Spin-lattice coupling of $R_{1-x}Lu_xB_4$ revealing anomalous weak ferromagnetism ($R=$Sm, Gd, Tb, Dy, Ho) B.Y. KANG, School of Materials Science and Engineering, Gwangju Institute of Science and Technology (GIST), Korea, SEONGSU LEE, Korea Atomic Energy Research Institute, Korea, SANG-YUN HWANG, SUNGDAE JI, Max Planck POSTECH/Korea Research Initiative, Korea, M.S. SONG, B.K. CHO, Gwangju Institute of Science and Technology (GIST), Korea — $RB_4$ ($R=$rare-earth elements) compounds exhibit antiferromagnetic ordering at low temperature and are classified as the Shastry-Sutherland lattice, which is a geometrically frustrated system. In previous study, it was reported that Y substitution in TbB$_4$ single crystals causes anomalous WF (weak ferromagnetism) even though Y$^{3+}$ is non-magnetic. The disturbance of a delicate equilibrium in a frustrated system can lead to new electronic and magnetic states. In this study, single crystals of $R_{1-x}Lu_xB_4$ ($R=$Sm, Gd, Tb, Dy, Ho), ($x=0~0.8$) were synthesized. WF is also observed. TbB$_4$ went through orthorhombic distortion below Néel temperature. To investigate the existence of orthorhombic distortion in TbLu$_{0.1}$B$_4$ ($x=0.1, 0.35$), high resolution single crystal x-ray diffraction was performed at 5 K. It was confirmed that the distortion was vanished with Lu substitution. Interestingly, lattice constant $a$ was increased with decreasing temperature below the $T_C$. The strong correlation between spin-lattice coupling and WF will be discussed in detail.