Analysis of Gene Presence in CoCo population
Summary of Linear Regression Model:

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                        OLS Regression Results
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Dep. Variable:                      y   R-squared:                       0.517
Model:                            OLS   Adj. R-squared:                  0.517
Method:                 Least Squares   F-statistic:                     8905.
Date:                Wed, 02 Sep 2020   Prob (F-statistic):               0.00
Time:                        20:00:40   Log-Likelihood:                -87895.
No. Observations:               25000   AIC:                         1.758e+05
Df Residuals:                   24996   BIC:                         1.758e+05
Df Model:                           3
Covariance Type:            nonrobust
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                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         30.0414      0.057    529.791      0.000      29.930      30.153
x1            15.1720      0.187     81.005      0.000      14.805      15.539
x2            15.0201      0.186     80.925      0.000      14.656      15.384
x3            45.2430      0.652     69.434      0.000      43.966      46.520
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Omnibus:                     1598.984   Durbin-Watson:                   1.999
Prob(Omnibus):                  0.000   Jarque-Bera (JB):             7626.259
Skew:                           0.033   Prob(JB):                         0.00
Kurtosis:                       5.705   Cond. No.                         12.9
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Trends: X1 represents the presence of the 2c4a gene, X2 represents the presence of the 3d2b gene, and X3 represents the presence of both.

Analysis: The constant coefficient is the intercept of the linear regression model—that is how much chocolate a CoCo with neither gene would be expected to produce. The presence of the 2c4a gene and the 3d2b gene have similar effects on CoCo production—with either gene a CoCo would be expected to produce around 15 more grams per day. With both genes, a CoCo would be expected to produce 75 more grams of chocolate per day than a CoCo with neither.

Gene Distribution Bar Graph:
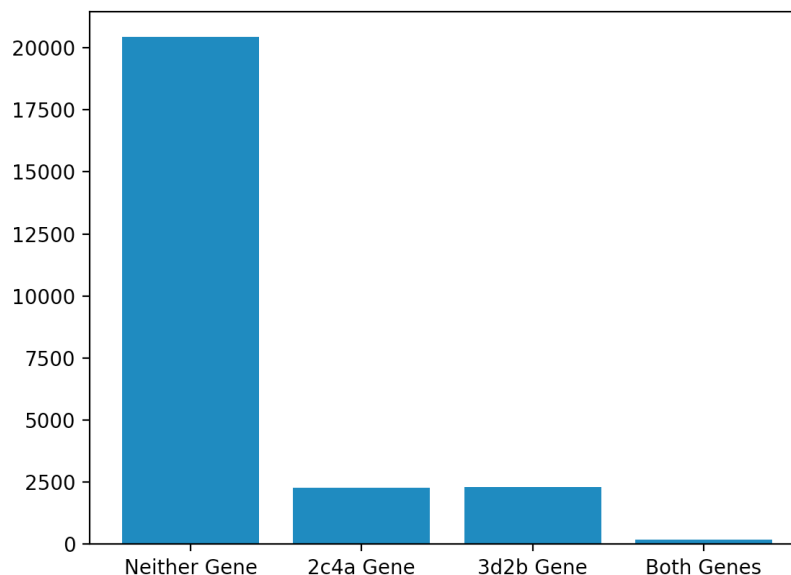
Conclusion: The presence of either gene has a similar and significant impact on the chocolate production of a CoCo. The presence of both genes quintuples the effect of only having a single gene.

Bonus:
Histogram of Chocolate Production:
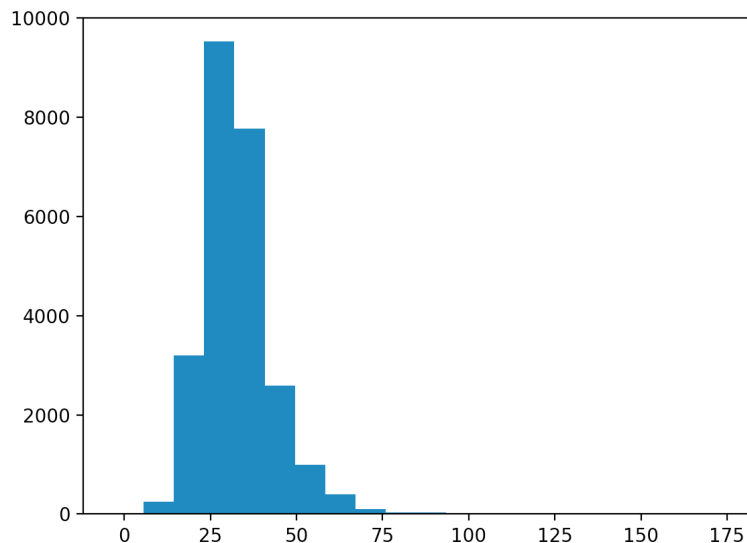
Trends: The best producing CoCos are those which produce over 75 grams of chocolate per day.

Analysis: The best producing CoCos are those with the presence of both genes, as suggested by the combined data of the linear regression model and histogram. Selectively breeding the most elite CoCos (those with both genes), it would take 36 months (with the population doubling every 6 months) for the initial population of 185 CoCos to reach a flock size of over 10,000, 11,840 exactly. That flock of 10,000 would produce 1054765.0216216217 grams, or around 1.16 US tons, of chocolate per day. By ID, these are the CoCos I would recommend for the breeding program:

['84ee451f-3918-402f-a655-8f90bfd95350', 'c969d8dd-53f8-44d6-81f4-c343957679a2', '2aa268b4-bfab-4125-913a-b790c8665f32',
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