Kutcharo caldera volcano, located in eastern Hokkaido, Japan, had erupted ca. 120 ka, forming the largest caldera (Kp IV). This study reveals the magma plumbing system during Kp IV activity. The KpIV eruption started by pumice-falls (Pfa), immediately followed by large volume pumice flows from distinct (NW-SE side) vent systems (Pfl). NE-side vent provided scoria-bearing pumice flows. After Pfl, a scoria flow unit issued only NNE direction (Sfl). Pumice is porphyritic and scoria is nearly aphyric. The matrix glass compositions of pumice are homogeneous, and those of scoriae are distinguishable into three types on P2O5, suggesting the existence of one silicic and three mafic magmas beneath Kutcharo volcano. Pfl includes all the types whereas Sfl has only one type. The whole-rock compositions also exhibit the similar variation. Complex zoning profiles of orthopyroxene suggest that magma mixing had occurred repeatedly a long time before the eruption. Thin reverse zoning of Fe-Ti oxides implies that mafic magma had injected into silicic one a few days before the eruption: i.e., injection of mafic magma was a trigger of eruption. Higher Sr isotopic ratios of scoria than those of pumice cannot explain the formation of silicic magma by fractional crystallization of co-existed mafic magmas. A large silicic magma would be produced by the accumulation of partial melts of the crustal materials, and multiple mafic magmas would be generated from the heat source basalt. In this way, mafic magma plays the important role of formation, evolution and eruption process of a large silicic magma system.