Small-scale farmers are crucial to guarantee food security for the world’s growing population: they cover 70% of the global food demand and represent 90% of the farms worldwide. Since agriculture is water dependent, the expected surge in food demand might increase irrigation water competition, if no water management plans are developed. Irrigation water is distributed among small-scale farmers through communal irrigation systems and small-scale farmers are confronted with two decisions regarding the systems management: (i) how much to invest into the infrastructure’s maintenance and (ii) how much water to extract. Moreover, environmental variations, due to climate change, affect the timing and quantity of available irrigation water, increasing production uncertainties. Thus, small-scale farmers’ dilemmas are aggravated by the uncertainty of water availability might disincentivize individual infrastructure contributions while exacerbating the likelihood of water over-extraction. The extent to which disturbances, such as environmental variations, affect the systems is linked to the system’s institutional robustness, defined as a set of characteristics that are constant in long-lasting systems. This research aims at understanding what is the particular role of institutional robustness in the development of communal irrigation systems management strategies during environmental variations. A mixed method research design was developed to address this question with a case study in Northwest Argentina. It included a frame field experiment, self-reported surveys, in-depth interviews, and observation. The economic experiment originally developed for laboratory conditions was modified as a framed field experiment. The empirical evidence from two communal irrigation systems test the hypotheses with a deductive approach. Some of the results were consistent with prevailing findings, while others challenged them. It was found that during environmental variations low institutional robustness might be overcome by previous common-pool-resource management experience, well-defined boundaries and collective choice arrangements have a positive relation to the system management, while externally imposed rules and the lack of institutional arrangements have a negative relation to the system management. Furthermore, this research uncovered potential strategies that could improve communal irrigation systems management under environmental variations to guarantee their sustainability, while also contributing to the theoretical development of common-pool resources and socio-ecological systems.