

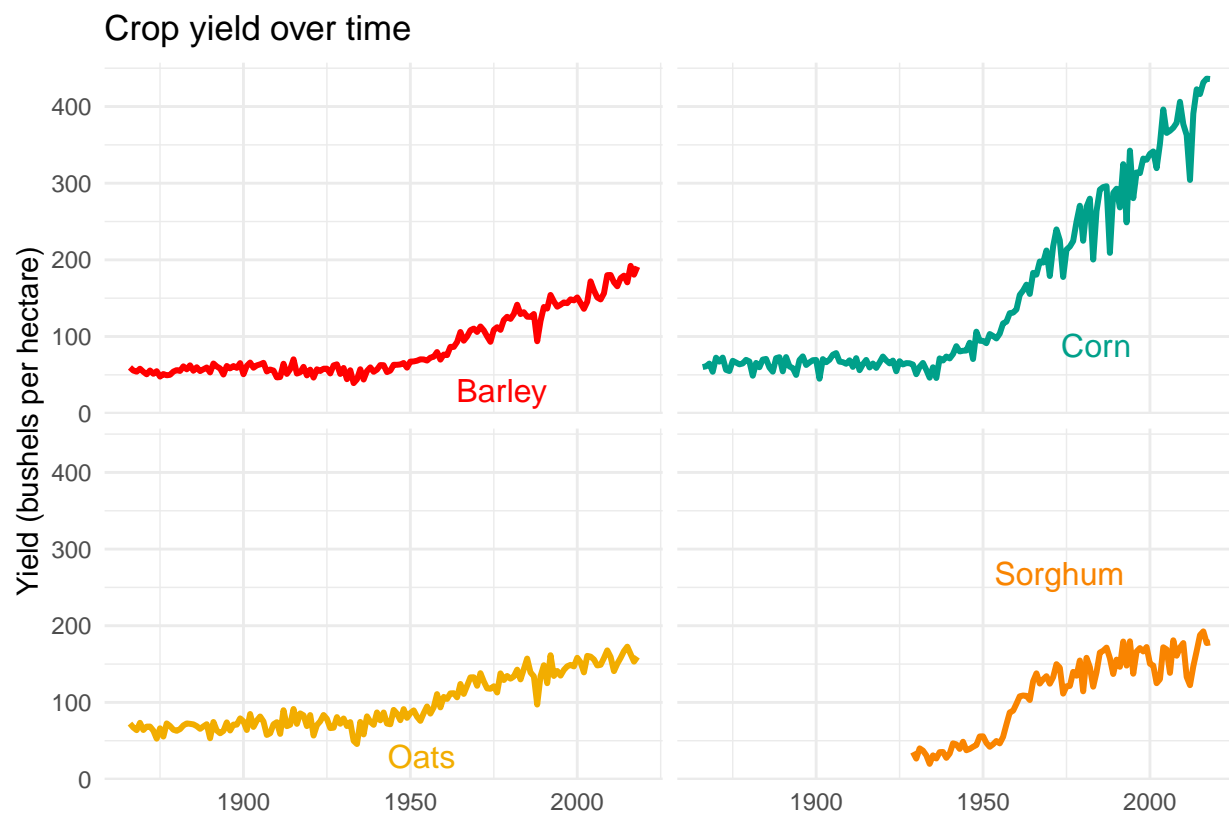
# ESM 201 HW 2

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## 1. Patterns in yield over time

### a. Finalized plot of yield over time



### b. Crop trends

In this case, it looks like Barley, Corn and Oats are all following the linear lower plateau curve. Sorghum is a little harder to determine because of there isn't as much data, but it looks more like a linear upper plateau or a linear piecewise with a decreasing rate.

### c. Extra

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu  
% Date and time: Wed, Mar 11, 2020 - 8:30:38 PM

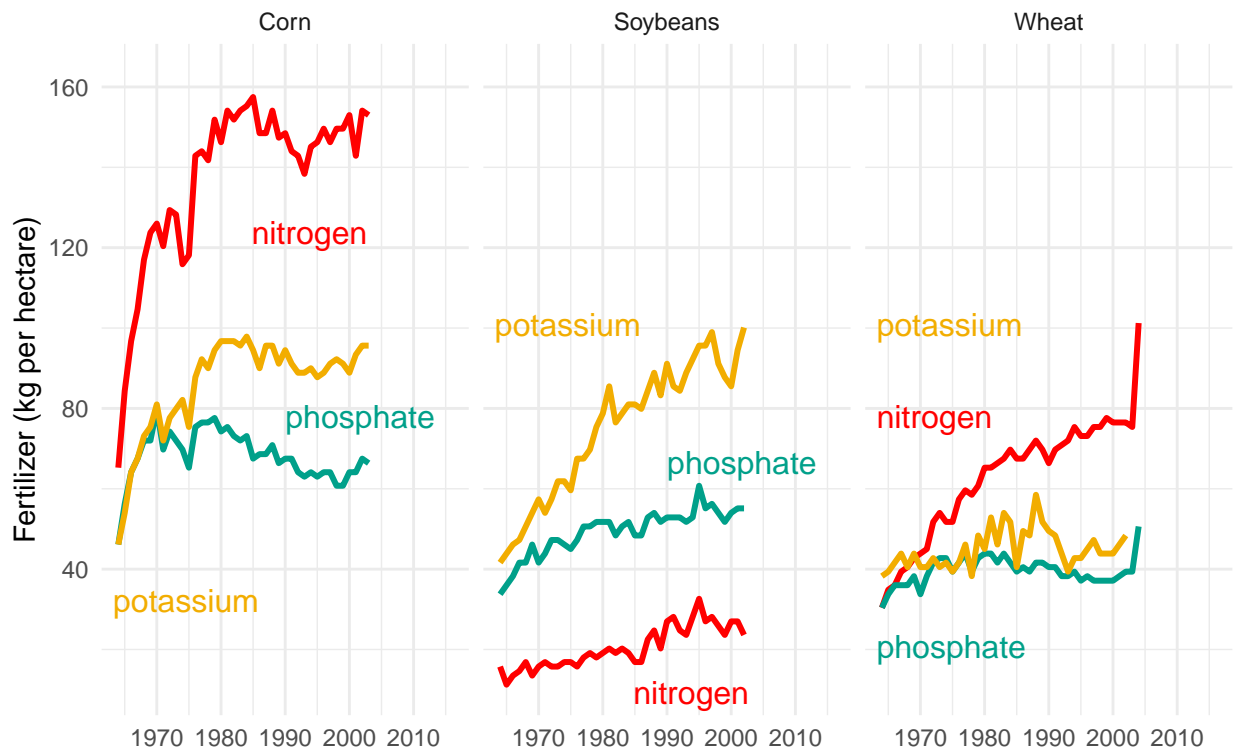
Table 1:

	<i>Dependent variable:</i>
	Yield
Hectares Planted	-37.966*** (5.015)
Hectares Harvested	39.694*** (5.813)
Constant	323.761*** (74.985)
Observations	93
R <sup>2</sup>	0.389
Adjusted R <sup>2</sup>	0.376
Residual Std. Error	94.406 (df = 90)
F Statistic	28.659*** (df = 2; 90)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

## 2. Fertilizer Use

### a. Finalized plot of fertilizer use

Fertilizer use over time



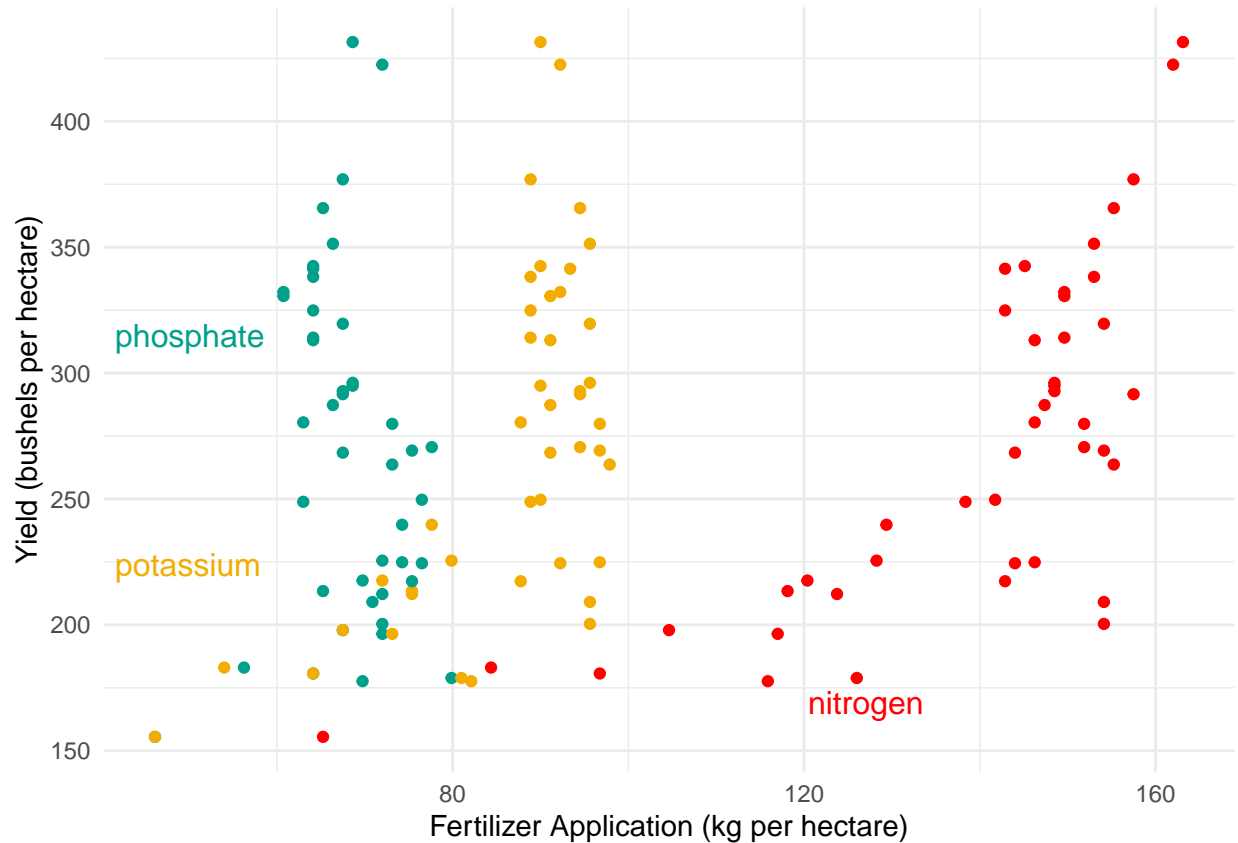
### b. Limiting nutrients

All three plants use different levels of these nutrients. In terms of application, it looks like both wheat and corn have the most nitrogen applied, whereas soybeans have the most potassium applied.

Because the limiting nutrient will be the one that has the highest level of application to the crop to encourage growth, nitrogen is limiting for wheat and corn and potassium is limiting for soybeans.

## 3. Case Study

### a. Finalized plot of fertilizer vs. yield



### b. Relationship between fertilizer and yield

There is not a linear relationship between fertilizer and yield. The data shows that as more fertilizer is applied, the yield stays about the same for both potassium and phosphate. Additional fertilizer does not produce more crops for these two nutrients. For nitrogen, the relationship is mostly the same, but there is a slight change in yield going from about 150 bushels per hectare to about 400 bushels per hectare with an additional 40 kg per hectare of nitrogen applied.