

Participatory Science Data Management Case Studies

Project Harvest and GardenRoots



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Improving Data Management for Participatory Science

Co-created community science projects, Gardenroots and Project Harvest, leverage visualizations to enable participants to successfully interpret their results and inform their gardening and watering practices.

Project Overview & Goals

Gardenroots (established in 2010) and Project Harvest (established in 2017) are co-created community science projects at the University of Arizona. Gardenroots sees gardens as hubs for environmental health research and education and seeks to answer whether soil is safe, if it is safe to cultivate food in the soil, and how much food can be grown in areas impacted by known, historical or ongoing forms of contamination. Gardenroots was initially funded by EPA, and now receives funding from the National Institute for Environmental Health Science, NIH and the University of Arizona Campus Center for Environmental Sustainable Mining (which receives funding from a state tax). Project Harvest aims to understand the fate of potential pollutants in harvested water (rainwater collected and stored for reuse) and how they impact soil, plant, and human health. Project Harvest is funded by the National Science Foundation.

Role of Project Participants

Both projects engage communities with historically underrepresented populations disproportionately impacted by resource extraction activities and climate change. Participants collect water, soil, plant, and/or dust samples from their gardens for analysis of potential contaminants. Project Harvest uses a peer education model where they train community health workers (called Promotoras) in sample collection methodologies over the course of several

iterative sessions.

Promotoras then train participating families in sample collection. In the beginning of Project Harvest, half of the participants do their own sample analysis (DIY) in lieu of lab analysis for certain parameters.

Issue:
Rainwater & Soil
Pollution

Location:
Arizona

Tools:
Custom Data
Platform

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Data Management

The research teams input data from the projects into a common electronic format (DIY data was added either from paper data sheets or via electronic submission that is available for Project Harvest), which is then added to newly developed databases. Data undergoes quality assurance processes to ensure completeness and accurate reflection in visualizations. Sample results are presented alongside standards and reference values as well as the analytical instrument's limits of detection (LOD). Community gatherings/data sharing events are hosted in each community where participants receive their data, give presentations of aggregate results, and ask additional questions. At these events, participants receive a printed results booklet that is also shipped out to those who could not attend the gathering. For Project Harvest, an art experience called "Ripple Effect" served as another way of sharing the data. A Gardenroots website provides point of access to participants and the

public - Project Harvest is still being finalized.

Data Use

As of now, the data are primarily used for individual health decision-making, university research, and broader policy decisions.

Issues and Lessons Learned

Addressing the limits of detection of laboratory equipment was a technical challenge. It was difficult to include every LOD in the online visualizations while still maintaining clarity. In the end, a range of LODs is reported with each visualization while the individual LODs by instrument run are retained in the database. Non-technical issues include potential participants' hesitancy to join the project, cultivating stakeholder relationships, and the impact of COVID. Security and potential negative impacts on home values were also of particular concern to participants.

A major lesson learned was the importance of gaining stakeholder confidence in the project, which increases community trust and engagement. Obtaining a positive endorsement from sensitive industries, such as mining, and partnering with schools were key to the success of the projects.

Outcomes and Success Factors

The major outcome is that participants are able to successfully interpret their results and either continue their gardening and watering practices or make modifications. The final step of how end users (particularly participants living in or near pollutants) receive, consume and understand data is a key consideration in achieving that goal. Both projects break through information barriers with visual materials and plain language preparation.

Other outcomes include reporting of a water utility exceeding arsenic limits, and two different incidences of fugitive dust—particulate matter suspended in the air, primarily from soil that has been disturbed by wind or other activities.

Gardenroots data have also been included in a modeling exercise, resulting in a merged dataset with state and federal data related to soil quality, food production and health. For details on this data integration, see: “Alleviating Environmental Health Disparities through Community Science and Data Integration” in *Frontiers*.

Opportunities

- There is a lot of investment in these projects, but there are currently limitations on wider use of the data. Use of standards in participatory science (PS) would help quell state and federal programs' concerns surrounding quality issues of PS data and encourage integration with their own collected data.
- These and similar projects would benefit from the integration of data into exposure and risk modeling and the building of platforms to integrate community data with state and federal for consolidation to a single location.