ABSTRACT. Given a row-finite k-graph Λ with no sources we investigate the K-theory of the higher rank graph C^*-algebra, $C^*(\Lambda)$. When $k = 2$ we are able to give explicit formulae to calculate the K-groups of $C^*(\Lambda)$. The K-groups of $C^*(\Lambda)$ for $k > 2$ can be calculated under certain circumstances and we consider the case $k = 3$. We prove that for arbitrary k, the torsion-free rank of $K_0(C^*(\Lambda))$ and $K_1(C^*(\Lambda))$ are equal when $C^*(\Lambda)$ is unital, and for $k = 2$ we determine the position of the class of the unit of $C^*(\Lambda)$ in $K_0(C^*(\Lambda))$.