In this thesis, we study the second order degenerate singular parabolic equations that describe the nonlinear Burger equation with the nonlinear reaction and weak diffusion forces. This model has applications in many areas of science and engineering , such as fluid flow, chemical reactions, and population evolution in mathematical biology. Our goal in this thesis is to study the qualitative behavior of local solutions and development of the interfaces with a finite speed of propagation in the irregular domain. In the first part, we introduce the local solutions of the equation in the regions where diffusion dominates over the equation limits, finding an approximate solution along the boundary curves, establishing determinants and constraints that achieve the existence and uniqueness of the solution, and applying the comparison theorem in the irregular fields with boundary curves. We also discussed the analysis of the growth in the interfaces, when both the reaction and the diffusion are in balance and both are more powerful than the nonlinear Burger term so that the interface function may expand or shrink or remain stationary. In the second part of the thesis, we concentrate on proving the existence of a solution to the traveling wave equation when the Burger term and the reaction are higher than the diffusion. Among the methods used for solving the technique of rescaling and blow-up techniques for the identification of the asymptotics of the barriers and application of the comparison theorem in non-cylindrical domains with characteristic boundary curves. V Table of Contents