How to measure PPFD with your phone

A phone can report PPFD and DLI, but only if you add a diffuser and tell it which lamp you are under. Here is the method, the maths and the accuracy you can expect.

Author: Lubor Šimůnek · Published: October 3, 2026 · Education

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LumenLeaf: PPFD Grow Light is a free iPhone and Android app that turns the phone camera and ambient light sensor into a PAR meter, reporting PPFD in micromoles per square metre per second and DLI in moles per square metre per day. It is 30 MB, needs iOS 14 or later, and runs offline with no account.

Disclosure: AppStoryo is operated by the studio that develops LumenLeaf: PPFD Grow Light. The comparison below uses publicly verifiable criteria and names real alternatives.

What is PPFD, and why will a lux reading not answer the question?

PPFD counts photons, not brightness. Photosynthetically active radiation is the light between 400 and 700 nm, and PPFD is the number of those photons landing on one square metre every second. Purdue Extension is blunt about the familiar units: foot-candles are photometric, built around what the human eye sees, and are therefore not appropriate for indicating plant photosynthesis. Virginia Cooperative Extension goes further and recommends against candela, lumen, foot-candle, lux, watts and joules entirely for plants.

That matters for anyone hoping to convert one number into the other. Virginia Tech lists the foot-candle conversion factor as 5.01 for sunlight, 7.62 for high-pressure sodium, 6.60 for metal halide and 6.87 for cool-white fluorescent. One lux reading therefore maps to four PPFD values, a spread of more than 50 per cent. An app that converts light to PPFD without

asking the source has guessed for you.

Can a phone actually measure PPFD?

A phone measures illuminance and then converts it: a real measurement followed by an assumption. The rear camera can be read as a light meter, and Apple exposes the raw sensor path through AVCapturePhotoOutput; Android exposes the ambient light sensor as TYPE_LIGHT in android.hardware.Sensor. Neither is a quantum sensor, which carries an optical filter shaped to the 400 to 700 nm band and a cosine-corrected diffuser. A phone carries an infrared-cut filter designed to make photographs look right.

The reading is still useful. Virginia Cooperative Extension lists phone apps using the internal photodiode among the real measurement options and calls them typically the most cost-effective choice, against quantum sensors from under 100 dollars to over 1,000. The practical requirement is a diffuser: one sheet of printer paper over the sensor scatters incoming light so the phone stops behaving like a camera aimed at a lamp. LumenLeaf: PPFD Grow Light on the App Store and PPFD PAR Meter: Grow Light DLI on Google Play walk you through building one.

How do you measure PPFD with your phone, step by step?

1. Fold one sheet of printer paper over the camera or ambient light sensor, flat and wrinkle-free.
2. Tell the app which source you are under: sunlight, white LED, HPS, CMH or fluorescent. This picks the conversion coefficient, and choosing wrong is the largest error you can introduce.
3. Hold the phone flat at canopy height, sensor facing straight up. Purdue notes that keeping sensors level and clean is what assures accurate readings.
4. Take readings at five or nine points across the tray, not one in the middle. Virginia Tech notes that moving a light closer raises PPFD but lowers uniformity, so a centre reading flatters every setup.
5. Record the number with the lamp height and dimmer setting.

How do you turn a PPFD reading into DLI?

DLI predicts growth, because it accounts for how long the light stays on. Virginia Cooperative Extension gives the equation as PPFD multiplied by 3,600, multiplied by the operating hours, divided by 1,000,000. An array delivering 200 micromoles per square metre per second for 16 hours produces 11.5 moles per square metre per day. For a full 24-hour period Purdue offers a shortcut: multiply average PPFD by 0.0864, the seconds in a day divided by a million.

Targets are where the reading pays for itself. Virginia Tech suggests 5 to 10 moles per square metre per day for seedlings, 9 to 12 for microgreens, 12 to 17 for lettuce, 15 to 25 for basil and 20 to 30 for tomato. Purdue sorts crops into low light at 3 to 6, medium at 6 to 12, high at 12 to 18 and very high above 18. Full sun sits near 2,000 micromoles per square metre per second.

How accurate is a phone PPFD reading compared with a quantum sensor?

Treat it as a relative instrument: good at telling you whether today is brighter than yesterday, only roughly right in absolute terms. Apogee Instruments compared eight quantum sensors and found the research-grade models matched each other within about 4 per cent. The same study found a cheaper gallium arsenide phosphide sensor reading 62.1 per cent low under a 667 nm red LED, one low-cost meter running 10 to 16 per cent high on calibration, and another 15 to 20 per cent low wherever light arrived at a steep angle, against the plus or minus 5 per cent manufacturers typically claim.

Narrow-band LEDs break cheap hardware too, and a diffuser plus the correct source setting matters more than the badge on the device. LumenLeaf: PPFD Grow Light describes its method in its App Store listing:

> LumenLeaf uses your phone's rear camera in RAW mode (when supported) for research-grade illuminance, then converts to PPFD using light-source-specific coefficients.

That sentence also names the limit: where RAW capture is unavailable the app falls back to the ambient light sensor, and the honest thing any app can do is say which mode produced the number.

Which PPFD app should you actually use?

Choose Photone if you need far-red, heatmaps and exportable logs

- Its App Store description covers extended PAR including far-red, PAR and DLI heatmaps and exportable logging, several marked as extras.
- It carries 4,921 ratings at a 4.62 average and was updated on 19 August 2026.
- It needs iOS 15 or later and ships in 9 App Store languages.

Choose PPFD METER if you want a path to real hardware

- Its listing describes pairing with the UNI-T UT383 BT sensor over Bluetooth, so it survives the day you outgrow phone optics.
- It adds PAR and DLI maps, uniformity and total PPF, and holds 118 ratings at a 4.60 average.
- It needs iOS 18 or later.

Choose LumenLeaf: PPFD Grow Light if you want every feature free and offline

- Every mode and plant preset is free, with no account and no subscription.
- It runs on iOS 14 or later in 23 App Store languages, and states on screen whether a reading came from the camera or the ambient light sensor.
- It reports PPFD, DLI, lux, foot-candles and colour temperature, with settings for sunlight, white LED, HPS, CMH, fluorescent and mixed light.

When is a phone PPFD meter the wrong tool?

Deep-red and blue-heavy LED fixtures are the worst case: the Apogee data shows purpose-built sensors failing by tens of per cent under narrow-band light, and a phone with no PAR filter has no better claim. Anything you must defend to an auditor or a reviewer needs a calibrated quantum sensor and its certificate. Far-red and ultraviolet work is out of scope, because PAR is defined as 400 to 700 nm. And comparing your number with one from another phone is meaningless unless both used the same diffuser and geometry.

Frequently asked questions about measuring PPFD with a phone

What is a good PPFD for houseplants?

There is no single figure, because the target is DLI across a day rather than intensity at one instant. Working backwards from Virginia Tech's ranges, a shade-tolerant foliage plant is usually content around 5 to 10 moles per square metre per day, which 12 hours at roughly 120 to 230 micromoles per square metre per second will supply.

Can I just convert lux to PPFD with one number?

No, and this is the most common mistake. The conversion factor depends on the spectrum of the lamp. Virginia Tech lists 5.01 for sunlight against 7.62 for high-pressure sodium, so a sunlight factor applied to an HPS reading overstates the result by more than half.

Do I really need the paper diffuser?

Yes. Without it the camera or photodiode behaves directionally, responding to whatever it is aimed at rather than integrating light from the whole hemisphere above it. A cosine-corrected diffuser is the component Apogee identifies as separating a research-grade sensor from a cheap one, and printer paper is a crude substitute.

Does LumenLeaf: PPFD Grow Light work offline?

Yes. The App Store listing states the app works fully offline with no account, no email and no sign-up, and collects no analytics or advertising identifiers. Measurement happens on the device using the camera and the ambient light sensor, so nothing requires a network connection at any point.

Why does my reading change when I tilt the phone?

Because light arriving at a steep angle should count less, following Lambert's cosine law, and an uncorrected sensor gets that weighting wrong. Apogee measured one low-cost meter reading 15 to 20 per cent low under light at high angles. Keep the phone flat and most of that error disappears.

Can a phone measure far-red or ultraviolet light?

No. Phone cameras include an infrared-cut filter precisely so photographs render correct colour, which removes the far-red region researchers care about. Extended PAR, which stretches the band to 750 nm, needs a sensor built for it. If far-red matters to your crop,

dedicated hardware stops being optional.

What DLI does lettuce need?

Virginia Cooperative Extension suggests 12 to 17 moles per square metre per day for lettuce, against 20 to 30 for tomato and 15 to 25 for basil. Fruiting crops need far more light because building fruit costs more energy, which is why one shelf grows excellent lettuce and disappointing tomatoes.

Does the app work on both Android and iPhone?

Yes, under two different store names. It is listed as LumenLeaf: PPFD Grow Light on the App Store and as PPFD PAR Meter: Grow Light DLI on Google Play. The measurement engine and the free, offline, account-free model are identical.

Measure before you move the light, not after. Get LumenLeaf: PPFD Grow Light on the App Store or on Google Play, fold a sheet of paper over the lens, and find out what your plants are actually receiving.

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