Photosynthetic Photon Flux Density

Lux and lumens are commonly used to measure light levels, but they are photometric units which measure the intensity of light as perceived by the human eye. The spectral levels of light that can be used by plants for photosynthesis is similar to, but not the same as what's measured by lumens.

Photosynthetic photon flux density (PPFD), photoperiod and spectral distribution play important roles in regulation of plant photosynthesis and morphogenesis during plant tissue culturing. When comes to measuring the amount of light available to plants for photosynthesis, biologists often measure the amount of photosynthetically active radiation (PAR) received by a plant.

The irradiance of PAR can be expressed in units of energy flux (W/m^2), which is relevant in energy-balance considerations for photosynthetic organisms. However, photosynthesis is a quantum process and the chemical reactions of photosynthesis are more dependent on the *number* of photons than the amount of energy contained in the photons. Therefore, plant biologists often quantify PAR using the number of photons in the 400-700 nm range received by a surface for a specified amount of time, or the Photosynthetic Photon Flux Density (PPFD). This is normally measured using $mol/m^{-2}s^{-1}$. Generally, most of the plants require at least light levels between 100 and 800 $\mu mol/m^{-2}s^{-1}$. For daylight-spectrum (6000 K) lamps, this would be equivalent to 5800 to 46,000 lm/m^2.