

Digital diagnostics platform for BBTv surveillance and diagnosis

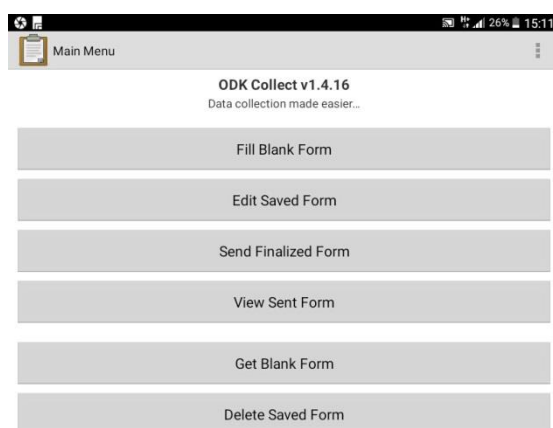
An Open Data Kit (ODK)TM-based diagnostics and surveillance system was established for the early diagnosis and surveillance of BBTv based on crowdsourcing as well as informed decision by the research and extension teams conducting surveys. The ODK digital data collection forms modeled on the existing BBTv survey template (Annex 1) and they were hosted on cloud server and linked to the BBTv alliance website (http://www.bbtvalliance.org/?page_id=238). The ODK forms can be used on Android-based mobile application and can be used both off-line and on-line. Data collected in off-line mode is automatically uploaded into cloud server when the device is connected to the internet. In addition to the survey form, CDS (Crop Disease Surveillance) enabled feature was also installed that uses a WebApp for rapid reporting and feedback from experts. Both features were piloted and partners are being trained in application of these features in Nigeria and Benin. Step-by-step functionality and usage is detailed below.

GUIDELINES FOR BBTv SURVEY ON OPEN DATA KIT (ODK)

USING ODK COLLECT

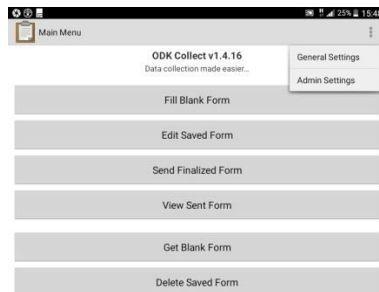
1. Install ODK collect

- a) On your android phone, go to google play and search for “ODK collect” or visit this link to download ;
<https://play.google.com/store/apps/details?id=org.odk.collect.android>
- b) After successfully installing the app, you will get a screen like this:

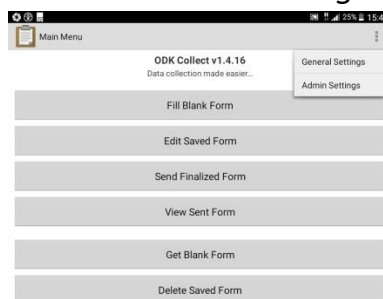


2. Configure ODK collect

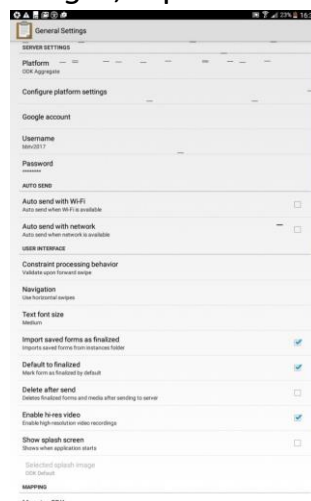
- a) From the main page of ODK collect, tap the **options** button as seen below (menu button is normally located at the top right corner of the app) See picture below.



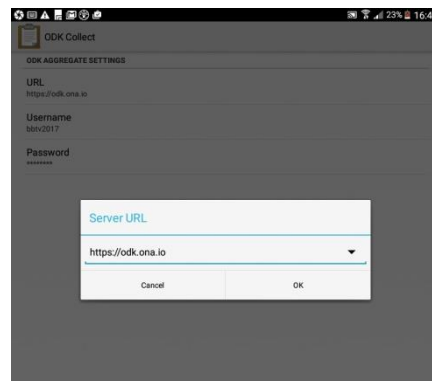
- b) Select *“General settings”*



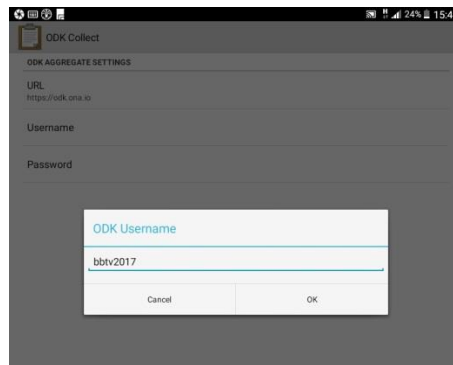
- c) Under *“Server Settings”*, tap on Configure platform settings.



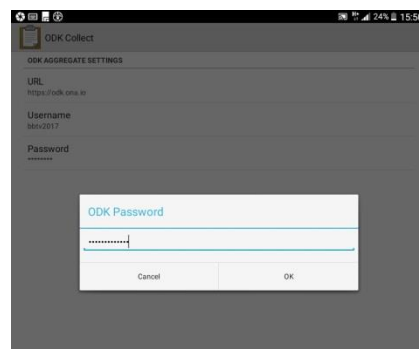
d) Enter <https://odk.ona.io> as the URL then tap OK;



e) Similarly, select Username and enter “**bbtv2017**”, tap OK



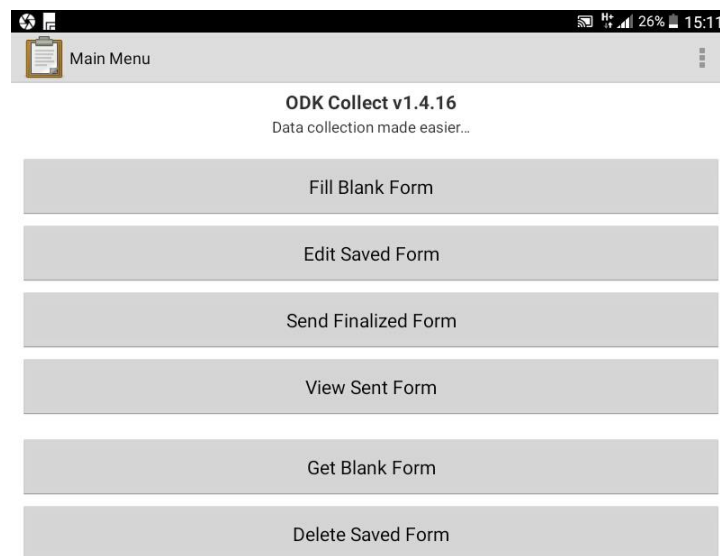
f) Then select password and enter “**Bunchytop2017**”, tap OK



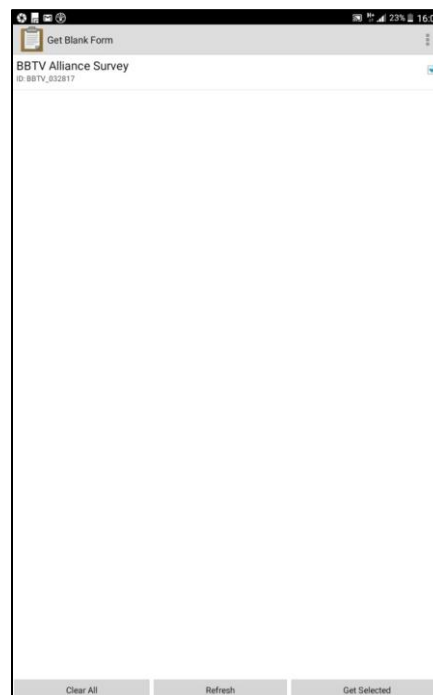
3. Download BBTV Survey form

Make sure you are connected to the internet before proceeding

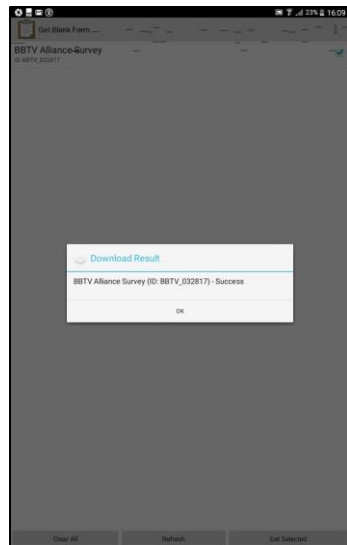
- a) Go back to the ODK collect main page and tap “*Get blank form*”



- b) Tap on the checkbox next to the BBTV Alliance Survey and then tap on “*get selected*” button to download the form to your device;

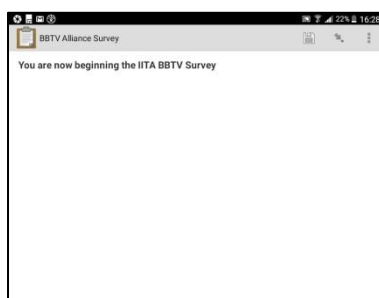
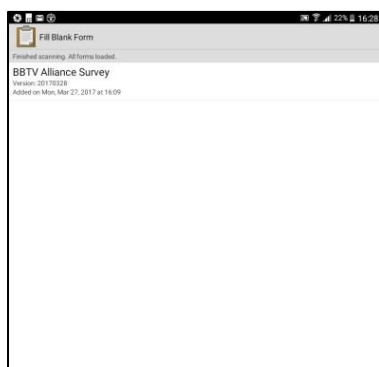


- c) The download result will pop up in a window. Click OK. You're ready to start collecting data!



4. Start filling out BBTV Survey form

Once you have downloaded forms to your device, you're ready to start collecting data. Tap on Fill Blank Form and select the form “**BBTV Alliance survey**”



Nigerian Agricultural Quarantine Officers testing the BBTV digital reporting tool



Annex 1.

[illegible]

16													
17													
18													
19													
20													

Other observations/comments:

Abbreviations for symptom description:

1. **ns** = no symptoms; **b** = bunching; **mcl** = dot-dash symptoms on leaves; **mcp** = dot-dash symptoms on petioles or pseudostem. Separate each symptom type with a ','. Severity scoring scales give below. 2 to 6 = '+' present; '-' = absent (CMV, BSV, BXW, Sigatoka, fusarium wilt)

I. Sample collection and estimation of disease incidence in a field:

a) Monitoring survey (disease present and at high incidence)

In each field, take observations from 20 plants/mats at random by walking across a 'W' shaped path, with 5 plants per side spaced at an equal distance from each other (Fig. 1). Record symptom type and severity score. Collect 4 samples for virus testing (detailed below), sampling the first symptomatic plant (if one is present) from the 5 that are observed in each traverse. If no symptomatic plants are present, sample the last of the 5 observed.

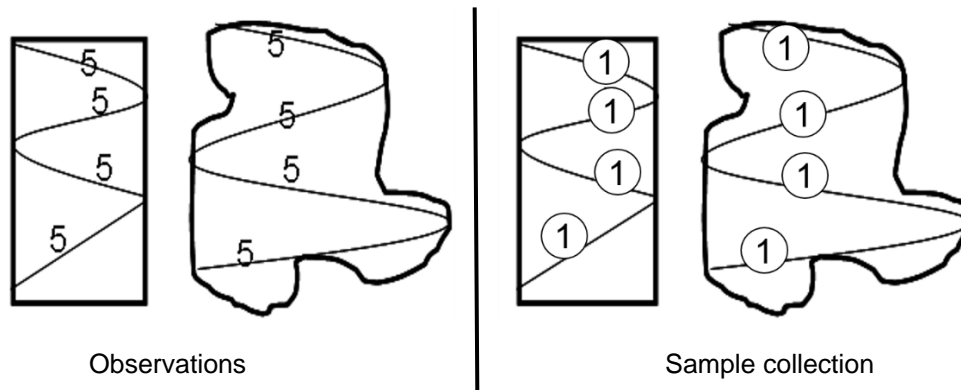


Fig. 1. Field layouts and monitoring survey and sample collection path.

b) Delimiting and surveillance surveys (disease not known to be present)

In each field, take observations from 100 plants/mats at random by walking across a 'W' shaped path, with 25 plants per side spaced at an equal distance from each other (Fig. 1). For these survey types, only record symptom type and severity score for symptomatic plants and plants sampled. Collect up to 5 suspected symptomatic samples for virus testing (detailed below), sampling the first 5 symptomatic plants observed. If no symptomatic plants are present, sample the last of the 25 observed on each traverse. If no symptoms are observed, note this in the "Other observations/comments:" section, and also the number of plants observed.

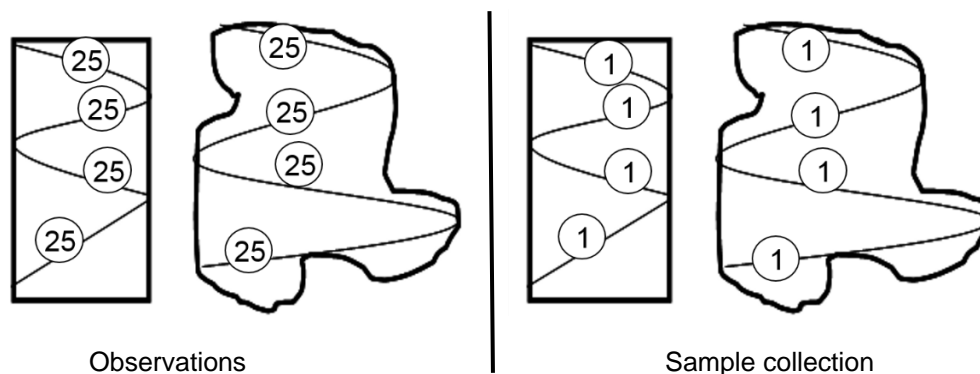


Fig. 2. Field layouts and delimiting and surveillance survey and sample collection path.

II. BBTv Symptom severity score and estimation of disease severity in a field:

Record symptoms on each plant or mat, counted for disease incidence using the following scale.

1 = No visible BBTv symptoms; plants apparently healthy; [plants with symptoms of CMV, BSV, fungal or BXW are scored as 1]

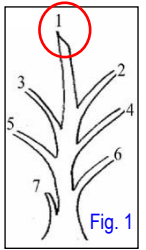
2 = Chlorosis on leaf margins; dot-dash streaks on petioles, leaves and pseudostems, upright leaves, but no apparent bunching.

3 = Typical bunching symptoms, with or without chlorosis on leaf margins, dot-dash streaks on leaf lamina, petiole and pseudostem.

- In case of a mat (multiple pseudostems), assign score of the most severely symptomatic pseudostem to the entire mat.
- Calculate means of plants with scores 2 and 3 to determine the average disease severity

III. Sampling for virus testing

- Collect sample from every plant observed for virus testing. In case of mat, select sample from the plant considered for severity score.
- Select mid rib of the youngest (Fig. 1) and gently squeeze it and collect sap (2 or 3 drops) directly on the FTA card. Avoid too much sap, otherwise it can spread and contaminate adjacent spots. Avoid finger and hand contact with pseudostem sap. Label FTA cards with pencil. Keep the FTA card flap open till the card is completely dry. Store dried FTA cards in cool and dry place at room temperature. Do not expose FTA card to direct sun or hot area. If available, store FTA cards at 4°C. For long term storage, place the FTA cards in plastic cover, tightly seal it and store at -20°C.
- Spotted area on FTA card turn light to dark brown due to oxidation of sap.
- Alternative to FTA: collect small leaf tissue and store on the vial packed with silica gel.



IV. Sampling for aphids

- Observe for aphids on emerging (unfurled) leaf sheath (**A**), base of leaf sheaths at the neck region (**M**) and between the sheaths of pseudostem at the base (**B**) (Fig. 2). Count the number of aphids and record in the data sheet. If possible, record the stages of aphids observed, nymphs (small brownish), wingless adults (black), and winged adults (black to brownish, with wings). Record numbers separately, and to distinguish stages, add suffix, n, a and w, to the integer. Note that in some genotypes aphids are mostly found in **B**, some at **A** and in some, mainly at all the three spots.
- Use camel hair art brush (size 1) to collect representative aphid sample from each field and preserve in 70% (v/v) ethanol in sterile water. With brush, gently tap bottom of the aphid. This will make aphid retract its stylet and free from the host. Forceful lifting can rupture mouthparts and might compromise morphological observations.

