Agriculture is the mainstay of the economy in Malawi and accounts for 40% of Gross Domestic Product (GDP) and 90% of export revenues. Corn is the major cereal crop grown as staple food under rainfed conditions, covers over 92% of the total agricultural area, and contributes 54% of caloric intake. Corn production is the principle occupation and major source of income for over 80% of the total population in Malawi. Issues of hunger and food insecurity for the entire nation are associated with scarcity and low corn production. The expected global temperature as well as precipitation amounts and patterns associated with climate warming are expected to affect corn production in Malawi. This study evaluates the impacts of climate change on rainfed corn production in Malawi. Lilongwe district, with about 1,045 square miles of agriculture area, has been selected as a representative area. First, outputs of 15 GCMs under different emission scenarios are statistically downscaled. For this purpose, LARS-WG is calibrated for the study area and daily precipitation, minimum and maximum temperature are projected for 15 GCMs for three time horizons of 2025's, 2050's and 2090's. Probability assessment of bounded ranges with known distributions is used to account for the uncertainties of GCMs. The GCMs outputs are weighted by considering the ability of each model to simulate historical data. AquaCrop, a new model developed by FAO, that simulates the yield response to water deficit conditions, is employed to assess potential rainfed corn production with and without climate change. The results indicate mean temperature increase of 0.52-0.94°C, 1.26-2.0°C and 1.78-3.58°C and rainfall changes of 11 to -17%, 0 to -26%, and -3 to -29% for 2020's, 2050's and 2090's respectively. Simulated corn yields for same time periods are expected to change as follows; 0.53 to -8.11%, -7.25 to 14.33%, and -13.19 to -31.86%. The study concludes with some adaptation strategies that the Government of Malawi could consider to improve national food security under climate change.