# Supplemental Lighting
# Run Time Worksheet

Use this worksheet to calculate how long to run supplemental lighting in your greenhouse.

Steps:

1.  What percentage of the sun does your greenhouse let through?  On a sunny day, use a PAR meter [1] to measure the "sunlight outside".  Then, run inside and measure the "sunlight inside" just above your crop.  Make sure your meter reads in $\mu mol \cdot m^{-2} \cdot s^{-1}$.

*"percent of sun getting in the greenhouse" = "sunlight inside" ÷ "sunlight outside"*

_____  =  _____ $\mu mol \cdot m^{-2} \cdot s^{-1}$ ÷ _____ $\mu mol \cdot m^{-2} \cdot s^{-1}$

(the answer will be a decimal less than 1.0)

2.  How much light does the sun give where you live at the time in question?

This is determined from the DLI maps or from a data recorder… call this *"DLI from sunlight outside"* .  Remember, DLI means "Daily Light Integral" and is reported in $mol \cdot m^{-2} \cdot day^{-1}$. DLI maps can be found here: https://www.canr.msu.edu/uploads/resources/pdfs/dli-maps.jpg

_____ $mol \cdot m^{-2} \cdot day^{-1}$ = *"DLI from sunlight outside"*

3.  How much light does your crop get from the sun?

*"DLI from sunlight inside" = "DLI from sunlight outside" x "percent of sun getting in the greenhouse"*

_____$mol \cdot m^{-2} \cdot day^{-1}$ = _____$mol \cdot m^{-2} \cdot day^{-1}$ X _____

4. How much total light does your crop need?

This is determined from crop production guides, research, Extension, etc…. call this *"Total DLI needed".* It is reported in $mol \cdot m^{-2} \cdot day^{-1}$.

_____ $mol \cdot m^{-2} \cdot day^{-1}$ = *"Total DLI needed"*

5. How much additional light do your lamps need to add to the sunlight?

*"Additional light needed" = "Total DLI needed" - "DLI from sunlight inside"*

_____ $mol \cdot m^{-2} \cdot day^{-1}$ = _____ $mol \cdot m^{-2} \cdot day^{-1}$ - _____ $mol \cdot m^{-2} \cdot day^{-1}$

6. How much instantaneous light do your lamps provide?

This is determined by using a light meter. Make sure it reads in $\mu mol \cdot m^{-2} \cdot s^{-1}$. Measure in the dark, the same distance below your lamps as the crop will be….call this *"Lamp Intensity"*

_____ $\mu mol \cdot m^{-2} \cdot s^{-1}$ = *"Lamp Intensity"*

7. How many hours do you need to run the lamps to provide the additional light?

*"Hours to run lamps" = "Additional light needed" ÷ ("Lamp Intensity" x 0.0036)*

_____ hours = _____ $mol \cdot m^{-2} \cdot day^{-1}$ ÷ (_____ $\mu mol \cdot m^{-2} \cdot s^{-1}$ x 0.0036)

**Be sure to do inside the parentheses first!**

Note:

[1] a "PAR meter" measures "Photosynthetically Active Radiation" in $\mu mol \cdot m^{-2} \cdot s^{-1}$. Also called "PPFD" ("Photosynthetic Photon Flux Density") or "Quantum Flux"