Once the DBH of all trees on farm have been captured correctly, the App user proceeds to calculate the respective canopy areas of each tree on the farm and finally the overall crown cover provided by all the trees by clicking on the "CALCULATE TOTAL CROWN COVER" button. The Canopy Area of the trees is displayed as a list and the total crown cover is displayed as a percentage as shown in fig. 4

Selecting the Canopy Area Calculator option allows a user to calculate the canopy area provided by a single tree based on its DBH.
For this functionality, the App user selects the tree type from a Drop Down option, enters the DBH of the tree and clicks on the "CALCULATE" Button.
The details of the Canopy Area is shown at the button of the same page as shown in fig. 5
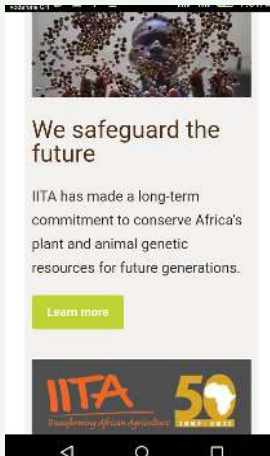
Selecting the last functional option labeled "IITA ALERTS/NEWS" routes the App user to the IITA website where information on articles and alerts are published to educate farmers and other stakeholders.

QUESTIONS?

Richard Asare
R.Asare@cgiar.org

Mustapha Dalaa
M.Dalaa@cgiar.org

CanOvaLator

The Canopy Cover Calculator for Cocoa Growing Systems

WHAT IS IT?

The inclusion of shade trees in cocoa growing systems has been acclaimed as one of the tangible adaptation strategies for cocoa cultivation in this era of extreme climatic conditions. However, one of the major problems of shade trees is the size of their canopy structure, which determines the amount of cover they provide to the cocoa tree underneath. Asare and Ræbild (2016) conducted a study to determine how tree characteristics affect canopy cover in cocoa plantations and identify a simple indicator for canopy cover for different tree species in cocoa systems in order to help determine appropriate canopy levels. The results suggest the canopy cover (CC) should reflect the effects of species, the diameter at breast height (DBH) and the crown area (CA). This study provided the basis for the development of a mobile app; the CanOvaLator (Canopy cover calculator for cocoa growing systems). This is an offline, user–friendly app that computes the amount of CC provided by the different tree species per unit area for cocoa farm.

MATERIALS AND METHODS

Asare and Ræbild (2016) recorded a total of 1042 shade trees on a total area of 127.7 ha. Majority (96 %) of the trees were as a result of natural regeneration, and comprised of 90 species from 30 families. The correlation between the DBH and canopy area of 28 predominant tree species across the cocoa regions in Ghana revealed that, the Crown Area (CA) of a tree species is dependent on the age of the tree; manifested in the DBH shown in equation [1]:

$$CA\ (m^2) = a + b(DBH) + \varepsilon \text{ --------------(1)}$$

where CA, a, b and DBH are the crown area, intercept, slope, and diameter at breast height respectively. ε is the residual, assumed to be independent and follows a normal distribution with expectation zero.

With the farm size and the DBH of all tree species on the farm, the app allows the user to input the DBH values of the respective tree spices which automatically computes the canopy cover (CC), as shown in equation [2]:

$$CC(\%\ ha^{-i}) = (TCA/Farm\ size)/10000 \text{ --------------(2)}$$

Where TCA is the sum of CA of all trees recorded per farm.

For each input made, the App connects to a native SQLite database hosted as part of the application to reference constants a, b and ε defined for the respective trees selected by the user. The referenced constants are mapped to the respective DBH values for the particular trees species on the farm and used to compute the CA and CC values from equations (1) and (2).

QUICK USER GUIDE

The following Screen shots and descriptions serve as a guide for users of the App:
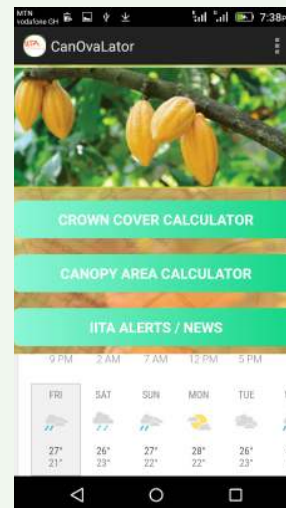

On launching the home screen, a user is introduced to this home screen (fig. 1) to select from amongst three available functional options of.
1. CROWN COVER CALCULATOR
2. CANOPY AREA CALCULATOR
3. IITA ALERTS & NEWS
As an extra, the App shows a weather forecast for the week as predicted by weather.com

On selecting the first option to calculate the crown cover: The App user first enters the farm size in hectares and goes on to select trees planted on the farm from the List of trees in a ListView as shown in fig.2
For each tree selected, a dialog is displayed for user to enter details of tree needed for computation of crown cover. Details of dialogue is discussed in the next step
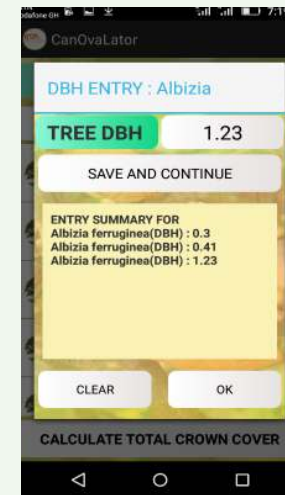
In the Pop-up dialogue (fig. 3) for a selected tree from fig. 2, the App user enters the DBH of the tree and clicks on "SAVE AND CONTINUE".
The user is able to enter other DBH values of the same kind of tree on this single dialogue if there are multiple trees of this type using the "SAVE AND CONTINUE" button.
Finally, the user clicks on "OK" and is returned to the screen as shown in fig. 2 where the user is able to repeat the process for other tree species.

NOTES

- *The App works offline (without internet) as its intended users are mostly in rural areas where internet connectivity is very poor or not available.*
- *The App was developed with the Java Programming Language and the graphical user interface designed with XML.*
- *Data is stored in an SQLite database as part of the application and other third–party integrations include pulling of weather feeds from weather today based on user's location.*