Agriculture in a changing climate

Historically, New England is an agriculturally productive area due to its short growing season and cold temperatures. As a result of climate change, temperatures in Vermont are expected to rise 2-3.6°F by 2050 and precipitation is expected to increase. Under this projected climate change scenario, growing season is predicted to lengthen 3.7 days per decade, creating new agricultural opportunities in the region. Given this change, which areas would be best for farmers to cultivate? Studies have examined global cropland suitability with climate change, but taking into account other location factors on a regional scale is important. This study will seek to explore ideal locations for small farms in Vermont, modeling suitability for farm land based on location and land suitability. This study is a pilot intended to discover whether or not we can identify land to use for cultivation based on proximity to highways, roads, and population centers. This study could serve as a model for examining future agriculture suitability in other states throughout New England, which are also projected to undergo similar changes in climate.

Where are ideal farms located?

Future farmlands: Identifying suitable land for agriculture in Vermont State

Model assessment

In order to assess farmland suitability, distances from population centers, as well as distances from roads and major highways were used to create weighted layers (Figures 1, 3 and 4). Next, land cover data were reclassified to rank land cover based on suitability for agriculture (Figure 2). Finally, map algebra was used to select layers that intersected with the “agriculturally prime soil” dataset. This layer is derived from the SSURGO dataset from the USDA by combining county-level VT soil data with the Top 20 attribute table from the SSURGO database and removing soils that are heavily sloped or that intersect water bodies or wetlands. Finally, pasture land, cropped land, and grazing land was mapped in order to compare the model with land already under cultivation. Figures 5-7 show examples of areas identified by the model as “most suitable.”

Location based on this model’s factors is one small facet of the decision about where to start a farm and only the beginning of exploration of ideal agriculturally suitable land parcels. Factors considered here are not an exhaustive list of variables to consider when looking for ideal farm land. Future studies could take into account other variables such as flood susceptibility or slope. Proximity rankings did not take into account travel time via roads, only straight-line distances. Because of the imprecision of this model due to errors in land classification in the NCLD dataset, some cells labelled as most suitable (3) are not actually viable (see Figure 5.)

Table 1. Total land areas in each suitability category and amount of land already under cultivation

<table>
<thead>
<tr>
<th>Suitability</th>
<th>Total Area (Ha)</th>
<th>Already under cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,002.56</td>
<td>333,144.36</td>
</tr>
<tr>
<td>2</td>
<td>173,229.12</td>
<td>173,229.12</td>
</tr>
<tr>
<td>3</td>
<td>124,047.36</td>
<td>124,047.36</td>
</tr>
<tr>
<td>4</td>
<td>289,823.75</td>
<td>289,823.75</td>
</tr>
</tbody>
</table>

Sources

7. U.S. Census Bureau, U.S. Census Bureau, 2010 Census of Population and Housing, accessed through Vermont Center for Geographic Data online, April 19, 2018.
8. U.S. Census Bureau, U.S. Census Bureau, 2010 Census of Population and Housing, accessed through Vermont Center for Geographic Data online, April 19, 2018.