Galaxy clusters are, as the largest building blocks of our Universe, ideal probes to study the large-scale structure and to test cosmological models. The principle approach and the status of this research is reviewed. Clusters lend themselves for tests in several ways: the cluster mass function, the spatial clustering, the evolution of both functions with redshift, and the internal composition can be used to constrain cosmological parameters. X-ray observations are currently the best means of obtaining the relevant data on the galaxy cluster population. We illustrate in particular all the above-mentioned methods with our ROSAT-based cluster surveys. The mass calibration of clusters is an important issue, that is currently solved with XMM-Newton and Chandra studies. Based on the current experience we provide an outlook for future research, especially with eROSITA.