（1）Figures 1a and 1b

**call\_image\_detection\_service\_finally**：

Using the developed model, outline the animal's weight, and further refine the animal's contour manually using Labelme

**read\_json\_to\_csv\_1\_finally**：

The images processed again with Labelme can be used to identify the animal's weight through an algorithm, and the results can be output in CSV format

**learn\_read\_json\_to\_jpg**

The images processed again with Labelme can be used to identify the animal's weight through an algorithm, and the results can be output in jpg format.

Figures 1a and 1b can be obtained using the three codes: call\_image\_detection\_service\_finally,read\_json\_to\_csv\_1\_finally, and learn\_read\_json\_to\_jpg.

Notes: Due to high server traffic and limited computational resources, processing requires queuing at “http://218.202.104.82:5806/image\_detection\_service”, which occasionally prevents the use of the Mask RCNN model for animal recognition in images.

(2) Animal GHG emission factors

The emission factors for livestock were calculated using the "Animal GHG emission factors.dta" dataset, in accordance with the IPCC Tier 2 methodology. Detailed algorithms and calculation procedures for each individual animal are documented in the file *"A Detailed Copy of the Actual Emission Factor Calculation for Each Individual Animal."* Due to the absence of high-quality feeding households in the dataset, scenario simulation was employed to calculate the carbon emission factors corresponding to high-quality feeding practices. The specific algorithm is as follows: Emission factor calculation under the high-quality scenario for the full sample

(3) The animal weight histogram

A histogram of animal weights was produced using the graph code in combination with the "data" file..

(4)Cost-benefit analysis

The cost-benefit analysis shown in Tables 4 and 5 was performed using Excel, and the specific calculation process is documented within the Excel file.

Fig2.opju. Figure 2 presents a donut chart generated with Origin software.