With the increasing popularity of the agent-based simulation technique in various scientific fields, there is a demand for an all-in-one framework for modeling agent-based simulations. Although there are numerous agent-based tools available, these in most cases feature complex syntax and language structures or are aimed to be used in specific domains only. In response this thesis presents a new approach to modeling agent-based simulations by developing a brand new agent-based framework - AgentLang. The framework features a programming language with a unified and simple syntax for defining agents and their properties. Moreover, it provides a web-based interface with a spreadsheet module for manipulating agents and their values using the familiar spreadsheet format as well as a visualisation module for rendering the simulation in real-time. These three features of the AgentLang framework aim to introduce a new way to modeling agent-based simulations and attempt to make agent-based modeling more accessible to people of all scientific fields.