



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

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Project Title Soil Compaction and Root Growth	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Soil compaction, the compressing of soil particles which lessens pore space, limits circulation of water, air, and nutrients throughout the soil. A major issue in many agricultural regions, compaction leads to high annual yield reductions. My experiment tests the effect of subsurface compaction on root growth of plants to determine the optimum level of compaction.</p> <p>Methods/Materials To begin my experiment, I gathered twelve pots (for three types of plants and four levels of compaction-51.73%, 31.34%, 23.88%, and no additional compaction). I used a heavy handle to compact the soil at different amounts, and measured the compaction by calculating the reduction of porosity. I then planted lima bean, okra, and tomato seeds, and I watered the plants daily with a constant amount. At the end of two months, I analyzed the root growth by carefully separating the plants from the soil, in the process measuring the depth of the roots in the soil and the volume of soil the roots held. Once the plants were completely removed, I measured the actual length of their roots.</p> <p>Results Roots that grew under the 53.73% compaction had the least depth in the soil, growing horizontally rather than vertically. Because of this, the roots were unable to absorb water and nutrients, which resulted in unhealthy yield (dry, short, weak stem, yellow leaves). Moreover, roots grown under no additional compaction held the least amount of soil, since the soil was very loose. The second and third levels of compaction allowed the roots to hold the most soil and grow the deepest to absorb water and nutrients.</p> <p>Conclusions/Discussion According to the results, some amount of compaction is needed for healthy growth of plants. Based on the results, I concluded that levels between 23.88% and 31.34% compaction are optimum amounts, which can be implemented in agriculture to lower annual yield losses.</p>	
Summary Statement Using three different plants, I measured the impact of subsurface compaction on root growth to determine the optimum range of compaction for healthy yield.	
Help Received My father bought the materials needed for the experiment.	