A simulation model was developed to describe French bean growth and development in Kenya. Parameters were estimated using data from a field experiment while a set of four experiments provided data for model evaluation. The model uses radiation and temperature to predict leaf area index and total plant dry weight. The model fitted well data of the experiment from which parameters were estimated. There was also a fair fit of data at least from two experiments but poor in the two others. Sensitivity analysis showed that the model is sensitive to light use efficiency, specific leaf area and light extinction coefficient and therefore, these parameters require to be estimated accurately for reliable model prediction. The initial leaf area index on the other hand did not seem to exert much influence on model prediction. The model would require improvements in simulation of leaf senescence and dry matter partitioning.