

Digital Hemispheric Photography

Leaf area index (LAI) can be defined as the total one sided area of leaf tissue per unit area of ground and is a key derived parameter that is associated with water and light interception, radiation transfer, water and carbon exchange. Leaf area index is the preferred measure of cover for vegetation and as a key variable used in total biomass estimation and in carbon cycling prediction models. Indirect measures of LAI include digital photographic methods using flat or hemispherical images, referred to respectively as DCP (digital cover photography) and DHP (digital hemispheric photography).

Digital Hemispheric Photography (DHP) is recommended for tall vegetation with complex structure (multiple strata).

1.1 Suggested Equipment for DHP

Lens - Sigma 4.5mm F2.8 EX DC HSM Circular Fisheye.

Camera - DSLR camera with > 10 Megapixel sensor of 24 mm size. ISO setting of 100 or 200 used where possible with an aperture of at least f 8.0.

1.2 DHP Image Acquisition

Protocol adapted from the AusCover protocol for determining LAI. [[http://data.auscover.org.au/xwiki/bin/view/Field+Sites/Hemispheric Protocol](http://data.auscover.org.au/xwiki/bin/view/Field+Sites/Hemispheric+Protocol) Matt Paget 2013/04/30]

Photographs are taken along six 100 m transects (20 m spacing) at 20 m intervals in the core 1 ha. Images are acquired with the camera looking towards the sky at the nadir (0°) using a tripod mount and level.

Details of location, height and time are recorded.

Photographs are taken along six 100 m transects (20 m spacing) at 20 m intervals in the core 1 ha.

Photographs are taken at the intercepts along the five transects, totaling 36 positions (Figure 1).

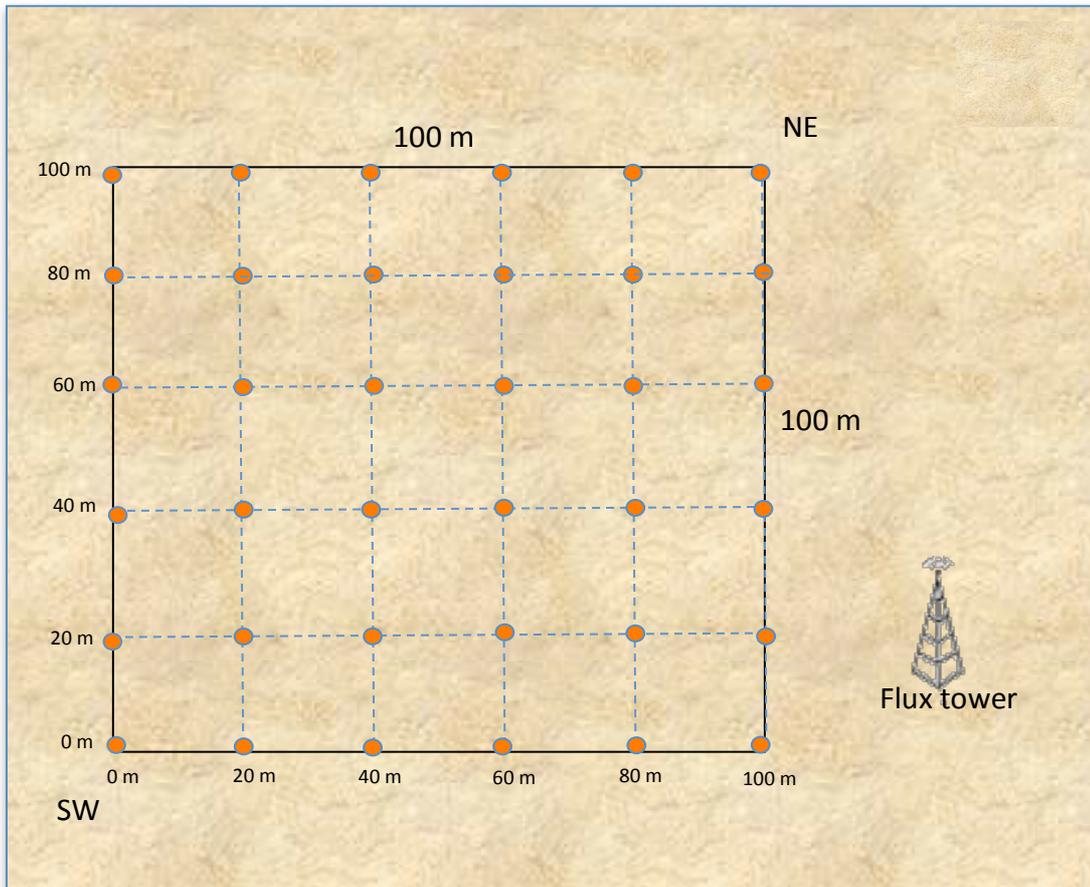


Figure 1: Positions for DHP photography within the core 1 ha vegetation plot.

IMPORTANT NOTE: Hemispherical canopy photographs are best collected in diffuse lighting conditions, when the sky is uniformly grey (e.g. around dawn and dusk when the sun is below the horizon, or on days with 100 % cloud cover). Images cannot be acquired when there is significant moisture in the air; condensation, mist/fog and rain affect light and therefore image quality.

The quality of DHP images for analysis purposes is compromised if taken at other times, particularly around solar noon.

1.3 DHP Camera Setup

Exposure - Exposure set at -1 (1 f-stop below automatic exposure).

Format - Set the camera to take the photos in **raw** format

Image Resolution - As high as possible.

Level camera - Ideally the camera should be within 10 degrees of horizontal.

Alignment - The camera is aligned so that magnetic north is aligned with the top of the photograph.

Camera height - Images should be taken at a standard reference height that is appropriate for the site. Typically this is at breast height (1.3 m above the height of the ground surface). However, if there is an understory at this height, it is good to have photos above the understory and below it (e.g. at 1.4 m - if 1.3m is the height of the understory, and 0.5 m). Also, if branches extend to the ground (like at jack pine sites), then it is good to take the photo from as close to the ground as possible to capture most of the leaf area.