	Phillips	40
Reeve Agri-Energy	Garden City	Finney	12
Western Plains Energy, LLC	Campus		45
White Energy	Russell	Russell	48

Source: Renewable Fuels Association, *Ethanol Biorefinery Locations* (<http://www.ethanolrfa.org/industry/locations>).