Maize production in the future March 31, 2014

In this exercise, we extrapolate from current maize production patterns in Zambia and use the DSSAT projections of maize yield under two climate change scenarios (Hadley and CCSM) to estimate the total change in maize production in Zambia's future. The Hadley model tends to be a bit drier than CCSM, while the CCSM model exhibits a smaller overall increase in average growing season temperature and a higher level of intra-seasonal variation in both temperature and rainfall.

First, some background on the baseline patterns of maize production across space: Figure 1 shows the total kgs produced in each district for the 2006/07 agricultural year. Dark colors indicate districts with more maize produced, and these tend to be in Central, Eastern, and Southern Provinces.

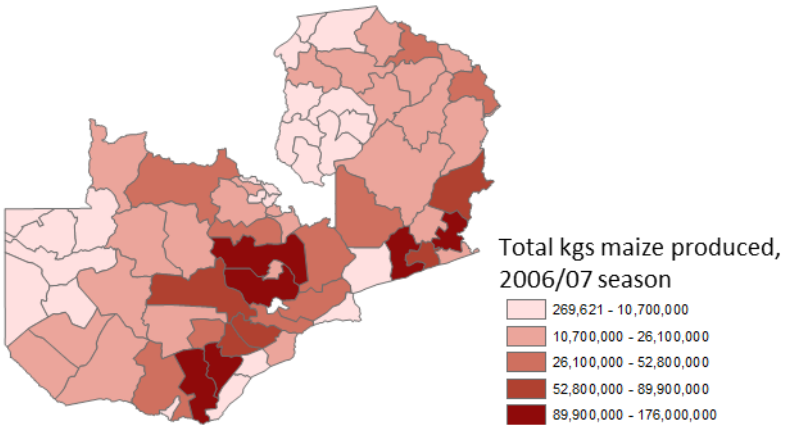

Figure 1. *Total maize production by district*

In this exercise, we differentiate the yield impact by whether or not fertilizer is applied. Figure 2 shows the proportion of maize area in each district that was cultivated with fertilizer during the 2006/07 season. Figure 3 also shows the proportion of maize area cultivated with local seed varieties for the same season.

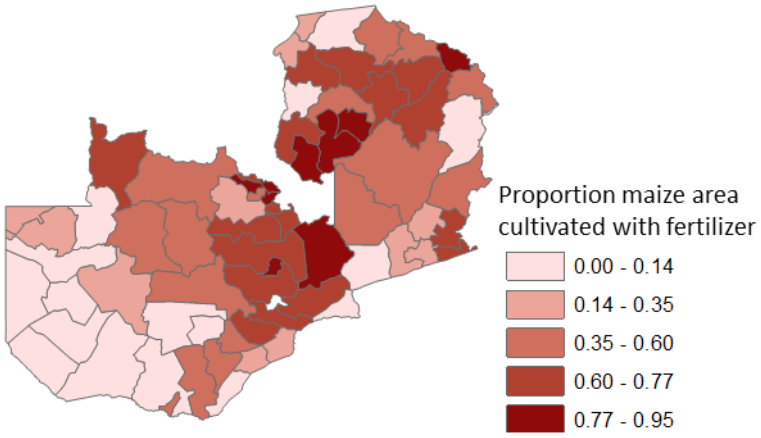

Figure 2. *Fertilizer use in maize production*

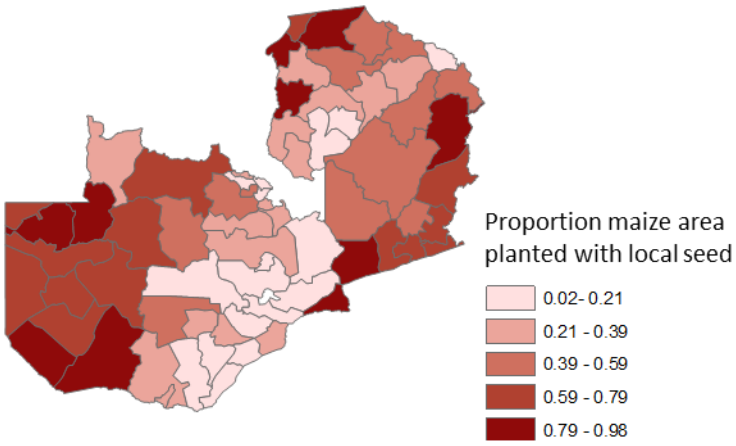

Figure 3. *Seed variety in maize production*

Now we estimate the total production impacts of climate change if we assume (*i*) the area planted to maize does not change in each district, (*ii*) the area planted with and without fertilizer does not change in each district, and (*iii*) the percent yield changes calculated for a generic hybrid maize variety also apply to local varieties. In other words, the percent change is applied to maize produced using both local and hybrid seed varieties.

For a generic 500-series maize seed variety, we reference DSSAT calculations of expected yield changes with a low fertilizer regime (5 kgs N/ha) and a high fertilizer regime (85 kgs N/ha). The percent change per district is the average over all pixels in the district, and the impacts under the two GCMs are for the year 2050. Figure 4 shows the change in total kgs produced under the Hadley scenario under the assumptions given in the previous paragraph. Light colors indicate little expected change in total production, while dark colors indicate a negative change of large magnitude. The total change in kgs produced for Zambia is a decrease in 232,677,481 kgs or **11.36%.**

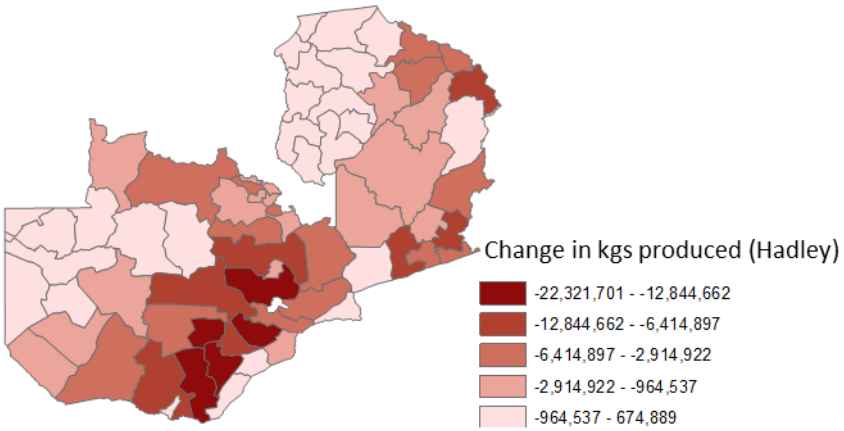

Figure 4. *Change in future maize production under the Hadley model*

Finally figure 5 gives the same estimates for the CCSM model. The overall negative impact of climate change is smaller, though the damage is still located in the same regions where much of the maize is grown today. The total change in kgs produced for Zambia is a decrease in 146,344,557 kgs or **7.15%**.

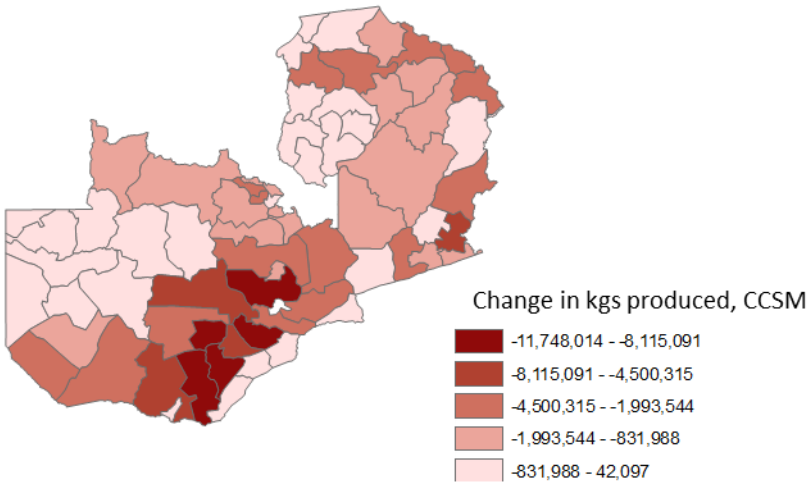

Figure 5. *Change in future maize production under the CCSM model*

While the assumptions made in this exercise are broad, it is useful to see how the estimated yield impacts of climate change overlay with the area where maize is currently grown. This provides an indication of the likely outcomes of no adaptation in crop production practices to the year 2050. Combined with information on the expected percent yield changes across Zambia, with and without fertilizer and for different seed varieties, this also gives an indication of the adaptation practices Zambia may use to narrow or close the expected decrease in total maize production in the future.