The ill-management of headwaters has frequently shown to severely impact the fluvial environment, with channel incision and gully erosion hazards affecting many areas around the world, especially in drylands. To counter this, many regions have adopted improved land management schemes aiming at restoring the physical, biological and hydrological integrity of the landscape. Therefore, much attention has been given to the rehabilitation and renaturalization of headwater streams and gullies. Despite recent successes in land rehabilitation for many areas worldwide, optimizing the management of (agricultural) landscapes remains challenging, especially considering global trends in land use and climate change. In this paper, an analysis is presented on indirect (catchment-wide) and direct (operating at the channel) gully rehabilitation measures and their success, by reviewing literature from dryland environments across the world. Understanding the success of gully rehabilitation measures was done by adding the life-cycle of a gully to the analysis, indicating that the success of gully rehabilitation is linked to the hydrogeomorphic development phase of gullies. From cut to fill cycle, gullies typically develop through a number of hydrogeomorphic phases, in which different geomorphic responses become dominant (from headcut retreat and downcutting, to widening and eventually, infilling). This has important implications for the type of interventions required to control gully development and the costs involved. Moreover, this analysis teaches us when (appropriate timing) and where (appropriate area) to start gully rehabilitation schemes, when cost-effective and sustainable solutions are sought.