

4-28-2017

## Standardization of Lab Practices

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### Recommended Citation

Stephen Akol, Philip Hutson, Grant Ives, Allie Oder, Joseph R. Vanstrom and Jacek A. Koziel. Standardization of Lab Practices. Final Report. TSM 416 Technology Capstone Project, April 28, 2017.

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# Standardization of Lab Practices

## **Problem Statement**

The Iowa State University BioCentury Research Farm (BCRF) is the first-in-the-nation integrated research and demonstration facility dedicated to biomass production and processing. This facility presents a unique opportunity for industry collaboration. It will accelerate innovation and production capacity associated with bio based fuels, chemicals, and products.

Lab processes for the research team are in varying formats, and may not encompass all relevant information and are not stored in the same location. This makes it challenging to cross-train staff, increase efficiencies and may lead to errors and re-work. When this problem is solved, the research team at the BCRF can increase work efficiencies, improve effectiveness of processes and ensure data quality and integrity. As of today, the research team cannot do this and our team will solve this problem by: a. standardizing the work and, b. developing Standard Operating Procedures (SOP's).

Our primary focus when developing an SOP, is the cotton moisture measurement of the samples. After this SOP is developed, then we will create a continuous improvement plan for future and existing SOP's including SOP's for all types of crops the BCRF accepts.

## **Disciplines**

Bioresource and Agricultural Engineering | Industrial Technology

# IOWA STATE UNIVERSITY

Department of Agricultural and Biosystems Engineering (ABE)

TSM 416 Technology Capstone Project

## Standardization of Lab Practices

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## 1 PROBLEM STATEMENT

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### A. Problem Statement

The Iowa State University BioCentury Research Farm (BCRF) is the first-in-the-nation integrated research and demonstration facility dedicated to biomass production and processing. This facility presents a unique opportunity for industry collaboration. It will accelerate innovation and production capacity associated with bio based fuels, chemicals, and products.

Lab processes for the research team are in varying formats, and may not encompass all relevant information and are not stored in the same location. This makes it challenging to cross-train staff, increase efficiencies and may lead to errors and re-work. When this problem is solved, the research team at the BCRF can increase work efficiencies, improve effectiveness of processes and ensure data quality and integrity. As of today, the research team cannot do this and our team will solve this problem by:

- a. standardizing the work and,
- b. developing Standard Operating Procedures (SOP's)

Our primary focus when developing an SOP, is the cotton moisture measurement of the samples. After this SOP is developed, then we will create a continuous improvement plan for future and existing SOP's including SOP's for all types of crops the BCRF accepts.

**B. Business Case Statement**

**a. What?**

When a new employee is hired to the team, the trainer teaches the employee his/her way of performing the process which can vary from trainer-to-trainer. Thus, our team will develop a process improvement plan that will re-format all existing and future documentation pertaining to the cotton moisture measurement.

**b. How?**

The problem seems to be concentrated around the initial training of the employee. If standard work can be created for the team, then the employees and management will understand when and how their process dips out of specification.

**c. When and Where?**

The problem happens throughout multiple processes of crop analysis. The problem starts at the training of the employee and can continue over multiple sets of crops including, but not limited to: cotton, grain, and biomass material.

**d. Why?**

The research team at the BCRF is interested in solving this problem because they want to increase work efficiencies, improve effectiveness of processes and ensure data quality and integrity. We assume that if the employees are being trained to perform the process in varying ways, then each employee might take longer or shorter than other students to produce results. If we have a chance, we will perform a time study for cotton and the process it takes to measure the moisture constituent. A time study will provide the research team an understanding of when their process dips out of specification.

**e. Who?**

Our solution has an opportunity to be spread across the entire agriculture industry. The research team has an extensive clientele list, and if the research team continues to maintain data quality and integrity while increasing efficiencies and effectiveness, their reputation will grow and they may have the opportunity to increase their project work.

## 2 GOAL STATEMENT

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**A. Main Objective(s)**

The objectives for the Standardization of Lab Practices is to rewrite and improve current process documentation to match one unified format. The final SOP aims to improve task efficiency, decrease human error, and improve cross training of employees.

**B. Specific Objective(s)**

- a.** Development of an SOP for cotton moisture testing
- b.** Run Time study for cotton samples
- c.** Recommend review and evaluation improvements

**C. Rationale**

- a. Reduce human error from inconsistent procedures
- b. Improve cross-training of employees on procedures

## 3 PROJECT PLAN/OUTLINE

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**A. Methods/Approach**

**a. Data Collection**

- i. Run time study to determine inefficiencies in testing process
- ii. Simulate testing process to gather observations

**b. Skills**

- i. Proficiency in use of Microsoft Word
- ii. Ability to perform statistics for time study and drying time estimations

**c. Solutions**

The solution must be easily used by other employees. Our solution will be tested three times to test its effectiveness and efficiency. Inaccuracies from the desired outcome as well as inconsistencies between test runs will be reported. Human error must be reduced to the absolute minimum. The solution will also be tested for timeliness and must have a completion time of less than or equal to the original procedure time length.

**d. Organization**

Responsibilities are divided up weekly by individual responsibilities and team responsibilities. Each member is responsible for thoroughly completing their assigned tasks within the given time. Most responsibilities change weekly, but each team member has a specific role within the team. Tasks within a role are not exclusive to the team member but will always be routed through them (ex: other team members can contact clients, but must consult Grant first).

Stephen Akol: Team Recorder

Grant Ives: Client Liaison

Philip Hutson: Document Arranger

Allie Oder: Project Developer

Our team will communicate with the client primarily through email. There is no set number of times to meet with the client or specific times; however, major milestones require in person meetings with the client. Milestones are turning points in the project. This includes project deliverables, completion of major task or document draft, and deadlines for meeting progress requirements.

**B. Results/Deliverables**

The deliverables for the project include time study of sample run time with recommendations for improvement (if time permits), SOP drafts, evaluation and review procedures, and the final report due April 28<sup>th</sup>, 2017. The deliverables are consistent with the scope of the project and match what has been asked for by the client.

### C. Timeline

The deliverables are listed in order of priority and are given an estimated deadline

1. SOP Final Draft – written and submitted on 3/29/2017
2. Time Study (if time permits) – during our final test of the SOP we were able to determine the process run time over two consecutive trial runs.
3. Process Improvement Plan Rough Draft – written and submitted on 3/17/2017
4. Process Improvement Plan Final Draft – submitted on 3/29/2017
5. Final Presentation Slides Rough Draft – written and submitted on 3/22/2017
6. Final Presentation Slides Final Draft – submitted on 3/29/2017
7. Final Report Final Draft – submitted on 4/14/2017
8. Presentation – delivered on 4/21/2017

## 4 BROADER OPPORTUNITY STATEMENT

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This project can appeal to a wide array of audiences as the basics are simple to understand until one digs deeper into the process of the lab processes. For someone who is not familiar reading SOP documents, it may be difficult to understand why one would need to standardize them. Once explained that it makes for clear expectations and directions, an average person can understand the scope of the project.

When it comes to agriculture, every type of process is important but the greatest challenge is providing for the growing population and need for agricultural products. Accurate moisture measurements are crucial to providing manufacturers with high quality raw material. Cotton is used in a wide array of products including clothing. The agricultural sector is always trying to improve the knowledge base of crops, and in this case the moisture content to understand if it is suitable for harvest and storage. The research team is one of the many contributors to the research and development of the cotton industry

The research conducted at the BCRF is similar to many types of labs studying agricultural crops. Most labs have SOP documents that are used to understand and perform many different types of testing. There are countless amounts of labs worldwide and more than likely most of them have some type of SOP documentation. Every technical industry has some sort of standard operating procedure and they would benefit from our approach to standardizing SOP's so that their company may operate smoother. With a clear, concise, and accurate SOP for a process such as moisture testing there is less room for error when instructions are unclear. The risk of losing the company money is decreased when the employee feels confident reading the SOP.

In this type of field, there is always emerging focus on efficiency in a process. Efficiency usually results in less time spent on a task and more revenue for the company. In this generation, specifically, everyone is focused on profit margins.

Improving SOPs can be a huge long-term impact for companies. If the company puts the time into standardizing their process, there is a chance for less time trying to understand the process. Ultimately

they are decreasing time and able to perform more tests. Increasing the efficiency of the process and of the operator, will result in increased profit margins for the company.

## 5 PROJECT SCOPE

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This project has very concise and straightforward deliverables. To standardize SOPs, continuous improvement process, and if time allows include a time study. The lab aspect of the business is included in the project scope. Since the BCRF is a lab, one could say the whole business is included in the scope. The only parts of the business not included would be the relationship with its customers. Also, where or how the final data collected is analyzed is not the focus of the project. Depending on how fast the deliverables are accomplished there is no aspects of the process that is out of the team's boundaries to analyze. A cost analysis is not included as a deliverable but as a team we believe would add a very insightful aspect to the project.

## 6 GRAPHICAL ABSTRACT

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