

OMB Control #0693-0089

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NIST Generic Clearance for Decision Science Data Collections

Agricultural plastic usage and recycling perspectives in the Midwest farming region

FOUR STANDARD SURVEY QUESTIONS

1. Explain who will be surveyed and why the group is appropriate to survey.

This Survey was developed in the NIST Materials Measurement Laboratory (MML) Polymers Processing Group. There are 3 major goals of the survey: 1) to understand the generation and means of disposal of plastic waste in the Midwest farming region, 2) to understand farmers' perception of their agriculture plastic consumption, and 3) to understand farmers' perceived barriers and willingness to participate in an agricultural plastic waste recycling program. This survey activity ties into ongoing Circular Economy activities looking at the impacts of contaminants (such as herbicides and pesticides) on the recyclability of plastic materials.

The survey is intended to be distributed at the Four States Farm Show in Pittsburg, Kansas, which sees wide attendance of farmers from Kansas, Missouri, Arkansas, and Oklahoma. Our target population is farmers attending the Four States Farm Show, with the goal of diverse participation from the different farming disciplines common in the region (e.g. cattle, corn, poultry, etc.). Agriculture in this region of the country is significant to food and energy crop cultivation.

2. Explain how the survey was developed including consultation with interested parties, pre-testing, and responses to suggestions for improvement.

This survey has been developed through an iterative process. The basis of the survey was drawn from a similar survey performed in Nova Scotia, Canada and published in 2016 (Muisse, I., Adams, M., Côté, R. & Price, G. W. Attitudes to the recovery and recycling of agricultural plastics waste: A case study of Nova Scotia, Canada. *Resour. Conserv. Recycl.* 109, 137–145 (2016)). The survey was subsequently input into Qualtrics and adjusted to be more appropriate to the Midwestern farming region and federal distribution.

The survey was workshopped with support from Christina Gore and Josh Kneifel in the NIST Engineering Laboratory (EL) Applied Economics Office (730.01). The survey draft was then distributed to NIST employees in the 642.06 unit to test for user experience. The survey was also workshopped, and user tested with the support from 4 County Extension agents out of Kansas State University who have personal farming experience and interact directly with farmers in Kansas.

Leveraging Qualtrics' complexity using branching and logic gates, 27 separate survey paths were developed to tailor questions about plastic farming materials to the diverse mix of farming activities possible in the region and to streamline the questions presented to participants (e.g. farmers who only grow vegetables don't get asked about animal agriculture materials and vice versa). The survey is set up in 3 blocks that look at 1) Contextualizing material (State, Farm size, Farming activities), 2) Farming plastic waste generation and disposal, and 3) Perspectives on

personal waste generation and willingness to participate in recycling activities. Based on Christina's recommendation, a block randomization was added so that half of participants will receive 'block 3' after 'block 1' and half will receive 'block 3' after 'block 2' so we can see if encouraging farmers to think about their plastic waste generation influences them to be more inclined towards recycling and interested in learning more.

3. Explain how the survey will be conducted, how customers will be sampled if fewer than all customers will be surveyed, expected response rate, and actions your agency plans to take to improve the response rate.

The survey was built in Qualtrics and is intended for digital participation at the Four States Farm Show via personal mobile device or provided tablet. We will have a 10x10 ft booth staffed by 3 NIST staff members where we will engage with farm show attendees. Participation will be fully voluntary with no incentives. The Four States Farm show sees attendance >20,000 people from the local states. The survey has been **designed with a 2000 response cap** that will stop survey collection after 2000 responses. The **survey is expected to take 15 minutes** based on trial data with individuals from the Kansas County Extension. No demographic information is being collected beyond what state the participant farms in and how big the farm is.

$$2000 \text{ (respondents)} * 15 \text{ Minutes} / 60 \text{ (minutes in an hour)} = 500 \text{ burden hours}$$

The survey will be available to access on the provided tablets and through a QR code that we will have printed and visible on our booth table. We will also distribute the QR code to be shown at the County Extension booth and with the Pittsburg State University information booth to reach as many people as possible up to our 2000 response cap. Interested participants will be encouraged to photograph the QR code and information sheet to distribute within their farming network or on social media. We will also provide small ¼ page pamphlets with information about the survey and the QR code for those interested in physical distribution. We will keep the survey open for 1 week following the Four States Farm Show (May 17th – 27th) or until the 2000 response cap is met to allow people to respond to the distributed QR code.

4. Describe how the results of the survey will be analyzed and used to generalize the results to the entire customer population.

The data will be analyzed for publication in a peer reviewed journal. The analysis will be primarily quantitative. We offer an optional space for participants to provide a free response of any other information they want to share which will be thematically analyzed.

The format of the survey involves multiple choice, ranking, number-locked responses, and select-all-that-apply type questions. Quantitative analysis will consist of descriptive statistics and data visualization aggregated over participants' farming domain (e.g. livestock vs vegetable farming) and location of their farm by State. Collected data will be used to link the scale and intensity of farming to develop estimates for farming plastic waste generation in the region. Inferential methods like ANOVA will also be used to identify statistical differences between the different response populations.