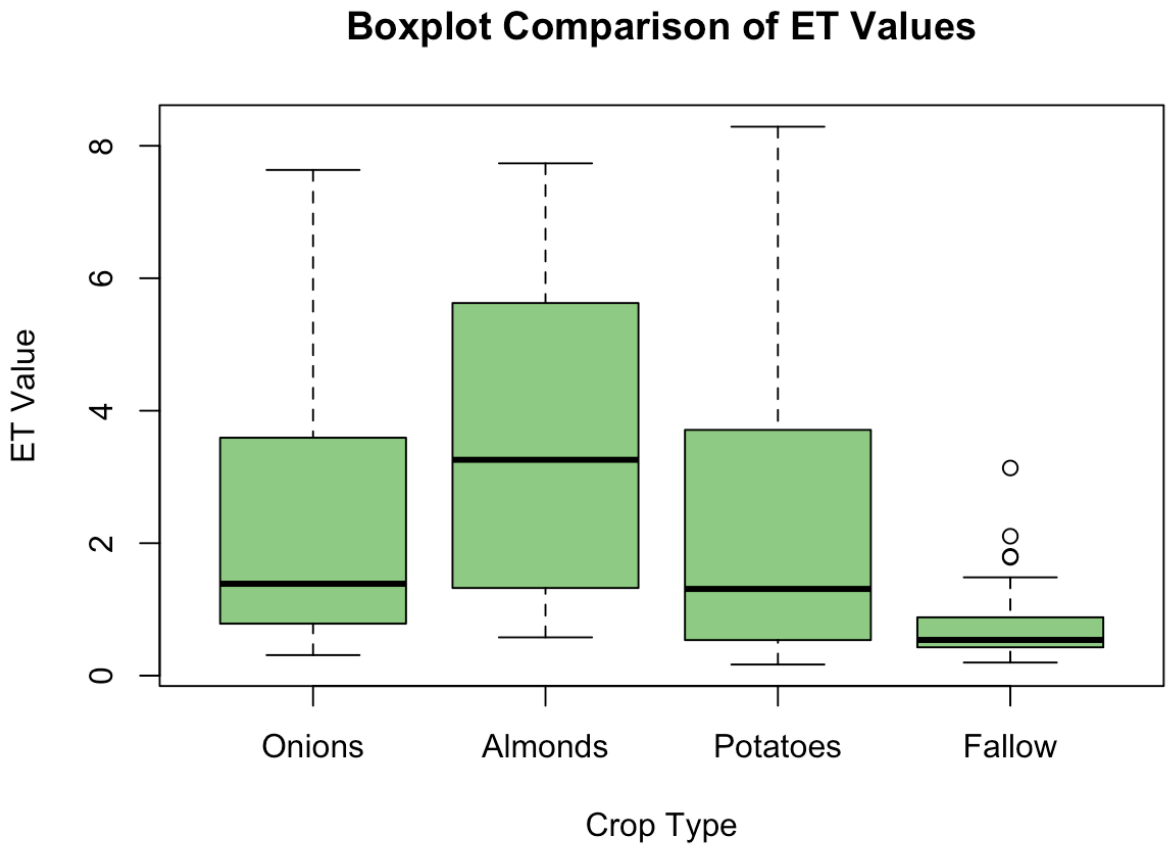
Anna Loeb
Professor Peichota
CPSC 370
5 October 2023

Analysis 1

F-tests between ET values:

Almond - Onion: F = 1.163, P-value = 0.5383 → No significant difference between variances
Almond - Potato: F = 0.781, P-value = 0.3139 → No significant difference between variances
Potato - Onion: F = 1.489, P-value = 0.1055 → No significant difference between variances
Almond - Fallow: F = 0.052, P-value = 2.2e-16 → Significant difference between variances
Potato - Fallow: F = 0.04, P-value = 2.2e-16 → Significant difference between variances
Onion - Fallow: F = 0.06, P-value = 2.2e-16 → Significant difference between variances

Box Plots:



Analysis 2:

Linear Regression Model:

Almonds

Residuals:

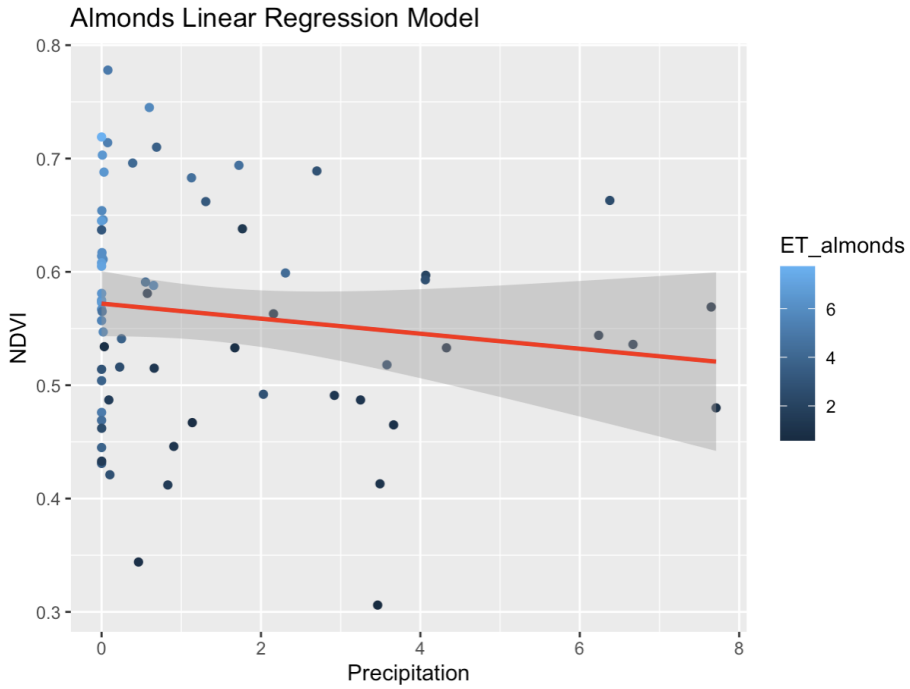
Min	1Q	Median	3Q	Max
-0.186559	-0.055203	-0.009352	0.047322	0.180814

Coefficients:

	Estimate Std.	Error	t value	P value
Intercept	0.422773	0.026591	15.899	< 2e-16 ***
ET_almonds	0.034257	0.005505	6.223	3.99e-08 ***
P_almonds	0.014430	0.005813	2.482	0.0156 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 '

Residual standard error: 0.07848 on 65 degrees of freedom
Multiple R-squared: 0.385
Adjusted R-squared: 0.3661
F-statistic: 20.35 on 2 and 65 DF, p-value: 1.374e-07



Onions

Residuals:

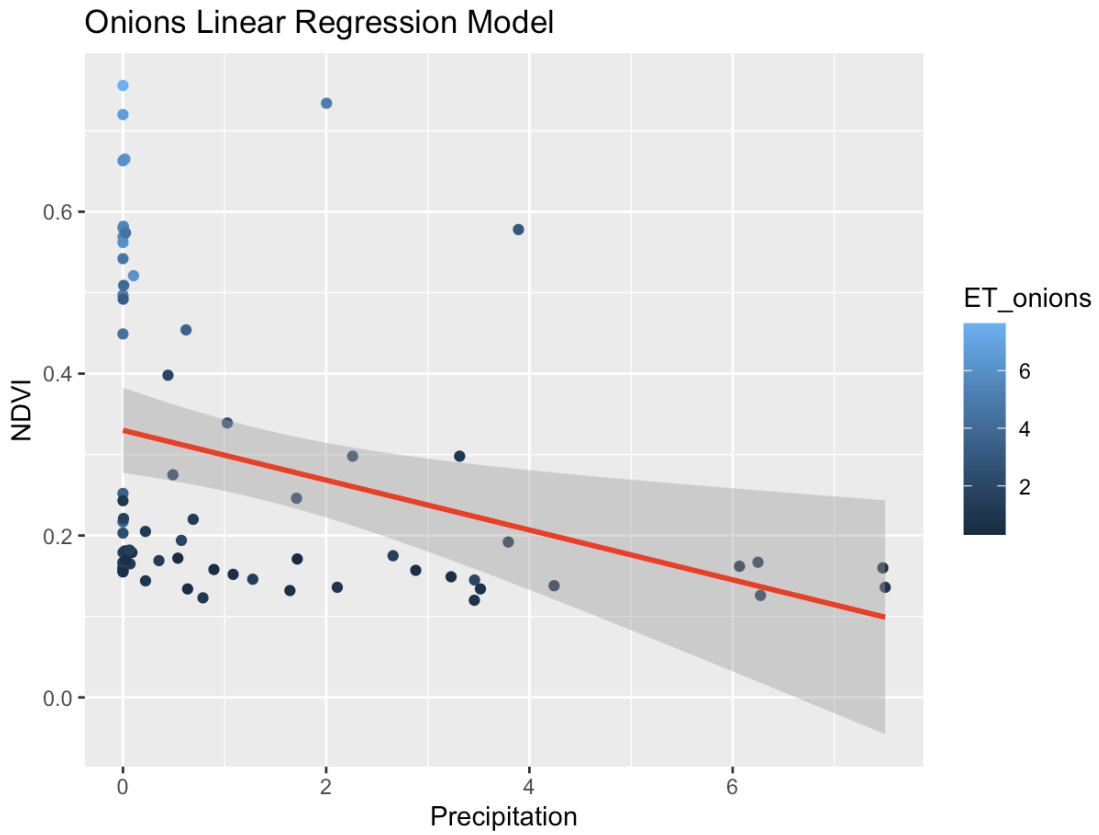
Min	1Q	Median	3Q	Max
-0.20221	-0.04044	0.00296	0.03422	0.21233

Coefficients:

	Estimate Std.	Error	t value	P value
Intercept	0.082595	0.016510	5.003	4.56e-06 ***
ET_onions	0.089029	0.004647	19.157	< 2e-16 ***
P_onions	0.002187	0.004691	0.466	0.643

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '

Residual standard error: 0.0703 on 65 degrees of freedom
Multiple R-squared: 0.8651
Adjusted R-squared: 0.8609
F-statistic: 208.4 on 2 and 65 DF, p-value: < 2.2e-16



Potatoes

Residuals:

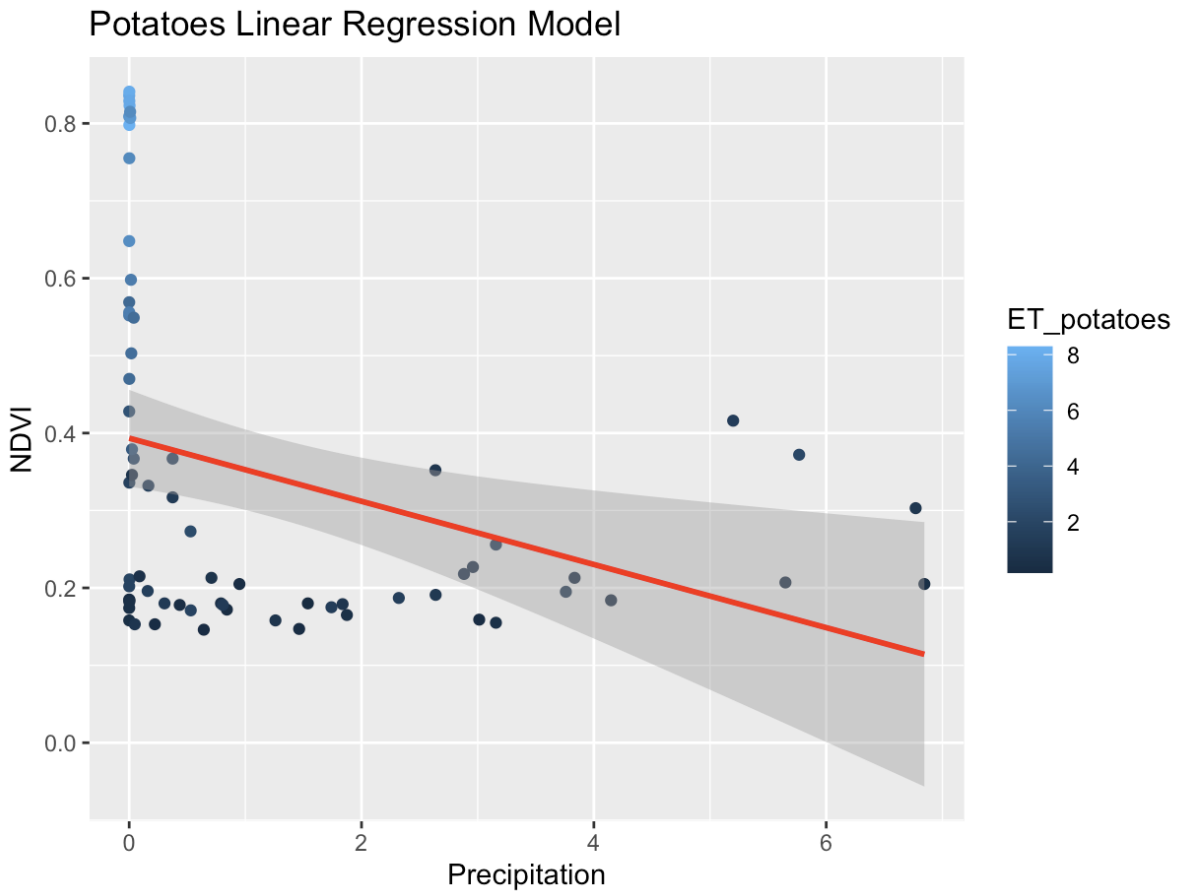
Min	1Q	Median	3Q	Max
-0.118536	-0.043815	-0.003214	0.032941	0.156247

Coefficients:

	Estimate Std.	Error	t value	P value
Intercept	0.121403	0.012956	9.370	1.11e-13 ***
ET_potatoes	0.091372	0.003238	28.221	< 2e-16 ***
P_potatoes	0.007775	0.004362	1.783	0.0793 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '

Residual standard error: 0.05904 on 65 degrees of freedom
Multiple R-squared: 0.9326, Adjusted R-squared: 0.9306
F-statistic: 450 on 2 and 65 DF, p-value: < 2.2e-16



Fallow

Residuals:

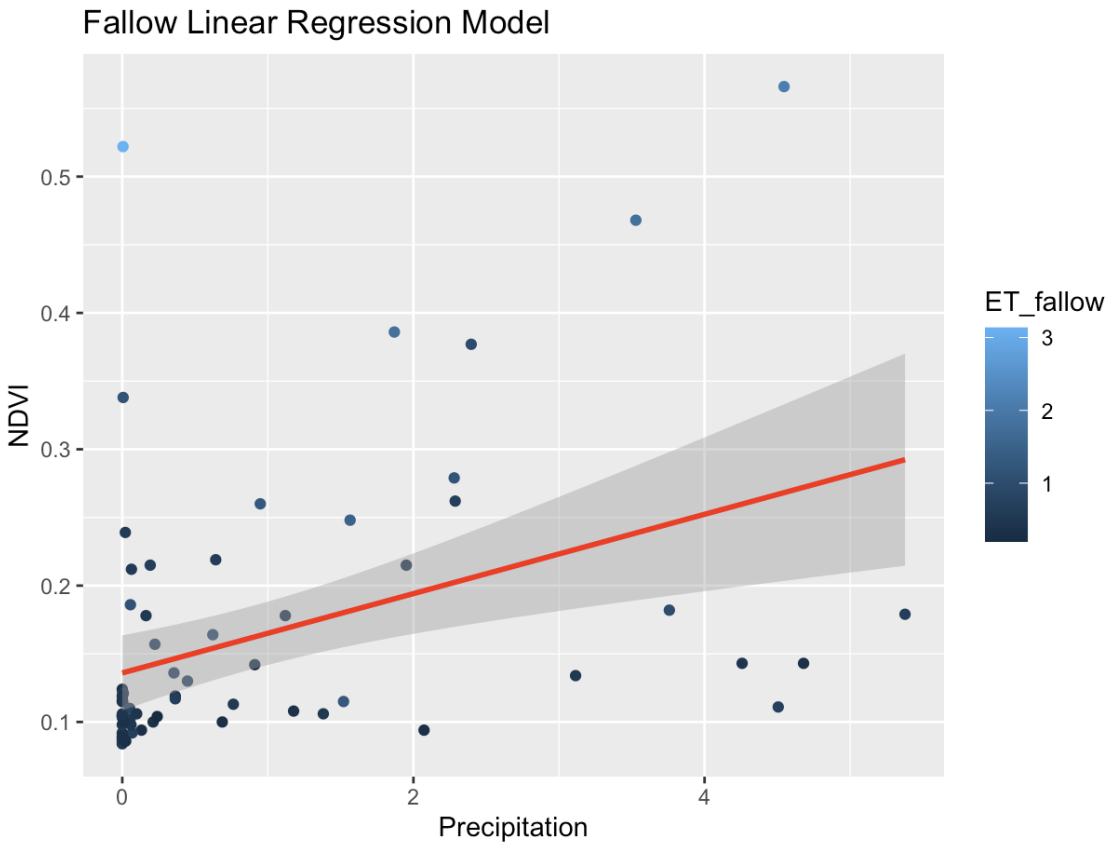
Min	1Q	Median	3Q	Max
-0.146754	-0.028704	-0.001271	0.020900	0.144713

Coefficients:

	Estimate Std.	Error	t value	P value
Intercept	0.030428	0.012069	2.521	0.01416 *
ET_fallow	0.164892	0.014212	11.603	< 2e-16 ***
P_fallow	0.015285	0.004921	3.106	0.00281 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '

Residual standard error: 0.055 on 65 degrees of freedom
Multiple R-squared: 0.7254
Adjusted R-squared: 0.717
F-statistic: 85.86 on 2 and 65 DF, p-value: < 2.2e-16



Prediction Model:

Almonds: P = 10, ET = 10
NDVI = 0.9096456

Onions: P = 10, ET = 10
NDVI = 0.9947603

Potatoes: P = 10, ET = 10
NDVI = 1.112875

Fallow: P = 10, ET = 5
NDVI = 1.007734

Summary

F-Values: While the p-values imply significant differences between variances of almonds, onions, and potatoes compared to fallow, all of the F-values are within the given confidence intervals, which suggests otherwise. This means that you will not be saving a significant amount of water by using one crop over another, especially between potatoes, onions, and almonds.

Boxplot: It is clear from the graph that fallow has the least variance in data compared to almonds, onions, and potatoes, while potatoes have the greatest variance.

Linear regression:
Almonds: The NDVI has significant relationships with ET and P, and the model explains 36.6% of the variance in NDVI.
Onions: The NDVI does not have a significant relationship to P, and it does have a significant relationship to ET. The model explains 86% of the variance in NDVI.
Potatoes: The NDVI has a weak relationship with P and a significant relationship with ET. The model explains 93% of the variance in NDVI.
Fallow: The NDVI has significant relationships with ET and P, and the model explains 71.7% of the variance in NDVI.
The linear regression models for Onions and Potatoes are well fit to the actual data.

Prediction Model:
In a theoretical climate change situation there could be increased precipitation as well as higher overall ET values. Using the regression models, I tested the four crops with values of 10 for precipitation and 10 for ET (5 for fallow because its general ET values were lower than the other crops). The input values increased the predicted NDVI value for all crops, meaning that the crops would be more lively with these values.