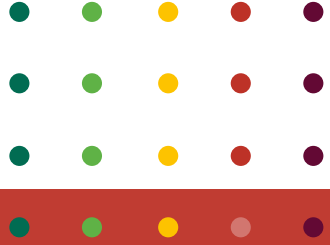




EXTENSION DOCUMENT
TECHNICAL GUIDELINES

HOW TO MEASURE VEGETATION COVER ON SLOPING LAND?





ABOUT THE PROJECT

The Project *“Agroforestry: potential for sustainable development in the uplands”* aims to contribute to sustainable development in sloping upland areas, with focus on evaluating agroforestry practices and systems addressing production and productivity, soil conservation, management practices such as nutrient application and weeding, and competitive effects between trees, crops and forage grass in young and mature agroforestry systems, study fruit value chains and market links, and assess opportunities and bottle-necks for wider agroforestry adoption and increasing of scale.

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VEGETATION COVER

Vegetation cover represents the percentage of soil covered by green vegetation, including grass, bushes, and trees. This cover is crucial for shielding the soil surface from raindrop splashing, enhancing soil organic matter, fortifying soil aggregate stability, increasing water-holding capacity, improving hydraulic conductivity, and reducing surface water runoff (Mohammad and Adam, 2010).



DETERMINING VEGETATION COVER



1. USING A DIGITAL CAMERA

Material:

L-shaped aluminum stick, metal cone and a digital camera.

Instructions:

In the field, vegetation cover is assessed by capturing photos from 3.5 meters above the ground using a digital camera mounted on an L-shaped aluminum stick (Fig. 1). The upright position of the stick during image capture is controlled by a rope connected to a metal cone at one end and fastened to the top of the L-shaped stick at the other end. The number of photos taken depends on the size of the field plot.

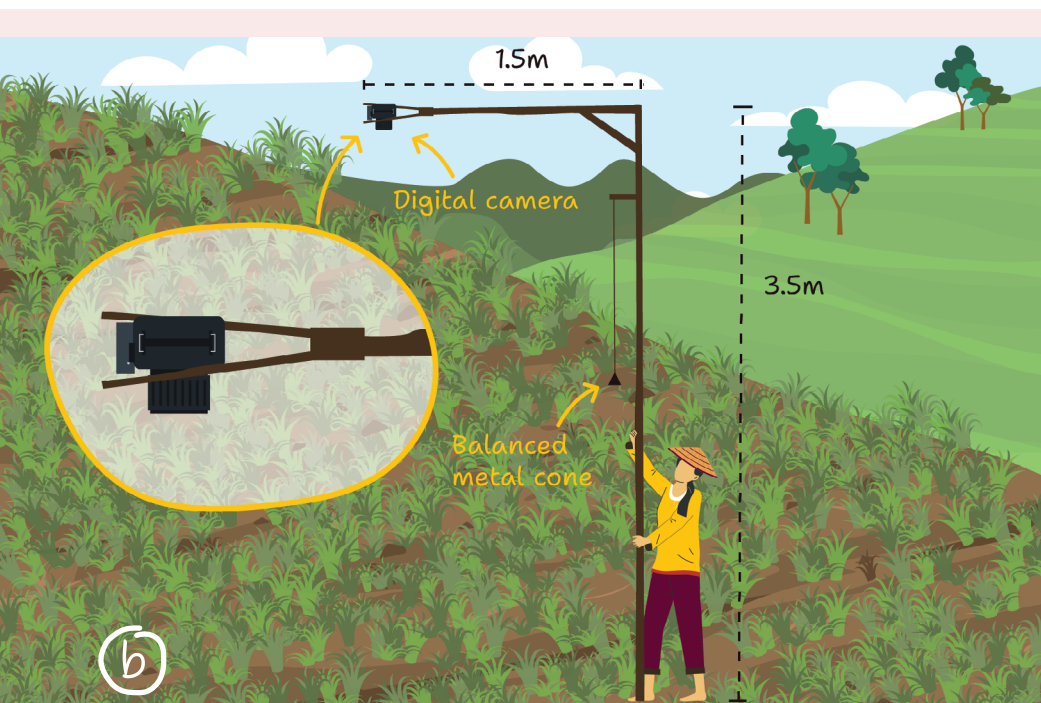


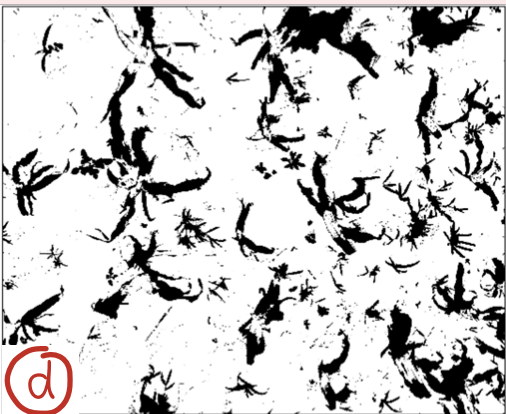
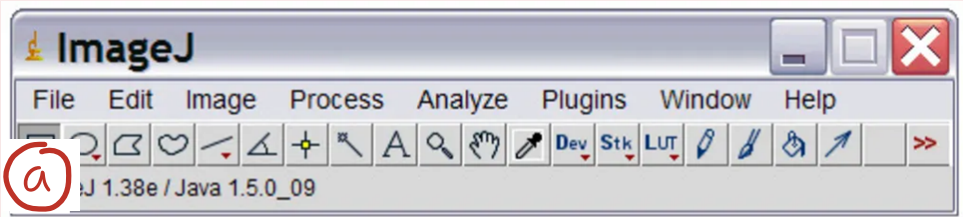
Figure 1. (a) Photo of vegetation in a plum-maize-forage grass agroforestry trial in Tram Tau district, Yen Bai province;
(b) L-shaped aluminum stick for mounting digital camera.

Vegetation cover can be calculated using the free image analysis software ImageJ version 1.52 (Xiong et al., 2019). The steps for using ImageJ to analyze digital images are as follows:.

1. Download and install ImageJ on the laptop, then open it.
2. Click File -> Open to import the raw photo captured in ImageJ.
3. Click Image -> Adjust -> Color Threshold -> Adjusting hue, saturation, and brightness threshold settings to split the image into two parts: green and non-green. These settings match the range of actual green colors of the target live leaves.
4. Click Analyze -> Analyze Particles -> Show -> Marks -> Display results + Summarize + Include holes -> OK.
5. The percentage area of green parts (vegetation cover) is determined from the analyzed results (Fig. 2).

Figure 2 (page 7). An example of a digital image analysis workflow from ImageJ software. (a) ImageJ software interface on the computer when opened; (b) Input of the image to be analyzed in the ImageJ software; (c) Setting image correction thresholds in ImageJ; (d) The green tissue of the plant in the selected photo is shown in black; (e) The green color of the vegetation is selected again with the “mask” function, then we will have the result of the vegetation coverage rate.

(Photos of an agroforestry trial combining plum-maize-forage grass in Tram Tau district, Yen Bai province)



Threshold Color

Hue

Saturation

Brightness

Thresholding method: Default

Threshold color: Red

Color space: HSB

Dark background

Original Filtered Select Sample
 Pick Macro Help

Result output

Tỷ lệ che phủ bởi thảm thực vật

Slice	Count	Total Area	Average Size	%Area	Mean
IMG_0109.JPG	4606	1581913	343.446	18.847	145.765

A red circle with the letter 'e' is placed in the bottom-left corner of the table area.

2. USING A MOTTLE CHART

Soil cover can be quickly assessed by local extension officers and farmers using a mottle chart, especially for large-scale fields or when equipment is scarce.

Material:

Quadrat frame made from simple field materials (usually 1m x 1m in size, Fig. 3 and 4a) and printed charts for estimating proportions (Fig. 4b)



Figure 3. Bamboo frame used to assess vegetation cover on the field

Instructions:

Place the quadrat frame on the ground and compare the vegetation cover proportion with the example charts.



Figure 4. (a) Quadrat frame for vegetation cover assessment; (b) Coverage rate reference charts (Source: FAO, 2006)

For example, in the figure above, the estimated soil cover can range between 30% and 40%.

REFERENCES

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- Xiong, Y., West, C.P., Brown, C.P., Green, P.E., 2019. Digital image analysis of old world bluestem cover to estimate canopy development. *Agron. J.* 111, 1247–1253. <https://doi.org/10.2134/agronj2018.08.0502>
- FAO. 2006. *Guidelines for Soil Description*. ISBN 92-5-105521-1

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