

Assessment of the Iowa Fueling Our Future Program

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RESEARCH PROJECT TITLE

Assessment of the Consumer Reasons for
Selection of Ethanol Fuel

SPONSORS

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tech transfer summary

Understanding the fueling preferences of Iowa's consumers can help increase the amount of both ethanol and biodiesel blends in the energy market and potentially improve air quality.

Background

This research expanded on an earlier evaluation of two stations that participated in the Fueling Our Future pilot program, which was administered by the Iowa Renewable Fuel Infrastructure Program (RFIP) through the Iowa Department of Agriculture and Land Stewardship (IDALS) and the Iowa Department of Transportation (DOT). The RFIP provides funding incentives to encourage private sector installation of renewable fueling pumps.

In a previous research phase, surveys were conducted at two stations participating in Fueling Our Future to gauge consumer opinions on biofuel use and fuel preferences. The results indicated that the most significant barrier to the adoption of higher blends of biofuel is a lack of knowledge about the compatibility of higher blends with most new vehicles. Cost was less of a factor than expected.

Problem Statement

The two stations where the initial surveys were conducted were more typical of rural cooperatives than conventional gas stations in Iowa and therefore had significantly different fuel options than many stations. Additionally, the sample size was insufficient for establishing patterns in the survey data.

As a result, this second phase of research was initiated to conduct additional surveys at a wider range of stations in Iowa.

Project Objectives

- Evaluate why consumers in Iowa make a particular fuel choice when a range of ethanol options is available
- Conduct additional surveys regarding biofuel use and fuel preferences at a wider range of stations in Iowa
- Evaluate the potential air quality impacts that might be expected due to Fueling Our Future and similar programs

Research Description

Consumer Surveys

A list of stations in Iowa selling biofuel blends was obtained, and candidate stations were selected based on various criteria, including location and the types of fuel blends offered. Each selected station was contacted. Surveys were ultimately conducted at 16 stations; all sold an array of ethanol blends, from E-10 (10% ethanol) to E-85 (85% ethanol), but only one sold biodiesel.

The survey used in the previous research phase was reviewed and updated. Because biodiesel was only sold at one station, questions related to diesel were excluded. While a single survey template was developed for all stations, the survey was tailored to the fuel sales for each station.

The survey requested demographic information; the type of fuel purchased and the reason for the selection; vehicle model and year; and, when appropriate, why a higher ethanol blend was not purchased. In addition, drivers were asked whether they owned a flexible fuel (flex fuel) vehicle. Questions were added to gauge how price changes would impact consumers' willingness to purchase higher ethanol blends and whether consumers would purchase vehicles optimized for mid-range ethanol blends.

The survey was administered by trained surveyors with Survey Research Services (SRS) at Iowa State University's Center for Survey Statistics and Methodology. Surveyors conducted in-person surveys with customers as they fueled their vehicles.

Surveys were conducted at four stations during fall 2016 and at 12 stations between May and August 2017. A total of 1,464 surveys were conducted: 10 of the 16 stations had between 50 and 200 respondents, and the remaining 6 stations had between 8 and 35 respondents.

Evaluation of Air Quality Impacts

To estimate the potential air quality impacts of the Fueling Our Future program, emissions rates for various biofuel blends were obtained and then used to determine emissions under different biofuel adoption scenarios. Because biodiesel was sold at only one station, biodiesel was not included in the evaluation.

To obtain emission rates for biofuel blends, the researchers reviewed the literature and consulted experts. While a widely agreed upon method to estimate the impacts of biofuels has not yet emerged, several studies provided information on fuel economy and carbon monoxide (CO), particulate matter (PM), hydrocarbon (HC), nitrogen oxide (NO_x), and carbon dioxide (CO₂) emissions.

Four potential scenarios were then developed to reflect different levels of market penetration for various biofuel blends. Scenarios ranged from a complete absence of biofuels to a market penetration for biofuels that reflects the results of the surveys.

Key Findings

Consumer Surveys

- For fuel purchases, 5.9% of respondents purchased E-15, 7.6% purchased a mid-range blend, and 7.2% purchased E-85. Current statewide averages for the use of these blends are 0.4%, 0.2%, and 0.8%, respectively. A total of 17.6% of respondents with flex fuel vehicles purchased E-15, 22.6% purchased mid-range blends, and 21.5% purchased E-85.
- Cost was the primary factor in the selected fuel purchase for purchasers of E-0, E-10, and E-85, while compatibility was the main factor for purchasers of E-15 and mid-range blends. Compatibility was a major factor for all respondents.
- Cost was also cited as the main factor for respondents with flex fuel vehicles who purchased E-0, E-10, or E-85; those who purchased E-15 or mid-range blends listed compatibility as the main reason. For respondents with non-flex fuel vehicles who purchased E-0 or E-10, cost was cited as the main reason.
- Depending on the fuel selected, 4% to 9% of respondents indicated that the purchased fuel was required by their employer.
- Concerns about vehicle compatibility, followed by cost, were the top reasons why respondents did not select a higher ethanol blend. Fuel economy was a more significant factor for E-15 purchasers than for those who purchased E-10 or regular gasoline.
- Respondents with flex fuel vehicles who purchased E-0 cited fuel economy as the main reason for not purchasing a higher ethanol blend; price was the main reason given by those who purchased E-10. For respondents with non-flex fuel vehicles, compatibility was the main reason.
- A total of 45% of those who purchased E-0, 31% of those who purchased E-10, 13% of those who purchased E-15, and 34% of those who selected mid-range fuels indicated they would purchase a higher blend if the blend they selected cost 25¢ more per gallon. The responses were similar when the additional cost was higher, indicating that respondents not initially swayed by a 25¢ increase would not likely be swayed by a greater increase.

- More than half of respondents indicated that they would be very or somewhat likely to purchase a vehicle that more efficiently used higher blends of ethanol.
- More than 80% of respondents selected the particular station due to location. The next most popular reasons were cost, good customer service, fuel options, and station reward programs.

Evaluation of Air Quality Impacts

Based on the percentage difference between the statewide sales information and the customer survey information, statewide adoption of ethanol options and subsequent changes in purchasing behavior could result in the following air quality impacts:

- 20% reduction in NO_x emissions
- Reduction in PM emissions much greater than 100%
- 3% reduction in CO emissions
- 20% reduction in HC emissions

Implementation Readiness and Benefits

Understanding why consumers in Iowa choose particular fuels among a range of biofuel options is of interest to fueling stations interested in offering different ethanol blends and may help programs such as the Iowa RFIP better target future participants.

The findings from this project can help various stakeholders—including legislators, environmental advocates, gas station owners, and others—better understand the fueling preferences of Iowa’s consumers and the barriers preventing widespread adoption of biofuels. Such an understanding would provide an opportunity to increase the amount of both ethanol and biodiesel blends in the energy market.

Moreover, the evaluation of the emissions impacts of different biofuel adoption scenarios illustrates the air quality benefits that can result from Fueling Our Future and similar programs.