**Statistical Design Consulting**

**SEMESTER REPORT**

**Spring 2024**

**Client:** Akhere Olenloa **File Number:** 24-004

**Department:** Agricultural and Biological Engineering **Major Prof:** Dr. Klein Ileleji

**Consultant:** Sumeeth Guda **Initial Meeting Date:** 01/30/24

**Meeting Attendees:** Akhere Olenloa, Sumeeth Guda, Dr.Klein Ileleji, Dr.Bruce Craig

**Statement of Problem:** To investigate the challenges that grain farmers and grain elevators face regarding adopting grain monitoring technology. Additionally, to develop a predictive model for the adoption of the technology.

**Goal of This Project:** PhD Dissertation, Journal Article

**Background:**

The purpose of the client’s study is to understand the state of adoption of grain storage monitoring technologies. Evidence suggests that there is a very low adoption rate despite advancements in technology. The problem the client wants to address is why only 10% of on-farm storage owned by farmers use a form of monitoring technology, and 30% of off-farm storage owned by grain elevators use a form of monitoring technology.

The client created a survey to send to both farmers and grain elevators to determine what factors ultimately influenced the farmers or grain elevators to adopt or not adopt the grain monitoring technology. Within their survey they had 5 key areas:

1. The first section is collecting demographic information about the participants. Collecting the education level, gender, and region the participants are located in.
2. The second section is about the characteristics of the grain storage facilities that the farmers or grain elevators have. It asks about their storage capacity, the type of grain collected, storage period, business period, and if there are already grain monitoring technologies in place.
3. The third section is about the technological features and drivers for adoption of the grain monitoring technology, assuming the participant already utilizes grain monitoring technology. Specifically what company their technology is from, what factors are being monitored (Humidity, CO2, Spoilage, Insects, Temperature, etc.), the frequency of the monitoring, and the use of the factor within the grain management.
4. The fourth section collects data regarding the participants’ perceptions and benefits of adopting grain storage management technologies.
5. The fifth section is asking about the challenges and constraints with respect to the adoption or use of grain storage technology.

From these 5 survey areas, the client wanted to use the data collected to answer the following research questions:

1. Is there an association of the demographic information (ex. age and gender), grain storage duration, grain storage capacity and location of grain storage on the adoption of stored grain monitoring technologies among grain elevators and farmers?
2. Do grain elevators and farmers’ experiences with managing stored grain influence their adoption of stored grain monitoring technologies?
3. How do grain elevators and farmers’ perceptions of stored grain monitoring technologies influence their adoption of stored grain monitoring technologies?

The ultimate end goal of this survey was to create a regression model to predict the adoption of grain monitoring technologies and to determine what factors are significant in the adoption.

**Progress During Current Semester:**

The client’s project was at the start of the design phase of their experiment. So ultimately the large part of the work done this semester was helping the client improve their survey and developing the statistical methodologies to answer their research questions.

The biggest change to the client’s survey was including a grain loss section, as well as making the survey more inclusive by incorporating the perspectives of participants who chose not to adopt and their reasons for not adopting. Once the survey was reviewed by the consultant and got IRB approval, the client was able to submit the survey to various farmers and grain elevators to gather the data.

The second main goal was to answer all of the client’s research questions or come up with a way to solve them. Because all of the client’s research questions were linear association questions on a binary response, logistic regression was determined to be the most appropriate model to use. Using dummy data generated by a simulated survey, the test data was used to fit a logistic model on it to answer the hypothesis questions. The consultant had to teach the client how to interpret the results and the key metrics to analyze with the logistic regression output.

The consultant provided the client with a document with the instructions and the model descriptions to put into SPSS for analysis on their collected dataset once they get enough data points.

**Current Status:** Continuing.