In order to predict the seasonal product rates of tomatoes by precipitation for each region specified in the PCA report in the Philippines, we combined multiple sources of data. We first assigned the monthly precipitation data to the MAPSPAM cells by latitude and longitude. Second, we assigned the elevation for each cell. Next, we obtained the seasonal tomato product rates for 16 regions from the PCA data and matched the average precipitation and elevation to each region by season. Once we obtained the data for seasonal precipitation, the seasonal product rate, and elevation for each of the 16 regions, we conducted a linear regression with the product rate as a dependent variable and the precipitation as an independent variable in SPSS 24.0. Since the dependent variable was highly skewed, we implemented a log-transformation for it. To control elevation, we classified the elevations into two groups, high and low, using K means in SPSS 24.0. Due to the small sample size, we excluded the samples in the high-elevation group and conducted a linear regression analysis for the group of low elevation (< 235). The total 56 samples in the group showed quite negatively strong correlation between X and Y (Log of product rate) (r = -0.734).

The regression results showed that both of the precipitation and the temperature were a statistically significant predictor (p <0.001 and p=0.025, ) in Table 1. For assumptions of linear regression According to Figure 1, the assumptions of linearity, normality, and homogeneity tended to be fairly met. For the assumption of independent observation, however, the product rates are not independent each other within region, so caution needs when interpreting the results.

Table 1. Linear Regression Result

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B | Std. Error | Beta | t | Sig. |
| Intercept | -6.360 | 2.670 |  | -2.382 | 0.21 |
| Precipitation | -0.008 | 0.001 | -0.750 | -8.402 | <0.001 |
| Temperature | 0.234 | 0.101 | 0.206 | 2.312 | 0.025 |

Based on the results, the equations of the predicted Log[product rate] and the predicted product rate are shown below.

Figure 1. Validation of Linearity, Normality, and Homogeneity

