1. What are the main reasons why people cut down trees?

   - To clear land for their crops and animals to graze
   - To make access roads for mining minerals, gas and other natural resources
   - To sell valuable species of trees for their wood (timber)
   - To use them as firewood
   - To use the wood to build their houses

2. Why are savannas not as good as forests at capturing carbon dioxide?

   Forests have a very high biomass, and are made up of many trees with millions of leaves. As each of these leaves acts as a mini carbon dioxide converter, the forests are able to capture thousands of tonnes of carbon dioxide. In comparison, savanna has a relatively low plant biomass – so there are fewer trees and less leaves to capture the carbon dioxide.

3. Why was it important that we used forest cover before humans arrived in our statistical estimation of relationships between natural variables and forest occurrence?

   The Amazon region was a mixture of savanna and forest even before humans arrived. As some parts of the Amazon were already savanna, it would have been inaccurate to suggest that all areas that were cleared by humans had originally been forest. This could then have possibly resulted in biased estimates of natural effects. Therefore, we started from an estimate of pre-human forest cover that we took from the World Conservation Monitoring Centre original cover data set.
4. Previous studies focused only on the effect of Mean Annual Rainfall (the average rainfall per year) on forests. Why did this produce inaccurate results?

**Answer**

It is the function of different variables acting together that we found to most accurately determine the state of the forest. Focusing on MAR alone will cause confounding effects due to natural variation of seasonality and soils.

Previous studies found concurrence of savanna and forest over large ranges of predictor variables because they did not consider the joint effect of all relevant variables.

5. (Harder question) Sum up all the positive feedback effects mentioned in this paper

**Answer**

There are three positive feedback effects in this paper: (1) fire feedback: forest loss - fire (more loss of forest leads to more fire, which then leads to more forest loss) (2) water cycle feedback: forest loss - rainfall (less forest could lead to less rain which would cause further forest loss) (3) carbon cycle feedback: increased atmospheric CO2 levels - climate change - forest loss (warmer temperatures and/or less rain can lead to more forest loss, which leads to a further increase of CO2 levels through decomposition of dead trees or increased fire occurrence and through a decreased sink). They are best shown via a causal loop diagram (see below).

**Causal loop diagram.** '+' indicates that the affected variable changes in the same direction as the affecting variable. '-' indicates that the affected variable changes in the opposite direction as the affecting variable. For example: (1) more rain leads to more trees, (2) more fire leads to fewer trees. Red loops indicate feedbacks. Note that the water cycle feedback is only positive if climate change causes less rainfall. The authors only analysed and modeled the fire feedback.