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DATE RECEIVED: **12/04/2023**

DATE APPROVED: **01/16/2024**

FILE NUMBER: **#24-004**

APPLICATION FOR STATISTICAL CONSULTING

LAST NAME: **Olenloa**

FIRST NAME: **Akhere**

DEPARTMENT (full name): **Agricultural & Biological Engineering**
ABE

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YOUR PRIMARY POSITION AT PURDUE: **PhD Student**

Other:

(if a student) MAJOR PROFESSOR LAST NAME: **Ileleji** FIRST NAME: **Klein**

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MAJOR PROFESSOR CAMPUS ADDRESS (BLDG & DEPT): **Agricultural and Biological Engineering / ABE**

MAJOR PROFESSOR EMAIL: **ileleji@purdue.edu**

HOW DID YOU FIND US: **Recommendation of my advisor or committee member**

LIST STATISTICS COURSES TAKEN AND STATISTICAL COMPUTING EXPERIENCE: **STAT 511 (Statistical methods), STAT 512 (Applied regression analysis), STAT 514 (Design of experiment)**

STAGE OF RESEARCH: **Design (no data collected yet)**

IF DESIGN STAGE IS COMPLETE, WAS A STATISTICIAN CONSULTED FOR DESIGN?

PREVIOUS CONSULTANT – INSTITUTION/DEPARTMENT:

ESTIMATED NUMBER OF CONSULTING HOURS NEEDED THIS SEMESTER: **<5 hours**

EXPECTED COMPLETION DATE OF PROJECT: **4/30/2024**

IMPORTANT DEADLINE OR DUE DATES RELATED TO YOUR PROJECT: **Ph.D. Dissertation submission in November 2024**

THE RESULTS OF THIS RESEARCH WILL PROBABLY BE PUBLISHED AS:

Ph.D Dissertation, Journal Article

IS THIS RESEARCH SUPPORTED BY A GRANT OR CONTRACT? **No**

If so, give grant/contract title:

GIVE A BRIEF DESCRIPTION OF YOUR RESEARCH INCLUDING:

PURPOSE:

Anecdotal evidence suggests that there is low adoption of stored grain monitoring and management technologies on-farms (less than 10%) and off-farms (grain elevators and processing facilities; less than 30%). The reasons for this low adoption have not been investigated and so not clearly understood. With the increasing growth of digital/smart agriculture, and the recent entry of a number of technology start-ups to stored grain monitoring and management space, it is imperative to understand what features these new tools offer, what tools are being adopted or not adopted, and how best to tailor the development of these tools based on challenges/need for managing large stocks of grain on and off-farm.

This research survey aims to gain valuable insights into the current state of stored grain monitoring technologies and management software (apps), and their adoption among farmers and grain elevators in the United States. The goal of this research is to better understand the state of stored grain monitoring technologies/management apps, and their adoption in order to guide their future developments and strategies within the grain industry. Additionally, one of the outcomes of this research will be to better guide industry and research on what tools and features in stored grain management apps farmers and operation managers desire, and what training need to be developed by industry and our land-grant Extension system.

DESCRIPTION OF VARIABLES TO BE MEASURED:

The data for this study would be primary data which will be from a survey of responses of stored grain elevators and farmers (participants) as well as grain extension (agents) educators.

Our developed questionnaire for this study still needs a review and then will be sent to various grain companies to solicit interest from participants. The questionnaire covers five thematic sections. The first thematic section will cover demographic information about the farmers and grain elevators (such as educational level, gender and region). For anonymity, names of participants will not be included in the questionnaire. The second thematic section will cover information and characteristics of the stored grain facility and technology (such as total capacity of stored grain, type of grain stored, location of grain storage facility and type of stored grain monitoring technology used). The third thematic section will cover stored grain monitoring technologies and their capabilities. The fourth thematic section will cover perceptions of the grain elevators and farmers towards adoption of stored grain monitoring technologies (such as intention to adopt, drivers of adoption and benefits). The fifth thematic section will cover the challenges and limitations facing the use of stored grain monitoring technologies (such as availability of capital, cost and user experience). The questionnaire has been reviewed by 5 persons; an expert in stored grain management, and two graduate students at Purdue University, and two farmers/grain elevators at ACRE, Purdue.

The total number of participants and response rate for the sample of this study will be determined after the survey is completed. A sample of participants that solely provide their decision on their adoption or not to adopt stored grain monitoring technologies will allow us to investigate the probability of participants adopting stored grain monitoring technologies.

Descriptive statistics which will include frequency analysis will be conducted to explore data trends and indicate potential significant variables from the survey responses. Chi-square statistical test will be carried out for categorical variables while the p-values will be reported. A binary logistic regression test will be conducted to model the categorical and ordinal responses of the independent variables. The model will predict the decision of adoption of stored grain monitoring technologies. The statistical analysis would help explain the associations of the dependent and independent variables.

The dependent variable will be the decision about adopting (adopt or not to adopt) stored grain monitoring technologies, while the independent variables will be age, gender, capacity of stored grain, grain storage duration, level of education, years of experience on grain storage and management, and location of storage facility. The non-significant variables will be dropped to build a final model that will have only the significant effects. Statistical Package for the Social Sciences (SPSS) version 26 will be used for statistical analysis, while Qualtrics survey platform through Purdue University would be used to design the survey and collect data of participant responses. Data collected for this study will be stored on a secure server at Purdue University.

RESEARCH QUESTIONS THAT YOU WANT TO ADDRESS USING STATISTICAL METHODS:

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?
4. What types of features and capability of stored grain monitoring technologies are commonly used by grain elevators and farmers?
5. What are the factors mostly influencing the adoption of stored grain monitoring technologies among grain elevators and farmers?
6. Are there unique challenges to the adoption of stored grain monitoring technologies among grain elevators and farmers?

STATISTICAL ISSUES:

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?

ADDITIONAL INFORMATION YOU THINK WOULD BE HELPFUL:

Test of Hypothesis

1. Ho: There is no significant association between 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.
H1: There is a significant association between 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. Ho: There is no significant relationship between the grain elevators' and farmers' experiences with managing stored grain and their adoption of stored grain monitoring technologies.
H1: There is a significant relationship between the grain elevators' and farmers' experiences with managing stored grain and their adoption of stored grain monitoring technologies.
3. Ho: There is no significant relationship between grain elevators' and farmers' perceptions of stored grain monitoring technologies and their adoption of stored grain monitoring technologies.
H1: There is a significant relationship between grain elevators' and farmers' perceptions of stored grain monitoring technologies and their adoption of stored grain monitoring technologies.

ATTACHMENTS: Attachment in client folder