Results

The shiny app currently includes data from 22 studies, allowing the user to interact with their data to investigate insect biodiversity.

Graphical user interface, text

Description automatically generatedUpon opening the app using the link <https://r26dnk-grace-skinner.shinyapps.io/meta_meta_analysis/>, the user is presented with an introductory tab including information on the number of agricultural systems studied and total number of datapoints from each study (Figure 1). The user may decide they want further information on a particular study, and can do this by selecting this study and viewing an additional table that appears.

**Figure 1.** Screenshot from shiny app introductory tab which gives an overview of the studies utilised within the app.

Next, the user decides that they want to understand how different agricultural systems impact biodiversity, thus they go to the agricultural systems tab. Here, they are presented with the results of a default model run on all available data. The user gains a general overview of the effect of the variable without needing to run their own model. The user may decide they are only interested in certain agricultural systems, or a certain metric, and can update the figure and table of coefficients based on their selections. The user may not fully understand the definition of one or more agricultural system, and so they click a button to show a table of descriptions. Finally, the user is able to download the results and store them locally.

After studying the default model output, the user decides that they wish to filter the dataset and run a custom model based on their specific hypothesis. Hypothetically, the user does not want to include datapoints that use biomass as a metric for biodiversity because their research suggests this could mask biodiversity trends in species richness. They go to the custom model tab and select all biodiversity metric categories apart from biomass. They then click ‘Run custom model’ and wait while the model runs. The user immediately spots that there are substantial difference between the output of this custom model compared to the default (Figure 2). Conservation agricultural system still has significantly higher biodiversity than conventional in the custom model (t = xxx), but the percentage change is only 4.08% compared to 36.34% in the default model. Furthermore, traditional agricultural is now not considered significantly different from conventional — biodiversity has actually reduced — whereas in the default model, traditional had significantly more biodiversity than conventional. This could be important to consider if the researcher wanted to perform further study. Chart, box and whisker chart

Description automatically generatedChart, box and whisker chart

Description automatically generatedThe choice of biodiversity metric used is clearly important.

**Figure 2.** Screenshots from the agricultural systems tab displaying the differences between the default model output which includes all available data, and a custom model which excludes data with biomass as their biodiversity metric category.

Following exploration with the shiny app, the user decides to conduct their own meta-analysis investigating an interesting finding further. Once they have completed their research, they are able to add in their results to the shiny app so the models can be run including this data. To do so, the user goes to the ‘Upload data’ tab and clicks browse. They select their results spreadsheet (a csv file) and upon some checks to verify the suitability of the results, they are uploaded.