Establishing a web-application platform for data visualization to enhance collaboration between researchers and farmers

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1. Introduction

With a growing environmental concern and a urgent demand for sustainable development in modern agriculture, on-farm experimentation (OFE) is becoming a widely embraced approach for agricultural studies and practices worldwide. Studies on OFE is more commonly recognized in European and North American countries. OFE brings together researchers, farmers, and other agricultural stakeholders to solve real challenges in agricultural production through experimentation. The primary issues include boosting yields, responding to climate change, and raising farmers' living standards. Because of the differences in environmental and socioeconomical backgrounds, farming scale is much smaller in Japan than other western countries. More engagements by either of farming companies, agricultural cooperative corporations, and smallholder farmers will be required to collect a significant amount of OFE data, which enables more efficient and robust decision making. Meanwhile, it is essential to develop effective tools to allow knowledge exchange or co-learning among farmers. Given the Japanese agricultural situations, a data visualization web-application platform will contribute to facilitate communications and interpretations of collected OFE data among farmers, agronomists, and researchers over the years in different locations

2. Material and Method

To encourage farmers to engage in OFE, it is important to provide them with examples of analyzed OFE data. A data visualization tool was established using R Shiny to assess the success of the interactive features which allows farmers to gain new insights into data analysis. More specifically, the web application aimed to facilitate farmers' understanding of causal impact on field-specific rice grain yield data, which subsequently support better decision making in the farm management and increasing the economic income. To develop web application, actual field-specific trial data was used. In this OFE, a certain farmer applied different rates of basal fertilizer in each paddy field, and then collected rice yield data using commercial yield monitors in Gero, Gifu, Japan over the three years (2020-2022).

3. Results and Discussion

Visualization function of linear regression models was developed through an interactive web application. By doing so, farmers can select different combinations of fields' characteristics in the application and then view graphs of the linear regression model, including regression lines, fitted scatter plots, and model equations. It gives farmers a better visualization of their relevance as well as importance to help farmers understand the relationship and importance of fields' characteristics. The application can also map the soil properties by utilizing a color gradient to represent the levels of different properties. Users can view the specifics of each field by clicking on the map markers. To enhance the interfaces and functions of the interactive web-application platform that would facilitate knowledge transfer or co-learning among farmers, we will conduct qualitative interviews with farmers who participated or did not engage in the OFE in near future.

References

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