

[25 marks] A fertilizer company claims that its product improves average rice yields by more than 400 kg per acre. A random sample of 15 observations shows an average increase of 418.65 kg per acre with a sample standard deviation of 48.60 kg per acre.

- (a) [5 marks] What is the population parameter of interest?
- (b) [20 marks] Stating any assumptions you need to make, test the company's claim as the alternative hypothesis, at the 5% level of significance.

a)

The population parameter of interest is the average increase in rice yield between with and without the fertilizer product

b)

Assume the sample is representative of the average rice yield; the average rice yield is (measured as) continuous; the data are independent and there is no relationship between the observations; there are no significant outliers.

The null and alternative hypotheses are

$$H_0 : \mu \leq 400$$

$$H_a : \mu > 400$$

Based on the question, the significance level is $\alpha=0.05$, and the critical value for a right-tailed test is $t_c = 1.761$.

The rejection region for this right-tailed test is $R=\{t: t>1.761\}$

The t-statistic is:

$$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$$

$$= \frac{418.65 - 400}{48.6/\sqrt{15}}$$

$$= 1.486$$

Since $t = 1.486$ and $t_c = 1.761$, $t \leq t_c$. Therefore we conclude that we cannot reject the null hypothesis.

So, there is not enough evidence to claim that the average rice yield is improved by more than 400 kg / acre, at the $\alpha=0.05$ significance level.