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ESMAP
Energy Sector Management Assistance Program

Biomass Resource Mapping in Vietnam

TRAINING WORKSHOP REPORT

OCTOBER 2016

This report was prepared by Full Advantage, Simosol, Institute of Energy and Enerteam, under contract to The World Bank.

It is one of several outputs from the biomass resource mapping component of the activity "Renewable Energy Resource Mapping and Geospatial Planning – Vietnam" [Project ID: P145513]. This activity is funded and supported by the Energy Sector Management Assistance Program (ESMAP), a multi-donor trust fund administered by The World Bank, under a global initiative on Renewable Energy Resource Mapping. Further details on the initiative can be obtained from the ESMAP website.

This document is an **interim output** from the above-mentioned project. Users are strongly advised to exercise caution when utilizing the information and data contained, as this has not been subject to full peer review. The final, validated, peer reviewed output from this project will be the Vietnam Biomass Atlas, which will be published once the project is completed.

ESMAP
Energy Sector Management Assistance Program

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Report on Training Workshop

Field Survey and Data Collection in Vietnam

September 28 - 29, 2016
at Meeting Room 1, Building A1, Nong Lam University, Ho Chi Minh City

FULL ADVANTAGE · SIMOSOL · VTT · MHG systems · Wiltrain Oy · PITCO · IE · ET ENERTEAM

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Training Workshop Organizing Team

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Ms. Ngo To Nhien, Project Office – Renewable Energy Development Project (REDP)/MOIT
Dr. Lê Quốc Tuấn, Team Leader, Nong Lam University
Dr. Ngo The An, Team Leader, Vietnam National University of Agriculture

Team of Consultants during the Training Workshop

Dr. Ludovic Lacrosse, Team Leader/Biomass Expert (FA)
Dr. Jussi Rasinmäki, Remote Sensing/GIS Expert (Simosol Oy)
Dr. Tran Quang Cu, Training & Field Survey Monitoring Coordinator (FA)
Mr. Bienvenido Anatan, Project Coordinator (FA)
Mr. Qazi Sabir, Field Biomass Survey Expert (PITCO Pvt., Ltd.)
Mr. Nguyen Duc Cuong, Local Project Coordinator (IE)
Mr. Tiet Vinh Phuc, Local Project Coordinator (Enerteam)
Dr. Phan Hieu Hien, Local Biomass Expert (Enerteam)
Ms. Tran Thi Yen Phuong, Event and Field Survey Monitoring Coordinator (Enerteam)

Project Background

Fast economic growth and significant population expansion are causing a significant surge in Vietnam's demand for energy. In recent years, electricity demand per head is estimated to have increased by 17% annually, more than twice as fast as economic growth. In order meet the growing demand, renewable energy (RE) sources are included in the latest power development plan of the country. The Government of Vietnam (GoV) has developed a comprehensive policy framework for the development of RE in the country. In order to speed up the expansion of sustainable renewable power generation, the GoV has requested the support of the World Bank (WB) and ESMAP's Renewable Energy Resource Mapping Initiative to help improve the country's knowledge and awareness of biomass energy resources.

The biomass resource mapping (Phase 1-3) is one component of the ongoing RE resource mapping project in Vietnam. It was launched in June 2015. The objective of this biomass mapping component is to support the sustainable expansion of electricity generation from biomass. This is fulfilled by providing the national government and provincial authorities in Vietnam, and commercial developers, with an improved understanding of the location and potential of biomass resources. For this purpose, the World Bank has assigned a consulting Consortium, including Full Advantage Co., Ltd. (Thailand) as a lead consultant, Simosol Oy (Finland), VTT Technical Research Center of Finland, MHG Systems, Wiltrain Oy, PITCO Private Limited, Institute of Energy (local Consortium member) and Enerteam (local Consortium member) to develop a Biomass Atlas for Vietnam.

For the creation of biomass atlas, the technical potential in harvest residue biomass is estimated based on two main information sources: land use classification and ground data via field surveys. The Nong Lam University (NLU) in Ho Chi Minh and Vietnam National University of Agriculture (VNUA) in Hanoi were selected by MOIT to conduct the survey and collection of field data on crop biomass residues in Vietnam.

The survey will be performed as a person-to-person interview of the farmers by the survey team using 3G smartphones and Android applications designed and/or recommended by Simosol/MHG Systems as survey tools. They will be using a phone application that can record their responses, indicate the location of the interview and attach a geographically tagged photograph of a reference field of the farm to be used in land use classification of satellite images. All the data will be transferred to the Consortium in real time and will be further processed for atlas mapping.

Workshop Objectives

The main objective of this workshop was to provide hands-on training to the field enumerators for conducting surveys of industrial and crop biomass residues in Vietnam.

Workshop Agenda

DATE 1: 28 Sep 2016 (Wed)	
08:00 - 08:30	Arrival of participants and registration
08:30 - 08:50	Welcome remarks by Dr. Lê Quốc Tuấn, Nong Lam University
08:50 - 09:00	Self-introduction of Participants and Trainers
09:00 - 09:20	Progress updates and revised Work Schedule of the project *by Dr. Ludovic Lacrosse, Team Leader/Biomass Expert*
09:20 – 10:00	Industrial biomass survey: Objective, Scope and Methodology *by Mr. Qazi Sabir, Field Survey and Monitoring Expert*
10:00 - 10:20	Tea/Coffee Break
10:20 - 11:00	Industrial biomass survey: Survey Questionnaires *by Mr. Qazi Sabir, Field Survey and Monitoring Expert*
11:00 - 11:40	Crop biomass survey: Objectives and Methodology *by Dr. Jussi Rasinmäki, Remote Sensing/GIS Expert*
11:40 - 12:00	Discussion and Q&A
12:00 - 13:00	Lunch
13:00 – 13:30	Discussion of Consortium with MOIT and local consultants
13:30 - 14:00	Crop biomass survey: Setting up the smartphones by the participants *by Dr. Jussi Rasinmäki*
14:00 - 15:00	Crop biomass survey: Hands-on training on using the survey tools *by Dr. Jussi Rasinmäki*
15:00 - 15:20	Tea/Coffee Break
15:20 - 16:00	Crop biomass survey: Hands-on training on using the survey tools *by Dr. Jussi Rasinmäki*
16:00 - 16:30	Discussion and Q&A
16:30 – 16:40	Concluding remarks by GDE
DAY 2: 29 Sep 2016 (Thu)	
06:30	Leave HCMC for Tien Giang province
08:00	Arrival of the participants at the meeting point
08:00 – 09:00	Arrival at the survey site
09:00 – 10:30	Exercise on industrial biomass survey
10:30 – 12:30	Exercise on crop biomass survey
12:30 – 14:00	Lunch
14:00 – 15:30	Q & A and assessment session on the field survey exercise

Workshop Proceedings

The workshop program was divided into two sessions spread over two days. On the first day, a classroom training session was conducted by the Consortium for Nong Lam University (NLU) and the Vietnam National University of Agriculture (VNUA) participants. On the second day, a pre-testing field activity was organized to test the survey methodology. A question and answer session with an assessment of the exercise was conducted in the afternoon.

Day 1 (September 28, 2016)

The first day session was attended by 22 participants from NLU and 10 participants from VNUA who will be working as enumerators and trainers of enumerators. The following organizations and firms attended the workshop:

1. GDE-MOIT, Hanoi
2. Full Advantage, Thailand
3. Simosol, Finland
4. PITCO, Pakistan
5. Institute of Energy, Hanoi
6. Enerteam, Ho Chi Minh City
7. Vietnam National University of Agriculture, Hanoi
8. Nong Lam University, Ho Chi Minh City

The day started with a welcome remark followed by a technical session.

Welcome Remarks and Introduction of the Project

As the host of the training workshop, Dr. Lê Quốc Tuấn of Nong Lam University welcomed all participants of the training workshop.

Dr. Ludovic Lacrosse, as the Team Leader of the Consortium then requested all participants and organisers to introduce themselves.

Ms. Ngo To Nhien of MOIT introduced the project and emphasized the importance of the preparation of a biomass atlas for Vietnam and, therefore, of collecting accurate data on the biomass resources in Vietnam.

Dr. Lacrosse presented the progress updates and the revised work schedule of the project stating that it is presently delayed for about one year due to some difficulties in the hiring of local consultants to conduct the field survey. He emphasized that the MHG systems application is capable of sending data to Simosol Oy in real time for validation check and can be immediately corrected while the enumerator is at the vicinity of the survey site. The two-day training workshop is expected to provide the local consultant and the participating enumerators with the knowledge on how to conduct the field survey,

Technical Session

During the technical session, Mr. Qazi Sabir who is the Field Biomass Survey Expert from PITCO Pvt., Ltd. initiated the technical session by presenting the methodology of the Industrial Biomass Survey. He was the Project Coordinator of a similar Biomass Mapping project in Pakistan. Mr. Qazi suggested that that MOIT/GDE should provide the letter of introduction to the project and the local consultants so that they will be allowed to conduct interviews at the selected industrial sites. Based on Pakistan experience, the local consultants also get better results through follow-up calls rather than just contacting the industrial facilities through e-mail.

During the Question and Answer session, several issues were raised on the different industrial sites.

Landfill / Dumpsite - It was commented that the unit for biogas use was a percentage. Some of the industrial sites do not have measuring instruments to determine CH_4 content. Dr. Cu said that local consultant should prepare the initial list of landfills and unmanaged dumping sites should be excluded from the survey. Dr. Hien asked how to determine the moisture content. Mr. Qazi replied that companies managing the landfills normally have this information. Dr. Cu also suggested that industrial enumerators should distinguish organic waste from inorganic waste. Information should be given in range instead of exact figures. A note should be provided in the survey form if some of the requested information is not available.

Wood Processing Mills - With regards to the wood processing mills, the survey should cover the quantity of the wood residues and wood processed. In response to Dr. Tuan's question on processed wood, Dr. Cu said that the survey will cover the saw mills and furniture makers. Producers of pellets and briquettes will not be included since they consume biomass. Following a request for clarification from a participant, Dr. Lacrosse also explained the difference between slabs and edges. In the event exact quantities of residues are not available, enumerators are asked to calculate these quantities by using the difference between the quantity of the logs and the timber products. It was also explained that the unit of the quantity to be used should be m^3/yr, and not ton/year while the bulk density should be reported in kg/m^3.

Rice Mills – Dr. Cu suggested that the enumerators stick to the proposed methodology as presented by Mr. Qazi to get the best result. It was reiterated that emails may not be very effective.

Pulp and Paper Mills / Food Processing - Dr. Cuong commented that there are only two pulp and paper mills in Vietnam that consume biomass in form of residues generated from the pulping process. Dr. Hien and Mr. Phuc suggested that the survey should be replaced with food/feed processing. The local consultants agreed to the proposal.

No further comments were made on sugar mill and brickmaking industry.

On the **Crop Biomass** survey, Dr. Jussi Rasinmäki, Remote Sensing/GIS Expert (Simosol Oy) led the technical session and during the setting up of the smartphone was assisted by the other consultants of the consortium.

Enumerators indicated that they will use their own smartphone devices for the field surveys. Dr. Jussi Rasinmäki provided step-by-step instructions on setting up the phone, downloading the required Android applications as well as configuring them for correct field data collection.

After setting up all the smartphones, Dr. Jussi Rasinmäki also briefed the participants about the possible issues which can occur during data collection and how to tackle them. At the end, the entire methodology was repeated to ensure that all participants were on the same page. The participants were given some time to check the application around the venue.

During the Q&A session on the hands-on training, Dr. Cu said that all interviews should be performed at the location of the crop field. Also some technical issues raised about the smartphone application may require some adjustments by the application provider while some sections will be updated by Dr. Jussi.

During the afternoon session, MOIT, the Consortium and the local consultants (NLU and VNUA) discussed about the immediate needs of the local consultants. As recommended, MOIT will provide the local consultants with endorsement letters so that they will be allowed to conduct the industrial survey and enter into the selected industrial sites. The local consultants will submit monthly progress reports on the conduct of the survey. It was also agreed that the local consultants will provide the Consortium with the data on the industrial surveys using the excel file templates. The Consortium will then validate the data before sending them to MOIT. Ms. Nhien of MOIT reiterated that the local consultants' survey should be finished by June 2017 to meet their contract payment terms deadline. The Consortium also provided the local consultants with the tentative list of industries to be surveyed.

Day 2 (September 29, 2016)

A pre-testing activity was organized in Cai Lay town in Tien Giang province on the second day of training workshop. The Department of Natural Resources and Environment (DONRE) was contacted by NLU to coordinate with the management of two rice mills for the industrial survey and to contact five farmers within the vicinity of the town for the crop biomass survey.

All the participants from the two universities (NLU and VNUA) who attended Day 1 were present for the field survey.

Likewise, all the team members of the Consortium who attended Day 1 also supported the local consultants in the field survey. They are Dr. Jussi, Dr. Ludovic, Dr. Cu, Mr. Bien, Mr. Qazi, Dr. Cuong, Mr. Phuc, Dr. Hien and Ms. Phuong.

Mr. Phạm Trọng Thực. Director of New and Renewable Energy Department / GDE-MOIT and Ms. Nhien also joined the industrial survey.

Before the start of the field activity, Mr. Thực gave an inspirational message inside the Cai Lay Ward compound and emphasized the objective and the importance of this biomass mapping project for Vietnam.

During the industrial survey, two survey teams composed of the local consultants together with the Consortium were separately deployed to the two rice mills namely DNTN Xay xát Phước Vinh (Phuoc

Vinh Rice Milling Private Company) and of DNTN Năm Nga (Nam Nga Private Company). The local consultants conducted the industrial survey using the forms provided during Day 1. The two teams then converged near the farms to be surveyed for crop biomass.

During the crop biomass survey, the local consultants formed three survey teams while the Consortium members distributed themselves among the three teams. Two of the farmers interviewed were Trần Thị Linhand Lê Kí Bình of xóm 3, Kp2, P.3, Cai Lậy Tiền Giang. The local consultants were then asked to implement the survey methodology using their smartphones which they learned in Day 1 and to take note of the various difficulties they may encounter.

Following the pre-testing activity, the local consultants shared their survey experience with the Consortium. The de-briefing session was co-chaired by Dr. Jussi and Dr. Cu. Dr. Hien suggested that the local consultants conduct several pilot interviews before doing the main activity. It was decided that Dr Jussi would revise the survey forms and android phone applications based on the feedback of the participants. Thereafter, the local consultant will update their applications. Also, enumerators were required to complete the survey and save them at the survey site before moving to the next site. Dr. Cu recommended that the enumerators should follow the sequence in the application. It was decided that other questions by the enumerators would be consolidated by the Team Leaders of the two universities (NLU and VNUA) before sending them to the Consortium.

It was also decided that the survey forms for industrial biomass surveys shall be updated based on comments from GDE-MOIT, and translated into Vietnamese.

Annex I

Presentation by

Dr. Ludovic Lacrosse

PROGRESS UPDATES AND REVISED WORK SCHEDULE OF THE PROJECT

28-SEP-2016

Dr. Ludovic LACROSSE
Team Leader / Biomass Expert

CONDITIONS OF USE

This material has been developed for the purposes of the Training Workshop on Field Survey and Data Collection held on **September 28-29, 2016 in Ho Chi Minh city** as part of the ESMAP-funded World Bank project on Renewable Energy Resource Mapping and Geospatial Planning: Vietnam.

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Background Information

- **Project title:** Renewable Energy Resource Mapping: Biomass [Phases 1-3] – Vietnam
- **Funded by:** World Bank
- **Implementing agency:**
  - World Bank (Vietnam) in close collaboration with the General Directorate for Energy (GDE)/Ministry of Industry and Trade (MOIT)
    Project timeframe: 18 months (June 2015 – Dec 2016)
- **Consultants:**
  - Full Advantage Co., Ltd. (FA), Thailand (Lead)
  - SIMOSOL Oy and Partners, Finland
  - Institute of Energy (IE), Vietnam
  - Energy Conservation Research and Development Center (ENERTEAM)
- **Local Consultants conducting the Field Surveys:**
  - Vietnam National University of Agriculture (VNUA) in Hanoi
  - Nong Lam University (NLU) in Ho Chi Minh City

Project Objectives

- **The objective of this assignment is** to support the sustainable expansion of electricity generation from biomass by providing the national government and provincial authorities in Vietnam, and commercial developers, with an improved understanding of the location and potential of biomass resources

- **Specific objective:** to support renewable energy mapping and geospatial planning for biomass resources in Vietnam

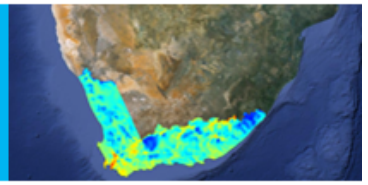
Three Phases of Biomass Resource Mapping

Training and capacity building

Geospatial planning and strategic environmental assessment

Phase 1

Interim resource assessment based on satellite analysis and global datasets

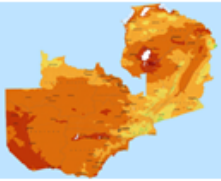


Phase 2

Data collection campaign to validate and improve interim resource assessment

Phase 3

Publication of validated resource atlas and accompanying datasets



Inform policy and regulations in support of renewable energy scale-up

Provide commercial developers with guidance and information

Progress of Phase 1

	Tasks/Activities	Progress
1.1	Project Inception (in Hanoi, HCMC and Can Tho)	Completed (Jun 15)
1.2	Identification and review of existing data sources	Completed (Jun 15)
1.3	Team Building (to identify and interact with local partners to to plan for data collection in Phase 2 of the project)	Completed (Jun 15)
1.4	Draft a TOR for local consultants to conduct the field survey and data collection	Completed (Jun 15)
1.5	Draft a time-bound Implementation Plan for Phase 2 of the project	Completed (Jul 15)
1.6	Phase 1 workshop and Finalization of Phase 1 outputs	Completed (Sep & Oct 15)

Revised Work Schedule of Phase 2

	Tasks/Activities	*Plan*
2.1	*Remote Data Collection and Analysis (Satellite images from Sentinel-1)*	*Ongoing*
2.2	*Training on Field Survey and Data Collection*	*28-29 Sep 16* ***(This event)***
2.3	*Conduct of field survey and data collection* ***by local consultants (VNUA and NLU)***	***Oct 16 to Jun 17***
2.4	*Conduct of GIS data acquisition of other driving components (e.g. road network, T&D network, water supply network, etc.)* ***coordinated by IE/ET***	*Oct 16 to Jun 17*
2.5	*Conduct of data analysis and production of draft Biomass Atlas*	*Jun - Sep 17*
2.6	*Conduct of a Stakeholder Validation Workshop*	*Oct 17*

Revised Work Schedule of Phase 3

	Tasks/Activities	*Plan*
3.1	*Conduct of final analysis of the data and the Biomass Atlas based on feedback from the participants of the Stakeholder Validation Workshop*	*Oct-Nov 17*
3.2	*Production of final data sets (in digital format) and final Biomass Atlas for Vietnam*	*Nov 17*
3.3	*Conduct of multi-stakeholder workshop(s) to disseminate the results of the study*	*Dec 17*
3.4	*Conduct of a two-day training for the selected local counterparts in maintaining and updating the Biomass Atlas*	*Dec 17*

Conclusions

- The project is delayed by 1 year due to a longer time needed for hiring the local consultants.
- In order to avoid any further delay in the project implementation, we strongly recommend that:
  - ✓ VNUA and NLU develop the detailed work plans for the survey activities and strictly follow them after being approved by GDE/MOIT.
  - ✓ The Consortium (FA/Simosol/IE/ET) provides the local consultants with a remote support (through email, skype calls, etc.) during the survey including data validation and verification.
  - ✓ The Consortium assists GDE/MOIT to review and comment on the reports (weekly, monthly, survey completion report & final report) which are submitted by the local consultants to GDE/MOIT.

Thank you!

Annex II

Presentation by

Mr. Qazi Sabir

INDUSTRIAL BIOMASS SURVEY: OBJECTIVE, SCOPE AND METHODOLOGY

Mr. Qazi Sabir

Field Survey and Monitoring Expert

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Industrial Survey – Objective

- The objective of this activity is to:
  - Assess the quantity and location of biomass residues generated from industrial processes. The geographical coordinates of the biomass generation sites are of utmost importance as datasets without coordinates cannot be used for mapping.
  - Assess the quantity of biomass being consumed for various purposes such as heat generation, power generation, cogeneration, biogas production, fertilizer production, etc.

Industrial Sectors to be Surveyed

- Industries that produce and consume biomass residues:
    1. Livestock Farms
    2. Municipal Solid Waste (MSW) sites
    3. Wood processing units
    4. Secondary crop residues
        - Rice milling
        - Sugarcane milling
- Industries that consume biomass residues:
    1. Brick-making factories
    2. Pulp and paper mills

Industrial Survey – Methodological Steps

Step 1	• Identification and preparation of initial list of industries
Step 2	• Submission of Survey Questionnaires to selected Industries
Step 3	• Compilation and Analysis/Validation of Surveyed Data
Step 4	• Selection of sites for On-Site Visits
Step 5	• Conducting On-Site Visit for Data Verification
Step 6	• Preparation of Final Report on Industrial Biomass Survey

Methodological Steps – Step 1

IDENTIFICATION AND PREPARATION OF INITIAL LIST OF INDUSTRIES

- The initial list of industries (in Excel format) will be based on

1. Reference lists of industries prepared by the Consortium, in consultation with relevant ministries (e.g. MARD, MONRE, MOIT) and provincial/city departments (e.g. DARD, DONRE, DOIT)
2. Consultation with relevant industrial associations (e.g., Vietnam Sugarcane & Sugar Association, Animal Husbandry Association of Vietnam, Vietnam Dairy Association, Vietnam Pulp & Paper Association, etc.)
3. Publicly available information (collected through internet search, personal contacts, etc.)

Methodological Steps – Step 1 (Contd.)

IDENTIFICATION AND PREPARATION OF INITIAL LIST OF INDUSTRIES

- The initial list of industries shall contain the following minimum information:

1. Name of the industrial establishment:
2. Detailed address (including geographical coordinates)
3. Size/capacity of the industrial establishment
    - Livestock: Farms that have at least 2000 pigs or 500 cattle.
    - MSW: MSW disposal sites (landfills) having more than 50 tonnes of MSW disposed per day
    - Wood Processing: Medium- and large-scale wood processing mills (>50 tonnes of input logs processed a day)
    - Sugar and Rice Mills: Medium and large-scale rice mills (>5 tonne/hour of paddy milled) and all sugarcane mills in Vietnam (around 40 mills)
4. Type of biomass used & specific biomass fuel consumption per unit of products (for biomass consumers)

Methodological Steps – Step 2

Submission of Survey Questionnaires to selected Industries

- Detailed survey questionnaires will be sent to selected industries based on the following criteria:

1. Different sizes (small, medium & large)
2. Geographically distributed all over the country
3. For livestock farms, different types of livestock (i.e., pig farms, cattle farm, etc.)
4. The industrial establishments in the initial lists which have incomplete information

Methodological Steps – Step 3

Compilation and Analysis/Validation of Surveyed Data

- The steps include:

1. Compilation of survey results into an Excel file
2. Conduct completeness check of data
3. Analyse data to ensure correctness through comparison standard/benchmark values (residue-to-biomass ratios etc.) and identify dubious/distrustful data and information
4. Validation of collected data/information with the industrial establishments through phone calls and following-up emails

Methodological Steps – Step 4

Selection of sites for On-Site Visits

1. Adoption of similar criteria as that chosen for selection of industries sending survey questionnaires
2. Preference to be given to those sites that provide incomplete/contradicting information.

Methodological Steps – Step 5

Conducting On-Site Visit for Data Verification

- Pre-Visit Preparation:
  - Print out the questionnaire & highlight the missing/contradicting information that need to be verified, etc.
- How to carry out the site visit:
  - Things to look out for during site visit such as using smartphone of the surveyor to record the coordinates of the site, observing the technology/equipment, etc.

Methodological Steps – Step 6

Preparation of Final Report on Industrial Biomass Survey

- Typical contents of the industrial survey report include:
  - INTRODUCTION
  - SURVEY METHODOLOGY
  - INDUSTRIAL SURVEY ACTIVITIES CONDUCTED
  - INDUSTRIAL SURVEY DATA ANALYSIS
  - LESSONS LEARNED
  - SURVEY ACTIVITY DETAILS
    - Initial List of Industries
    - Validated Data Questionnaires
    - Visits Summary
    - List of Follow-up Calls / Emails to Industry

Local consultants hired by GDE/MOIT for the survey

2 local consultants contracted by GDE/MOIT for conducting the field survey and data collection, including industrial biomass survey:

- Vietnam National University of Agriculture (VNUA) is responsible for the survey in 31 provinces/cities in the North of Vietnam
- Nong Lam University (NLU) is responsible for the survey in the remaining 32 provinces/cities in the Central and South of Vietnam.

Scope of industrial biomass survey for VNUA

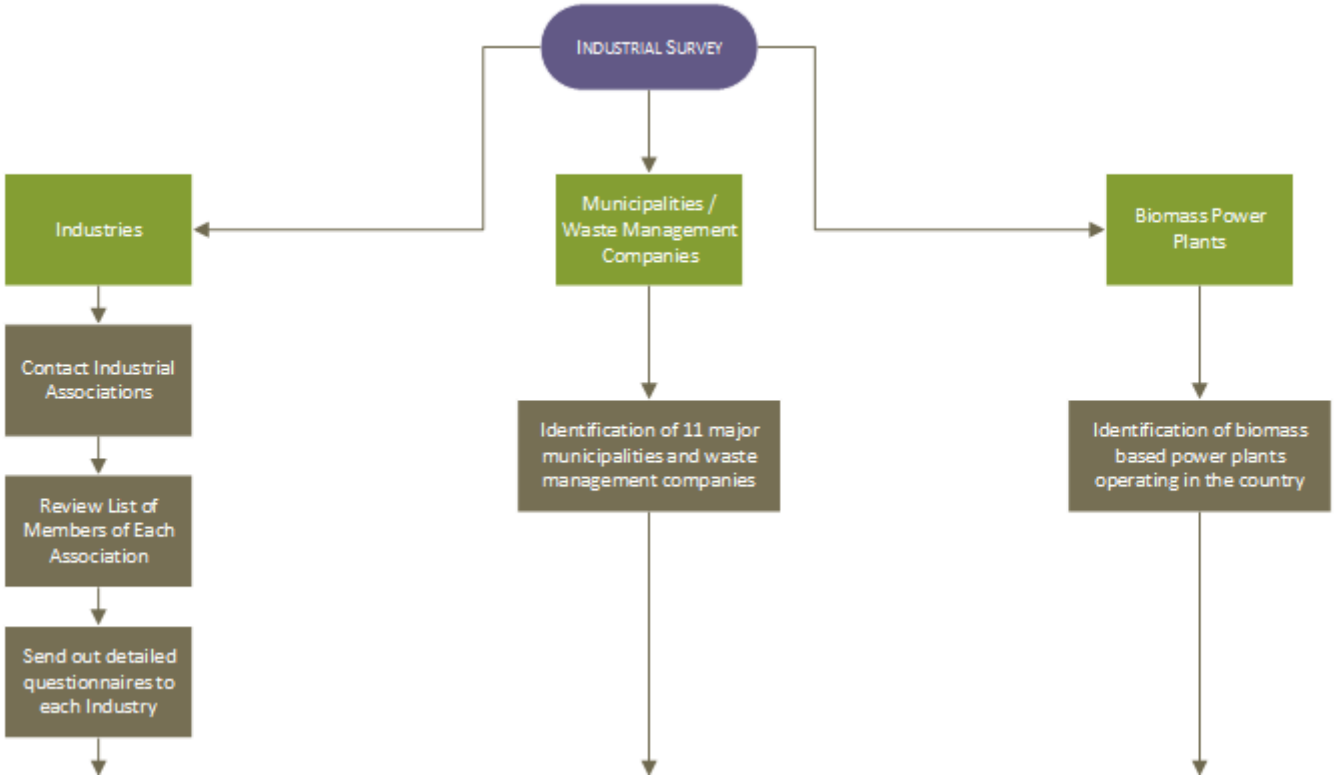
No.	Industrial sector	Minimum number of sites to be included in sectoral lists	Minimum number of sites to be sent the questionnaire	Minimum number of sites to visit
1.	Livestock farms	60	30	10
2.	MSW landfills	30	20	10
3.	Wood processing mills	60	30	10
4.	Rice mills	50	30	10
5,	Sugar mills	11	11	10
6.	Brick-making factories	40	20	10
7.	Pulp and paper mills	50	30	10
	Total	**301**	**171**	**70**

Scope of industrial biomass survey for NLA

No.	Industrial sector	Minimum number of sites to be included in sectoral lists	Minimum number of sites to be sent the questionnaire	Minimum number of sites to visit
1.	Livestock farms	80	40	20
2.	MSW landfills	40	30	15
3.	Wood processing mills	40	20	5
4.	Rice mills	150	70	30
5,	Sugar mills	29	29	15
6.	Brick-making factories	60	30	10
7.	Pulp and paper mills	30	15	5
	Total	**429**	**234**	**100**

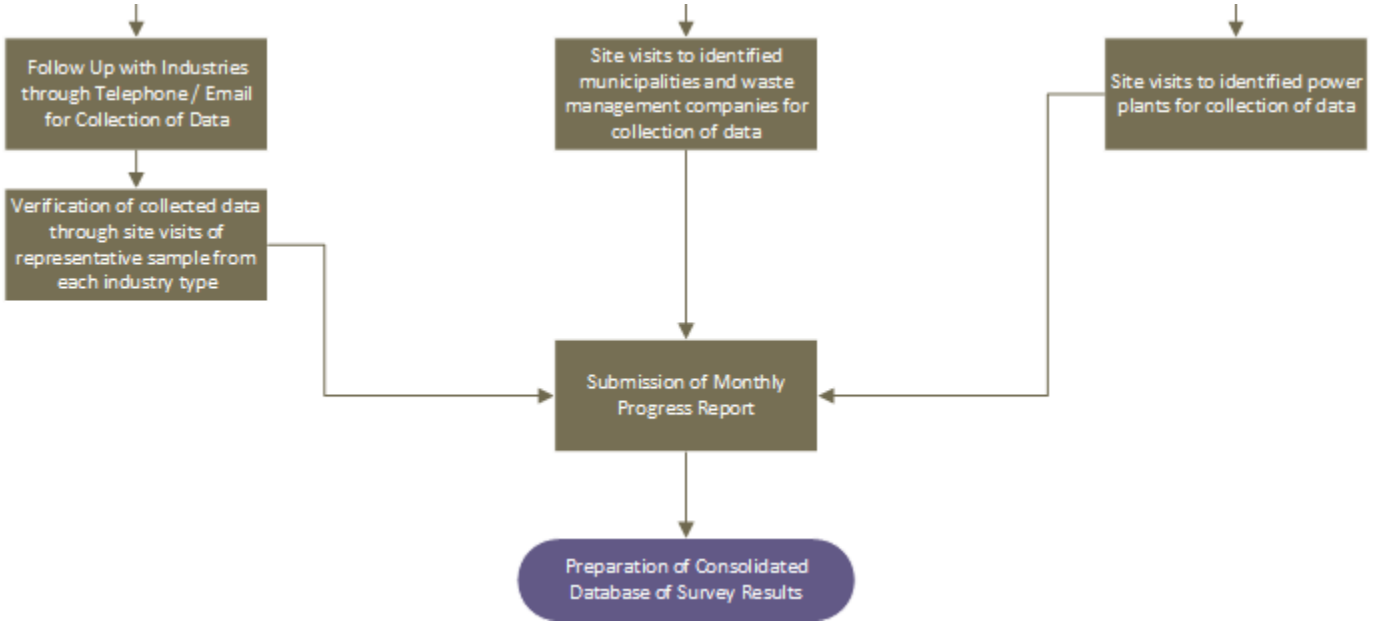
EXPERIENCE FROM PAKISTAN

Industrial Survey Flowchart*



*** Industrial Survey conducted under World Bank "Renewable Energy Resource Mapping in Pakistan – Biomass" by PITCO**

Industrial Survey Flowchart (Cont.)



INDUSTRIAL SURVEY

Overall Statistics

Sr.#	Sector	Contacted Units	Visited Units
1	Textile	209	8
2	Rice	176	34
3	Cement	27	1
4	MSW	11	10
5	Power Plants	16	10
6	Sugar Sector	84	9
7	Dairy	19	2
8	Food Processing	4	3
9	Paper and Pulp	26	2
10	Wood Processing	3	2
11	Associations/Organizations	12	10
	Total	**587**	**91**

INDUSTRIAL SURVEY

Overall Statistics

Sector	Total Data Collected	Email	Follow-up calls	Site Visits	Publicly Available Information
Textile	**21**	1	9	8	3
Rice	**66**	1	31	34	
Cement	**6**	3	0	1	2
MSW	**11**	0	1	10	
Power Plants	**12**			10	2
Sugar Sector	**35**		26	9	
Dairy	**5**	2	1	2	
Food Processing	**3**			3	
Paper and Pulp	**4**	1		2	1
Wood Processing	**3**		1	2	
Associations	**12**		2	10	
Total	**178**	**8**	**71**	**91**	**8**

Lessons Learned

1. Industrial Associations in Pakistan are purely administrative bodies dealing mainly with policy level issues. With the exception of few, none of these has statistical/operational data of its member Industries.
2. Members lists provided by each Industrial Association (except PSMA) do not represent total number of industries for the respective sector.
3. Industrial Associations lack the requisite capacity to gather data from its members. Hence, no help was offered to PITCO in this respect.

Lessons Learned

4. Of all the Industries contacted, only few (less than 3%) responded to the e-mails containing data collection requests
5. Most of the data were collected through personal connections within the industrial sector as well as follow-up phone calls
6. Despite the fact that the project benefits were clearly communicated to each industrial sector, most of the industries are reluctant to share biomass generation/consumption data
7. Site visits for data collection/data verification visits had a 99% success ratio

Thank you!

Annex II

Presentation by

Mr. Qazi Sabir

(SURVEY FORMS IN ENGLISH)

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Paper and Pulp Mills

Surveyor Name:		Survey Date:

Contact Details:

Name of Paper and Pulp Mills			
Address			
GPS Coordinates:	Latitude	Longitude	
Name of Contact Person			
Mobile Number		Email:	

Biomass Residues Consumption Details:

Sr. No.	Type of Biomass Residues	Total tonnes of residues/raw biomass processed per year (t/yr)	Source of biomass supply (i.e., biomass traders, rice mills, sugar mills, etc.)	Quantity of biomass consumed as a feedstock (raw material) for paper production (t/yr)	Quantity of biomass consumed for process steam and/or electricity production (t/yr)	Moisture Content of Biomass (%)	Net Calorific Value of the Biomass (kCal/kg)	Purchasing Price (VND/t; VND/units)
1								
2								
3								
4								
5								

Total Paper/Pulp produced	

Biomass-Based Power/Cogeneration Plant (if applicable)

Electricity load of Pulp and Paper Mill				
Steam consumption of Pulp and Paper Mill		kg/t of paper or pulp produced	Steam pressure (bar)/ temperature (^oC)	
Type of Boiler (Fixed grate, Travelling grate, Vibrating grate, Bubling fluidized bed (BFB), Circulating fluidized bed (CFB))				
Number of boilers installed		units	Rated steam capacity of the boilers	
Pressures of the boilers				
Technology of steam turbines	☐ Back Pressure		☐ Extraction Condensation	
Installed power capacity of turbo-generators				
Operational time of Cogeneration plant				
Grid connection	☐ Electricity Export Connection		☐ Electricity Import Connectio	
Capacity of electricity export connection				
Average electricity export				
Total biomass fuel consumed by the cogeneration plant				
Additional biomass purchased				
Types of additional biomass purchased (i.e., bagasse from sugarmills, sugarcane trash (tops & leaves), rice straw, rice husk, etc.)				
Prices of purchase of additional biomass fuels (for each type of biomass)				
Any future plan for high pressure power / cogeneration technology (If high pressure system is not in place)	☐Yes			

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Wood Processing Mills			
Surveyor Name:		**Survey Date:**	

Contact Details:			
Name of Wood Processing Mills			
Address			
GPS Coordinates:	**Latitude**	**Longitude**	
Name of Contact Person			
Mobile Number		**Email:**	

Forest Management:	
Type and source of wood (natural forest or managed forest)	
Does the processing mill own the forest area? (Yes/No)	
Total Forest Area (ha)	
Trees turnover time (years)	
Total amount of wood harvested per year (t/yr or m^3/yr)	

Wood Residue Production at the Mill:				
Processing Capacity of the Wood Processing Mills (t/day or m3/day)	**Average of Wood Logs processed in the last three years (t/yr or m3/yr)**	**Mills Average Operating Hours per year (hrs/yr)**	**Actual Wood Logs Processed (t/yr or m3/yr)**	**Production of Wood Residue (t/yr or m3/yr)**
Sawdust (t/yr or m3/yr	**Edges (t/yr or m3/yr)**		**Slabs (t/yr or m3/yr)**	**Other, if any. (t/yr or m3/yr)**

Wood Residue Consumption and Sales					
Type of Wood Reisdue	**In-house consumption (t/yr or m3/yr)**	**Quantity of wood residue sold (t/yr or m3/yr)**	**Selling Price (VND/t or VND/m3)**	**Net Calorific Value of Wood Residue kCal/kg**	**Use of sold residues (e.g. pellet or briquettes production; energy production; charcoal production).**

Wood Residue-Based Power Generation/Cogeneration		
Electricity load of the Wood Processing Mill		MW

Steam consumption of Wood Processing Mill (for timber drying)		kg/t or kg/m3 of sawn timber	**Steam pressure (bar)/ temperature (^oC)**		
Type of Boiler (Fixed grate, Travelling grate, Vibrating grate, Bubling fluidized bed (BFB), Circulating fluidized bed (CFB))					
Number of boilers installed		units	**Rated steam capacity of the boilers**		TPH
Pressures of the boilers					bars
Technology of steam turbines	☐ Back Pressure		☐ Extraction Condensation		
Installed power capacity of turbo-generators					MW
Operational time of power / cogeneration plant					Day/Year
Grid connection	☐ Electricity Export Connection		☐ Electricity Import Connection		
Capacity of electricity export connection					MW
Average electricity export					MWh/yr
Total biomass fuel consumed by the power / cogeneration plant					t/yr
Additional biomass purchased, if any					t/yr
Types of additional biomass purchased (i.e., bagasse from sugarmills, sugarcane trash (tops & leaves), rice straw, rice husk, etc.)					
Prices of purchase of additional biomass fuels (for each type of biomass)					VND/tonne
Any future plan for high pressure power / cogeneration technology (If high pressure system is not in place)			☐ Yes ☐ No		

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Brick-Making Factories				
Surveyor Name:			**Survey Date:**	

Contact Details:			
Name of brick-making factory			
Address of the factory			
GPS coordinates:	**Latitude**	**Longitude**	
Name of contact person			
Mobile number		**Email:**	

Size of Brick Making Factory i.e. Total number of bricks produced a year		**units/year**
Average annual operational hours of the plant		**hours/year**
Processing Capacity of Plant		**t/day**
Amount of energy consumed for processing 1 ton of biomass		

Biomass Consumption Details:

Sr. No.	Type of biomass residue	Total tonnes of residues/raw biomass processed per year (t/yr)	Source of biomass supply (i.e., biomass traders, rice mills, sugar mills, etc.)	Amount of biomass consumed for producing 1000 bricks (kg)	Moisture content of purchased biomass (%)	Net Calorific Value of the biomass (kCal/kg)	Biomass storage period at the factory (Months From - To)	Buying price (VND/t)
1								
2								
3								
4								
5								

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Rice Processing Mills

Surveyor Name:		**Survey Date:**	

Contact Details:			
Name of rice processing mill			
Address of the mill			
GPS coordinates:	**Latitude**	**Longitude**	
Name of contact person			
Mobile number		**Email:**	

Rice Husk Production at the Rice Mill:					
Number of rubber-roll husker	Capacity, kg/hr (Paddy)	Total, ton/hr	Number of disk husher	Capacity, kg/hr (Paddy)	Total, ton/hr
2	2000	4	6	1200	7.2
Est. Rice husk capacity, ton/hr		11.2			
Design capacity of the rice mill (t/day of paddy processed)	**Rice milling season (From/To)**	**Average amount of paddy processed in the last three years (t/yr)**	**Average operating hours of rice mill per year (hrs/yr)**	**Production of rice husk (t/yr)**	**Moisture content of rice husk (%)**

Current Utilization of Rice Husk:				
In-house use of rice husk (t/yr)	**Purposes of in-house use of rice husk (e.g. paddy drying, pellete production), etc**	**Amount of rice husk sold (t/yr)**	**Who are the buyers of the rice husk (i.e., biomass traders, brick factories, cement factory, power plant, etc.)**	**Selling price of rice husk at rice mill (VND/tonne)**
300	- Paddy drying			
1000	- Briquette/Pellet making			
100	- Other (specify)			
50	- Other			
1450	= TOTAL in-house use			
Briquette/Pellet making		Qty sold, Tonne /yr	Who are the buyer	Selling price, VND/ t

Existing Rice Husk-Based Power/Cogeneration Plant				
Electricity consumption of the rice mill				kWh/tonne of paddy processed
Monthly electricity consumption, kWh	**Average**	**Minimum**	**Maximum**	
(If possible)				
Steam consumption of the rice mill (if applicable)		kg/t of paddy processed	**Steam pressure (bar)/ temperature (°C)**	
Type of Boiler (Fixed grate, Travelling grate, Vibrating grate, Bubling fluidized bed (BFB), Circulating fluidized bed (CFB))				
Number of boilers installed	units	**Rated steam capacity of the boilers**		TPH
Pressures of the boilers				bars
Technology of steam turbines	☐ Back Pressure	☐ Extraction Condensation		
Installed power capacity of turbo-generators				MW
Operational time of power/cogeneration plant				Day/Year
Grid connection	☐ Electricity Export Connection	☐ Electricity Import Connection		
Capacity of electricity export connection				MW
Average electricity export				MWh/yr
Rice husk consumed by the power/cogeneration plant				t/yr
Additional biomass purchased, if applicable				t/yr
Types of additional biomass purchased (i.e., rice husk from other rice mills, rice straw, etc.)				
Prices of purchase of additional biomass fuels (for each type of biomass)				VND/tonne
Any future plan for high pressure power / cogeneration technology (If high pressure system is not in place)			☐ **Yes**	☐ **No**

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Sugar Mills

Surveyor Name:		**Survey Date:**	

Contact Details:			
Name of sugar mill			
Address of the mill			
GPS coordinates:	**Latitude**	**Longitude**	
Name of contact person			
Mobile number		**Email:**	

Bagasse Production at the Sugar Mill:					
Design Crushing capacity of the sugar mill (TCD)	**Sugarcane milling season (From/To)**	**Average amount of sugarcane processed in the last three years (t/yr)**	**Average operating hours of sugar mill per year (hrs/yr)**	**Production of bagasse (t/yr)**	**Moisture content of bagasse (%)**

Current Utilization of Bagasse:					
In-house use of bagasse (t/yr)		**Purposes of in-house use of bagasse**	**Amount of bagasse sold (t/yr)**	**Who are the buyers of the bagasse (i.e., power plant, paper & pulp mill, etc.)**	**Selling price of bagasse at Sugarmill (VND/tonne)**
example	15000	= Cogenration			
	3500	= Other use (Specify)			
	1200	= Other use			

Existing Bagasse-Based Cogeneration Plant				
Electricity consumption of the sugar mill				kWh/tonne of sugarcane processed
Steam consumption of the sugar mill		kg/t of sugarcane milled	**Steam pressure (bar)/ temperature (°C)**	
Type of Boiler (Fixed grate, Travelling grate, Vibrating grate, Bubling fluidized bed (BFB), Circulating fluidized bed (CFB))				
Number of boilers installed	units	**Rated steam capacity of the boilers**		TPH
Pressures of the boilers				bars
Technology of steam turbines	☐ Back Pressure	☐ Extraction Condensation		
Installed power capacity of turbo-generators				MW
Operational time of cogeneration plant				Day/Year
Grid connection	☐ Electricity Export Connection	☐ Electricity Import Connection		
Capacity of electricity export connection	**Impossible to specify! No power plant just for export; the export is from surplus electricity**			MW
Average electricity export				MWh/yr
Total biomass fuel consumed by the cogeneration plant				t/yr
Additional biomass purchased, if applicable				t/yr
Types of additional biomass purchased (i.e., bagasse from other sugarmills, sugarcane trash (tops & leaves), rice straw, rice husk, etc.)				
Prices of purchase of additional biomass fuels (for each type of biomass)				VND/tonne
Any future plan for high pressure power / cogeneration technology (If high pressure system is not in place)			☐ **Yes**	☐ **No**

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for Livestock Farms

Surveyor Name:		**Survey Date:**	

Contact Details:		
Name of livestock farm		
Address of the farm		
GPS coordinates	**Latitude**	**Longitude**
Name of contact person		
Mobile number		**Email:**

Manure collection and use

Type of animals	Number of animals	In-farm feeding (day/yr)	Feeding in pastures (day/yr)	Quantity of manure collected (t/day)	Current in-house utilization of manure (t/day)	Quantity of manure sold (t/day)	Price of manure sold (VND/t)
Cows							
Buffaloes							
Pigs							
Poultry (Specify:……..)							

Manure sold to (Please specify the purpose of manure usage by the buyer):

Current in-house utilization of manure:	☐ Fuel for cooking
	☐ Fertilizer production
	☐ Biogas production
	☐ Other:_____

Details of biogas production and/or biogas-based power plant (If applicable):

Amount of manure used for biogas production					tonne/day
Biogas produced		m3/day	CH4 content:		%
Current use of biogas	☐ Fuel for cooking				%
	☐ For heat generation (furnace, boiler, kiln, etc.)				%
	☐ For power generation				%
	☐ For heat and power generation (cogeneration)				%
	☐ Flaring				%
If biogas is being used for power generation, please provide the following information:					
Biogas power plant technology (i.e., biogas engine, steam turbine, etc.)					
Installed power capacity of the power plant					MW
Average operational time for the power plant					hour/day
					day/yr
Any plan for installing biogas-based power plant in the future	☐ Yes	☐ No			

Further Comment of Surveyor:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Survey Form for MSW Dumping Sites/Landfills			
Surveyor Name:		**Survey Date:**	

Contact Details:			
Name of Waste Management Company			
Head Office Address			
Name of Contact Person			
Contact Number:		**Email:**	

MSW Details:		
Average quantity of MSW collected		t/day
Waste characteristics		organic/inorganic fraction of waste
Moisture Content		%

Landfill Details:

No.	Name of Dumping Site/ Landfill	GPS Coordinates of the Dumping Site/Landfill (North, East)	Area of Dumping Site/ Landfill (ha)	Type of Landfill (Managed/ Unmanaged)	Quantity of MSW dumped (t/day)	Quantity of MSW utilized at the site (t/day)	Quantity of MSW sold (t/day)	Price of MSW sold (VND/tonne)
1								
2								
3								
4								
5								

Current MSW Utilization at the landfill:

No.	Composting/ Fertilizer production (Yes/No?)	RDF production (Yes/No?)	Biogas production (Yes/No)	Power generation (Yes/No)	Others (please specify)	Technology used (Biogas engine/ Steam turbine / MSW gasifier) for power generation?	Installed power capacity of the power plant (MW)	Off-grid or grid-connected?
1								
2								
3								
4								
5								

Future Plan of the Landfill

No.	Is the landfill expanded in the future (Yes/No?)	Is the landfill closed in the future (Yes/No?)	When is the plan implemented (Year)	Quantity of MSW collected in the future (t/day)	Quantity of MSW utilized (t/day)	Quantity of MSW sold (t/day)	Purposes of MSW utilization in the future (i.e., biogas production, power generation, composting, etc.)?
1							
2							
3							
4							
5							

Further Comment of Surveyor:

Annex II

Presentation by

Mr. Qazi Sabir

(SURVEY FORMS IN VIETNAMESE)

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Bảng Khảo sát Các Trang trại Chăn nuôi		
Tên người khảo sát:	**Ngày khảo sát:**	

Thông tin liên hệ:			
Tên trang trại chăn nuôi			
Địa chỉ			
Toạ độ GPS:	**Vĩ độ**	**Kinh độ**	
Tên người liên hệ			
Điện thoại di động:		**Email:**	

Thu gom và sử dụng chất thải chăn nuôi (phân)							
Loại gia súc/gia cầm	**Số lượng**	**Nguồn thức ăn trong trang trại (ngày/ năm)**	**Thả đồng (ngày/ năm)**	**Lượng phân thu được (tấn/ngày)**	**Hiện trạng sử dụng phân (tấn/ ngày)**	**Lượng phân bán được (tấn/ngày)**	**Giá phân bán (VND/tấn)**
Bò							
Trâu							
Lợn (Heo)							
Gia cầm (Cụ thể:……..)							

Phân bán để (Vui lòng nêu rõ mục đích sử dụng phân của người mua):

Hiện trạng sử dụng phân tại chỗ	☐ Nhiên liệu
	☐ Sản xuất phân bón
	☐ Sản xuất Biogas
	☐ Khác:_____

Thông tin để sản xuất biogas và/hoặc nhà máy phát điện dựa vào biogas (Nếu có):					
Lượng phân dùng để sản xuất biogas					tấn/ ngày
Lượng Biogas sản xuất được		m3/ngày	Nồng độ CH4:		%
Hiện trạng sử dụng biogas	☐ Nhiên liệu				%
	☐ Cung cấp nhiệt (lò nung, lò hơi, lò luyện, v.v.)				%
	☐ Cung cấp điện				%
	☐ Cung cấp nhiệt và điện (đồng phát)				%
	☐ Flaring				%
Nếu đang sử dụng biogas để phát điện, vui lòng cung cấp các thông tin sau:					
Công nghệ phát điện từ biogas (chẳng hạn động cơ biogas, tuabin hơi nước, v.v.)					
Công suất lắp đặt của nhà máy điện					kW
Thời gian vận hành trung bình của nhà máy điện					giờ/ ngày
					ngày/ năm
Nhà máy có kế hoạch xây dựng nhà máy phát điện biogas trong tương lai:	☐ Có	☐ Không			

Ý kiến bổ sung của người khảo sát:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Bảng Khảo sát về các Bãi rác lộ thiên/ Bãi rác chôn lấp

Tên người khảo sát:	Ngày khảo sát:	

Thông tin liên hệ:			
Tên Công ty Quản lý Chất thải			
Địa chỉ trụ sở			
Tên người liên hệ			
Điện thoại di động:		Email:	

Thông tin chất thải rắn đô thị:		
Lượng chất thải rắn đô thị trung bình được thu gom		tấn/ ngày
Đặc tính của chất thải		Tỉ lệ thành phần hữu cơ/ thành phần vô cơ của chất thải
Độ ẩm của chất thải		%

Thông tin về bãi chôn lấp:

STT.	Tên Khu vực thải bỏ/Bãi chôn lấp	Định vị GPS của Khu vực thải bỏ/Bãi chôn lấp (Bắc, Đông)	Diện tích của Khu vực thải bỏ/Bãi chôn lấp (ha)	Loại bãi chôn lấp (Được quản lý/Chưa được quản lý)	Lượng chất thải rắn đô thị được chôn (tấn/ ngày)	Lượng chất thải rắn đô thị được tận dụng tại bãi rác (tấn/ ngày)	Lượng chất thải rắn được bán (tấn/ngày)	Giá bán chất thải rắn đô thị (VND/tấn)
1								
2								
3								
4								
5								

Thực trạng tận dụng chất thải rắn ở bãi chôn lấp:

STT.	Sản xuất phân compost/ phân bón (Có/Không?)	Sản xuất nhiên liệu từ rác RDF (Có/Không?)	Sản xuất Biogas (Có/Không)	Phát điện (Có/Không)	Khác (vui lòng ghi rõ)	Công nghệ sử dụng (Động cơ Biogas/ Tuabin hơi nước / khí hóa chất thải rắn đô thị) để phát điện?	Công suất điện cài đặt của nhà máy điện (MW)	Không nối lưới điện hoặc nối lưới điện?
1								
2								
3								
4								
5								

Kế hoạch tương lai của bãi chôn lấp

STT.	Bãi chôn lấp có mở rộng trong tương lai không? (Có/ Không)	Bãi chôn lấp có đóng cửa trong tương lai (Có/ Không)	Khi nào kế hoạch được thực hiện (Năm)	Lượng chất thải rắn đô thị thu được trong tương lai (tấn/ ngày)	Lượng chất thải rắn đô thị được tận dụng (tấn/ngày)	Lượng chất thải rắn đô thị bán (tấn/ ngày)	Mục đích của việc tận dụng chất thải rắn đô thị trong tương lai (chẳng hạn sản xuất biogas, phát điện, phân hữu cơ, v.v.) ?
1							
2							
3							
4							
5							

Ý kiến bổ sung của người khảo sát:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Bản Khảo sát Nhà máy chế biến lúa gạo, Nhà máy xay xát lúa gạo			
Tên người khảo sát:		**Ngày khảo sát:**	

Thông tin liên hệ:		
Tên nhà máy chế biến lúa gạo, nhà máy xay xát lúa gạo		
Địa chỉ		
Định vị GPS:	**Vĩ độ**	**Kinh độ**
Tên người liên hệ		
Số ĐTDĐ		**Email:**

Sản xuất trấu ở nhà máy xay xát gạo:					
Công suất thiết kế của nhà máy xay xát (tấn lúa/ngày)	**Mùa xay gạo (Từ/ Đến)**	**Lượng gạo trung bình được xay trong 3 năm gần đây (tấn/ năm)**	**Số giờ hoạt động trung bình của nhà máy xay xát mỗi năm (giờ/ năm)**	**Sản xuất trấu (tấn/năm)**	**Độ ẩm của trấu (%)**

Thực trạng tận dụng trấu				
Dùng trấu trong nhà máy (tấn/ năm)	**Mục đích của việc sử dụng trấu trong nhà máy (chẳng hạn sấy lúa, điện/ đồng phát, sản xuất trấu viên, trấu củi)**	**Lượng trấu bán ra (tấn/ năm)**	**Đối tượng mua trấu (chẳng hạn người kinh doanh sinh khối, các lò gạch, nhà máy xi măng, nhà máy phát điện, v.v.)**	**Giá bán trấu tại nhà máy xay xát (VND/tấn)**

Nhà máy phát điện/ điện đồng phát nhờ trấu hiện có					
Điện năng tiêu thụ của nhà máy xay xát					kWh/tấn lúa
Điện năng tiêu thụ của nhà máy xay xát trong tháng					kWh/tháng
Hơi nước tiêu thụ của nhà máy xay xát (nếu có)		kg/tấn lúa được xay	**Áp suất hơi (bar)/ nhiệt độ (^oC)**		
Loại lò hơi (Buồng lửa ghi cố định, buồng lửa ghi xích, tầng sôi sủi bọt (BFB), tầng sôi tuần hoàn (CFB))					
Số lượng lò hơi lắp đặt		đơn vị	**Công suất hơi định mức của lò hơi**		TPH
Áp suất của lò hơi					bars
Công nghệ tuabin hơi	☐ Đối áp		☐ Ngưng hơi có cửa trích		
Công suất điện lắp đặt cho máy phát điện tuabin					MW
Thời gian vận hành của nhà máy nhiệt điện/ đồng phát					Ngày/ năm
Nối lưới điện	☐ Bán lên lưới điện		☐ Mua điện từ lưới điện		
Công suất của điện bán lên lưới					MW
Sản lượng điện bán ra					MWh/năm
Nhà máy phát điện/ đồng phát tiêu thụ trấu					tấn/ năm
Lượng sinh khối được mua thêm, nếu có					tấn/ năm
Loại sinh khối được mua thêm (chẳng hạn, trấu từ nhà máy xay xát khác, rơm, v.v.)					
Giá mua của các nhiên liệu sinh khối (đối với từng loại sinh khối)					VND/tấn
Nhà máy có kế hoạch đầu tư nhà máy điện/đồng phát sử dụng công nghệ hơi cao áp (Trong trường hợp không có hệ thống hơi cao áp)			☐ **Có**		☐ **Không**

Ý kiến bổ sung của người khảo sát:

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Bản Khảo sát Nhà máy Mía đường

Tên người khảo sát:		**Ngày khảo sát:**	

Thông tin liên hệ:			
Tên nhà máy Mía đường			
Địa chỉ			
Định vị GPS:	**Vĩ độ**	**Kinh độ**	
Tên người liên hệ			
Số ĐTDĐ		**Email:**	

Sản xuất bã mía ở nhà máy:					
Công suất ép thiết kế của nhà máy đường (TMN)	**Mùa ép mía (Từ/ Đến)**	**Lượng mía được ép trung bình trong 3 năm gần đây (tấn/ năm)**	**Thời gian hoạt động trung bình của nhà máy đường mỗi năm (giờ/ năm)**	**Sản xuất bã mía (tấn/ năm)**	**Độ ẩm của bã mía (%)**
					45 - 50%

Hiện trạng sử dụng bã mía:				
Việc sử dụng bã mía trong nhà máy (tấn/ năm)	**Mục đích của việc sử dụng bã mía trong nhà máy (chẳng hạn phát điện đồng phát)**	**Lượng bã mía bán được (tấn/ năm)**	**Đối tượng mua bã mía (chẳng hạn nhà máy phát điện, nhà máy giấy và bột giấy, v.v.)**	**Giá bán bã mía của nhà máy đường (VND/tấn)**

Nhà máy điện đồng phát dựa vào bã mía hiện có					
Điện năng tiêu thụ của nhà máy đường					kWh/tấn mía được ép
Tiêu thụ hơi của nhà máy đường			kg/tấn mía ép	**Áp suất hơi nước (bar)/ nhiệt độ (^{o}C)**	
Loại lò hơi (Buồng lửa ghi cố định, buồng lửa ghi xích, tầng sôi sủi bọt (BFB), tầng sôi tuần hoàn (CFB))					
Số lượng lò hơi lắp đặt		đơn vị	**Công suất hơi định mức của lò hơi**		tấn hơi/giờ
Áp suất của lò hơi					
Công nghệ tuabin hơi	☐ Đối áp		N□ưng hơi có cửa trích		
Công suất điện lắp đặt của hệ thống máy phát					MW
Thời gian vận hành của nhà máy điện đồng phát					Ngày/ Năm
Nối lưới điện	☐ Bán điện lên lưới		Mu□ điện từ lưới điện		
Công suất của điện bán lên lưới					MW
Sản lượng điện bán lên lưới					MWh/năm
Tổng nhiên liệu sinh khối do nhà máy điện đồng phát sử dụng					tấn/ năm
Lượng sinh khối được mua thêm, nếu có					tấn/ năm
Các loại sinh khối được mua thêm (bã mía từ nhà máy mía đường khác, xác mía (ngọn mía và lá mía), rơm, trấu, , v.v.)					
Giá mua của các nhiên liệu sinh khối (đối với từng loại sinh khối))					VND/tấn
Nhà máy có kế hoạch đầu tư nhà máy điện/đồng phát sử dụng công nghệ hơi cao áp (Trong trường hợp không có hệ thống hơi cao áp)				☐ **Có**	☐**Không**

Ý kiến bổ sung của người khảo sát

RENEWABLE ENERGY RESOURCE MAPPING: BIOMASS [PHASES 1-3] - VIETNAM

Bảng Khảo sát các nhà máy làm gạch				
Tên người khảo sát:			**Ngày Khảo sát:**	

Thông tin liên hệ:			
Tên Doanh nghiệp:			
Địa chỉ			
Tọa độ (GPS):	**Vĩ độ**	**Kinh độ**	
Tên người liên hệ			
Điện thoại di động:		**Email:**	

Quy mô của nhà máy làm gạch (sành, sứ), chẳng hạn tổng số lượng sản phẩm sản xuất trong 1 năm		**đơn vị/ năm**

0

Thông tin tiêu thụ sinh khối

STT.	Loại phế phẩm sinh khối	Lượng phế phẩm sinh khối mua được (tấn/ năm)	Nguồn cấp sinh khối (chẳng hạn các nhà kinh doanh sinh khối, nhà máy xay xát, nhà máy mía đường, v.v.)	Lượng sinh khối tiêu thụ để sản xuất 1,000 viên gạch (kg)	Độ ẩm của sinh khối mua được (%)	Nhiệt trị của sinh khối (kCal/kg)	Thời gian trữ sinh khối ở nhà máy (Tháng Từ- Đến)	Giá mua (VND/tấn)
1								
2								
3								
4								
5								

Ý kiến của người khảo sát:

Annex III

Presentation by

Dr. Jussi Rasinmaki

CROP BIOMASS SURVEY: OBJECTIVES AND METHODOLOGY

Dr. Jussi Rasinmäki
Remote Sensing/GIS Expert

Benefits

- The final deliverable of the project should help commercial developers in aiming their efforts in building biomass based electricity generation capacity
  - With specific emphasis on avoiding side effects on food security and existing alternative uses

- This can be simplified as three questions:
  - Where to build the power plant?
  - For which feedstock?
  - Using which conversion technology?

Approach

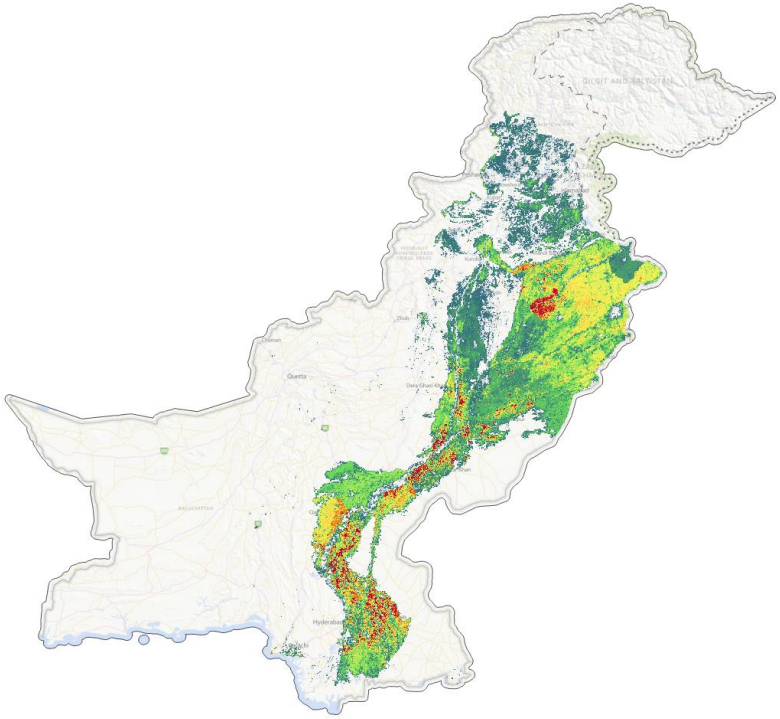
- Where?
  - We need to use spatial mapping, i.e. produce maps that are useful for the project developers
- **Which feedstock?**
  - We need to put the feedstock resources on the map by type of feedstock, i.e. **land use mapping down to crop species level for agricultural land**

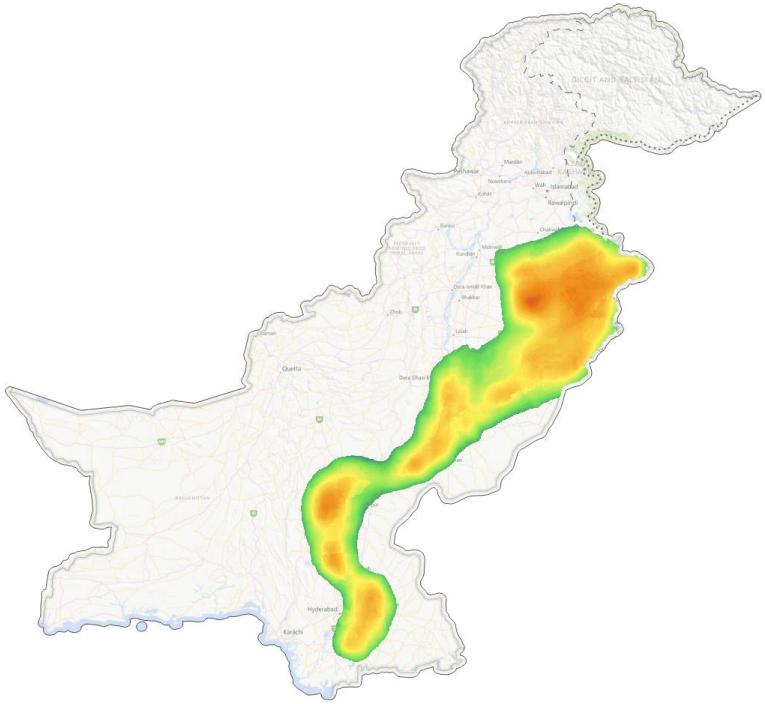
Approach (Cont.)

- Which technology?
  - Combine the different aspects:
    - **Feedstock supply information**
    - Technical and investment profile of the technology
    - **Infrastructure**
  - ➢ Potential for the given technology at the given place, the final output

Deliverables

- Two types of maps





Distribution of the feedstock over the provinces

"Hotspots" for power plant investments

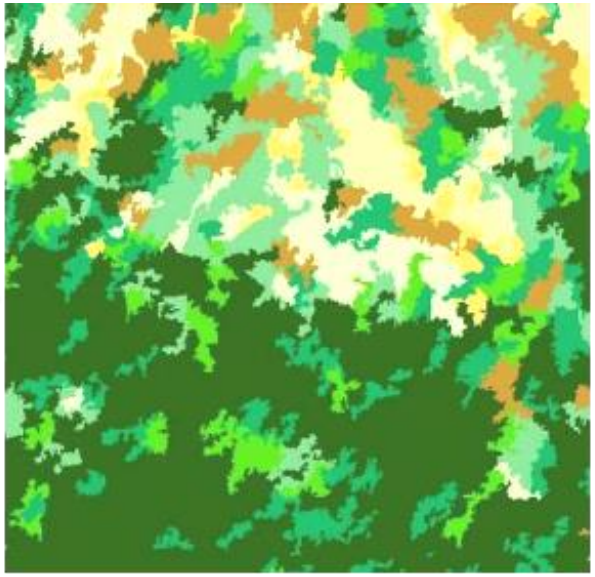
Methods

- Which feedstock, i.e. biomass resource potential?
  - Satellite image based land use classification
  - **For agricultural crops, regional field survey on**
    - **Productivity**
    - **Residue-to-crop ratio**
    - **Farming practises (residues utilised in farming, animal husbandry)**
    - **Other uses of harvest residues**
    - **Market prices**
    - **Field reference data for the satellite image inventory**

Methods – Satellite image inventory

- From a satellite image to land use classification:

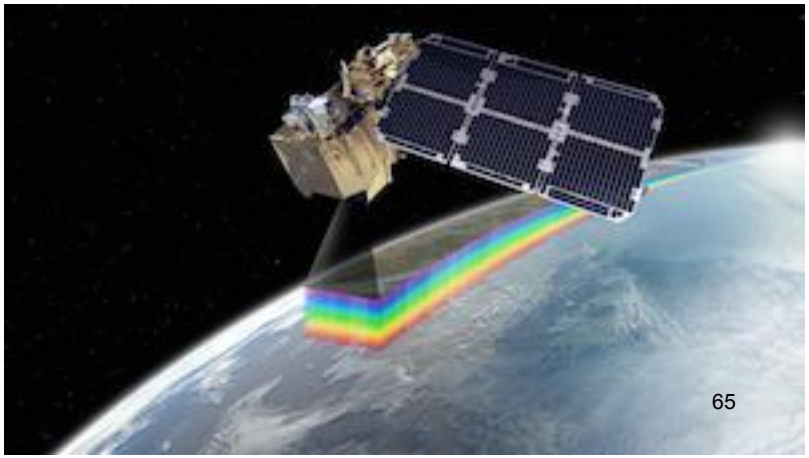
Original satellite image



Complete classification
of land use classes
for the same area

Methods – Satellite image inventory

- Based on ESA's Sentinel-1& Sentinel-2 images
  - Free, frequent revisit times, reasonable spatial resolution for the purpose
  - Defines the spatial mapping unit for the project, 20 m x 20 m (for Sentinel-1 radar images)
- **Time series analysis of images over one year to cover crop rotation**



Methods – Field survey

- Serves two purposes:
  1. The satellite image interpretation needs **very accurately located field observations of land use;** the results for it are only as accurate as the field data
  2. **Information** for converting the *theoretical biomass potential* to *sustainable technical potential* **for crops**
- Done with the help of inventory software on smart phones (cf. the "very accurately located field observations")

Concept – Biomass Potential

- Crop yield -> amount of harvest residues = ***Theoretical biomass potential***
  - Minus own use of the harvest residues (fodder, fertilizer, …)
  - Minus other existing uses of the harvest residues
  - Minus amount not feasible for collection & delivery

  = **Sustainable technical potential**

  Hence a detailed questionnaire on the phone to be filled with the farmers

Required Data

- Besides the field survey data, additional data are needed from official statistics and GIS data sets:
  - Location and size mapping of other biomass resources, not detectable from satellite images, using available statistics:
    - Processing site producing secondary crop residues like bagasse, rice husk
    - Stable based feeding sites for cattle & poultry
    - Industrial wood processing sites
    - Municipal solid waste
    - Existing biomass based power plants

Required Data (Cont.)

- Location and size of current biomass resource users:
  - Sugar mills
  - Textile industry
  - Cement industry
  - Paper industry
  - …
- **A parallel survey will be executed for these aspects**

Required Data (Cont.)

- GIS data for
  - Geography
  - **Transport infrastructure network**
  - Water supply network
  - Security areas
  - Protective and Conservation areas
  - Urban areas
  - **Power Transmission system infrastructure**

Methods – Biomass For Electricity Modelling

- The final step is the GIS model building, combining the different data sets:
  - Feedstock supply information from the satellite image analysis and field survey (=>***Biomass Atlas: sustainable technical potential***)
  - Technical and investment profile of the technology
  - Infrastructure

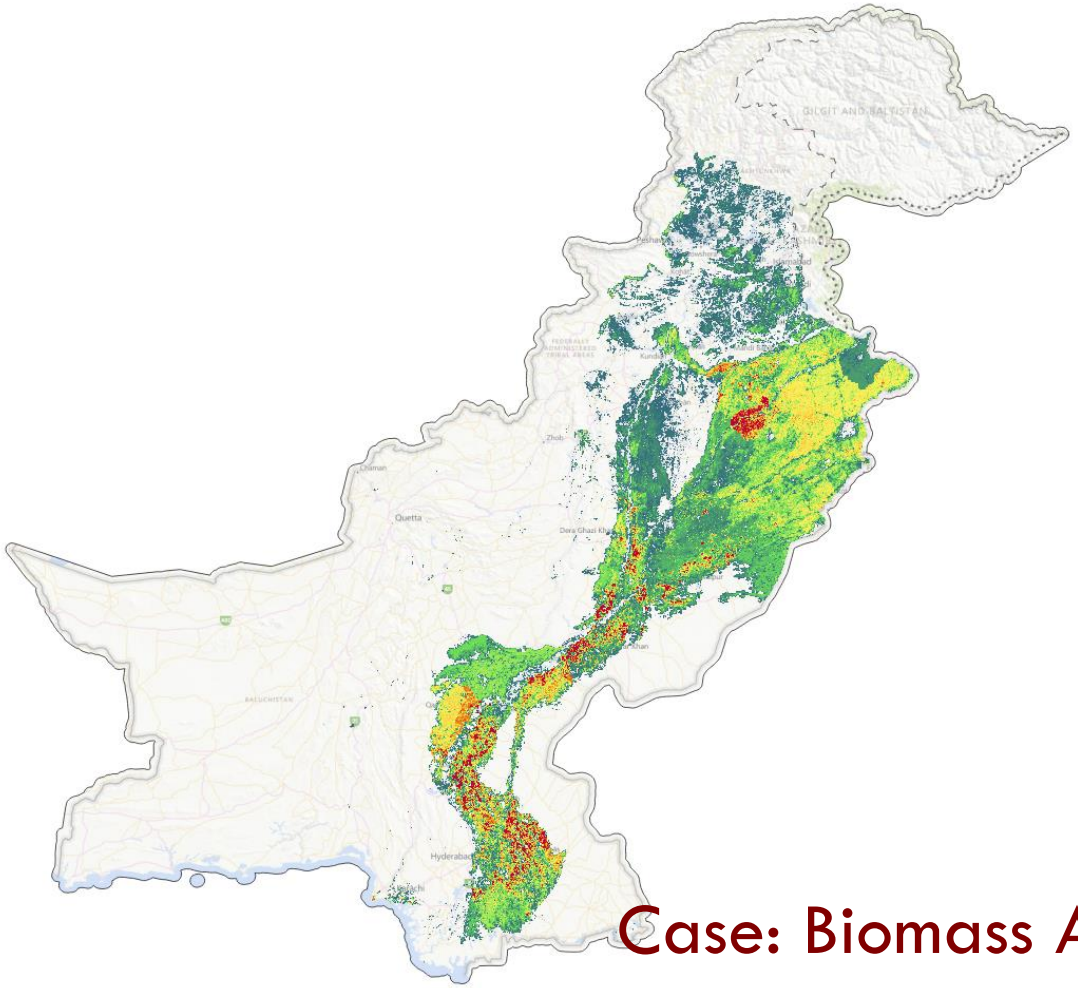
➢ Potential for the given technology at the given place (=> ***Biomass Atlas: investment potential***)

Deliverables

- The GIS datasets produced during the project
  - Raw GIS datasets
  - **Biomass Atlas:** sustainable technical potential
  - **Biomass Atlas:** investment potential
- The GIS model used to generate the Biomass Atlas datasets
  - Transparent parameterisation
  - Ability to update the Atlases as conditions change
    - E.g. financial parameters, new power plants, change in cultivated crops, change in other uses

Deliverables

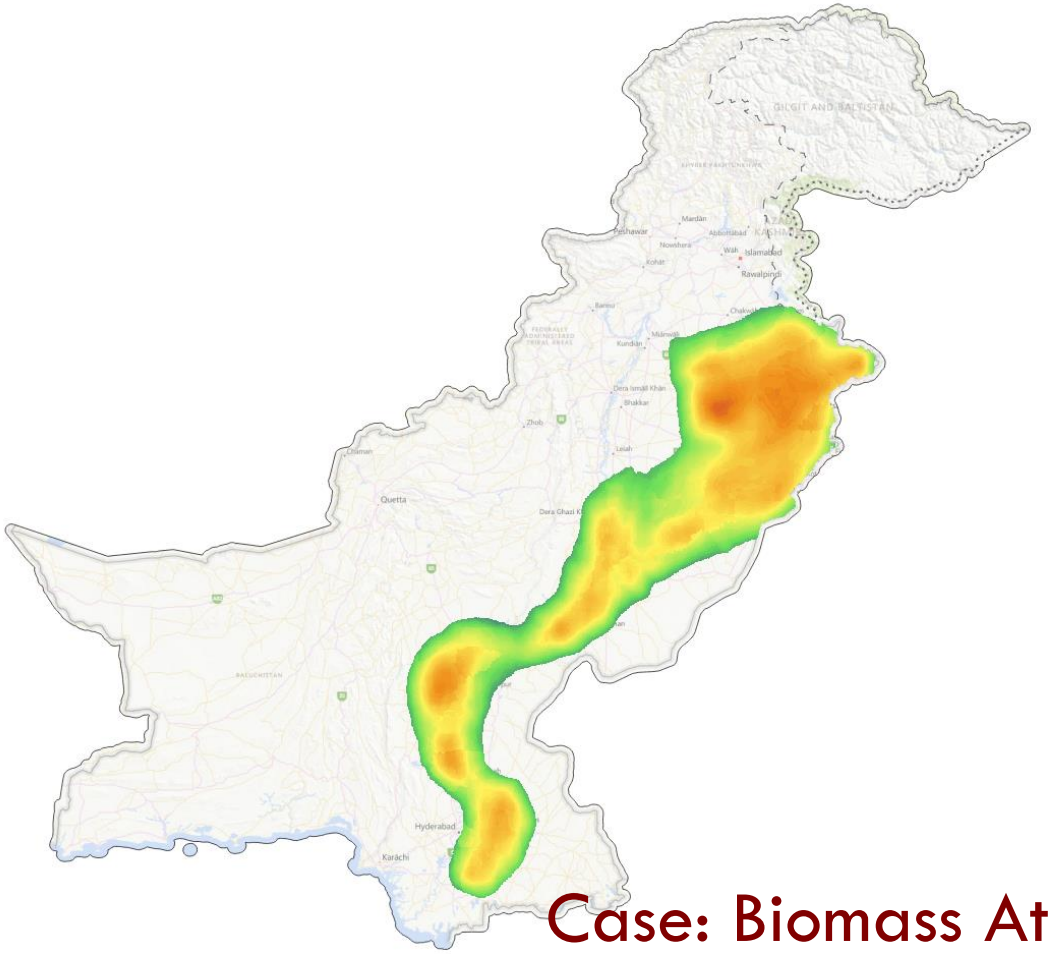
- **Biomass Atlas:** sustainable technical potential



Case: Biomass Atlas for Pakistan

Deliverables

- **Biomass Atlas:** investment potential



Case: Biomass Atlas for Pakistan

Thank you!

WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program

BỘ CÔNG THƯƠNG VIỆT NAM
MINISTRY OF INDUSTRY AND TRADE OF THE SOCIALIST REPUBLIC OF VIETNAM

Biomass Resource Mapping in Vietnam

Field Survey Training Material – Setting Up the Survey Smartphone

September 2016

Prepared by:
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Enerteam, Vietnam
Institute of Energy, Vietnam
PITCO (Private) Limited, Pakistan

Date: 6 September 2016

Country:

Vietnam

Project title and ID:

Renewable Energy Resource Mapping: Biomass [Phases 1-3] - Pakistan
Project ID: 1178842

Implementing agency:

The World Bank (Vietnam) in close coordination with the General Department of Energy, Ministry of Industry and Trade of Vietnam (GDE/MOIT)

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Date of report:

6th September 2016

Table of Contents

Introduction

This document contains the training material for the execution of the field survey for crop production. The field survey is conducted as part of a technical assistance project being implemented by the World Bank in Vietnam. The project aims to support renewable energy mapping and geospatial planning for biomass, solar and wind. It is being undertaken in close coordination with the Ministry of Industry and Trade (MOIT), Government of Vietnam. The project is funded by the Energy Sector Management Assistance Program (ESMAP), a global knowledge and technical assistance program administered by the WB and supported by 11 bilateral donors, and is part of a major ESMAP initiative in support of renewable energy resource mapping and geospatial planning across multiple countries.

The field survey will be performed as a person-to-person interview by the survey team with the farmers using smartphones as survey tool. They will be using a phone application that can record their responses, indicate the location of the interview, and attach a geographically tagged photograph of a reference field on the farm. The second objective of the field survey is to partially map the road network over the survey area. This will be executed by tracking the location of the survey smartphones during the survey execution field trips.

The survey will cover the whole of Vietnam. Vietnam National University of Agriculture (VNUA) and Nong Lam University (NLU) hired by GDE/MOIT will conduct the survey.

The survey has two objectives: (i) to provide data to estimate the harvest residue potential for energy production use, and (ii) to collect reference ground observations for satellite image based land use classification. For the first objective the survey interview will target the following “per hectare” factors for each region and crop species:

- Crop production level
- Residue-to-crop ratio
- Amount of crop residues that should be left in the field
- Amount of crop residues used for other purposes
- Accessibility to the harvest residues related to farm activities such as harvesting method and types of available machinery
- Current market prices for the harvest residues

For the second objective, one field on the farm will be selected as a reference field. A geotagged photo will be taken with the smartphone survey application of that field, and the crop species for the six previous cropping seasons will recorded during the interview. This information will then be used as the ground reference data in the satellite image interpretation process for land use classification. Besides the farm locations, land cover class ground observations are collected for land cover classes outside of agricultural land. For these locations the smartphone app will be used as a tool to record the location and land cover class associated with that as well as a geotagged photograph.

Setting up the phone

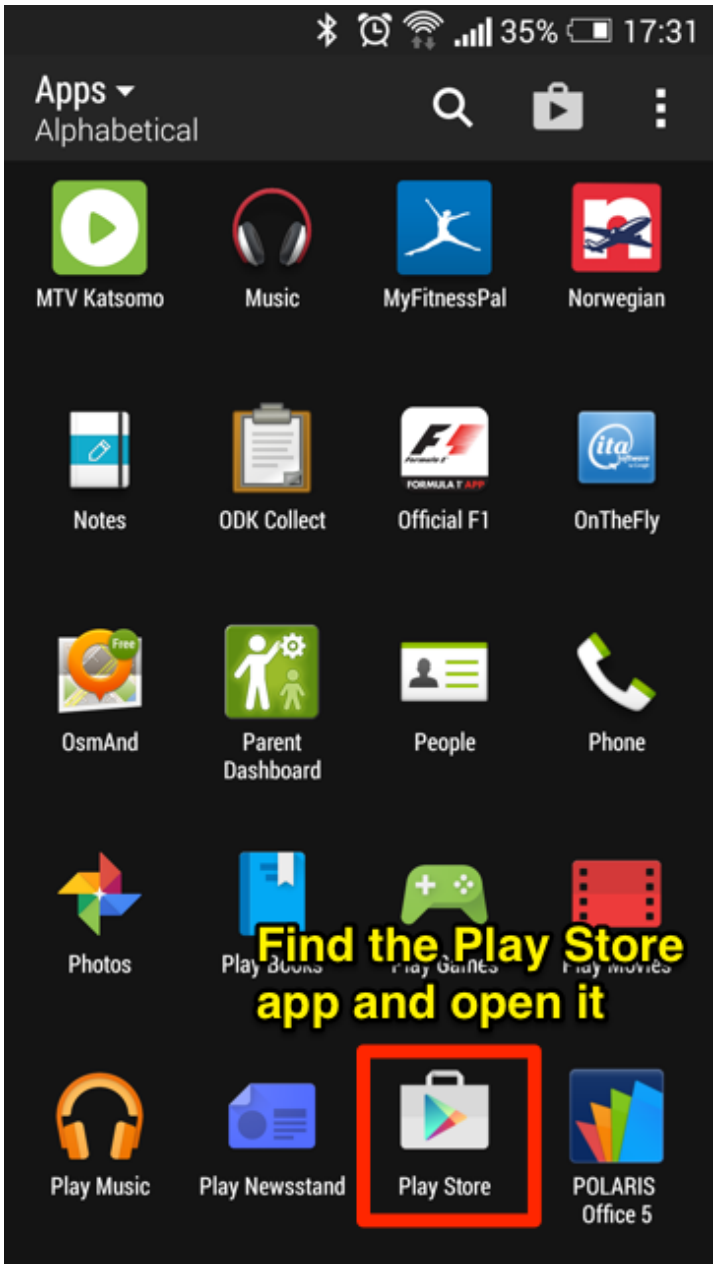
Setting up your phone for the field survey

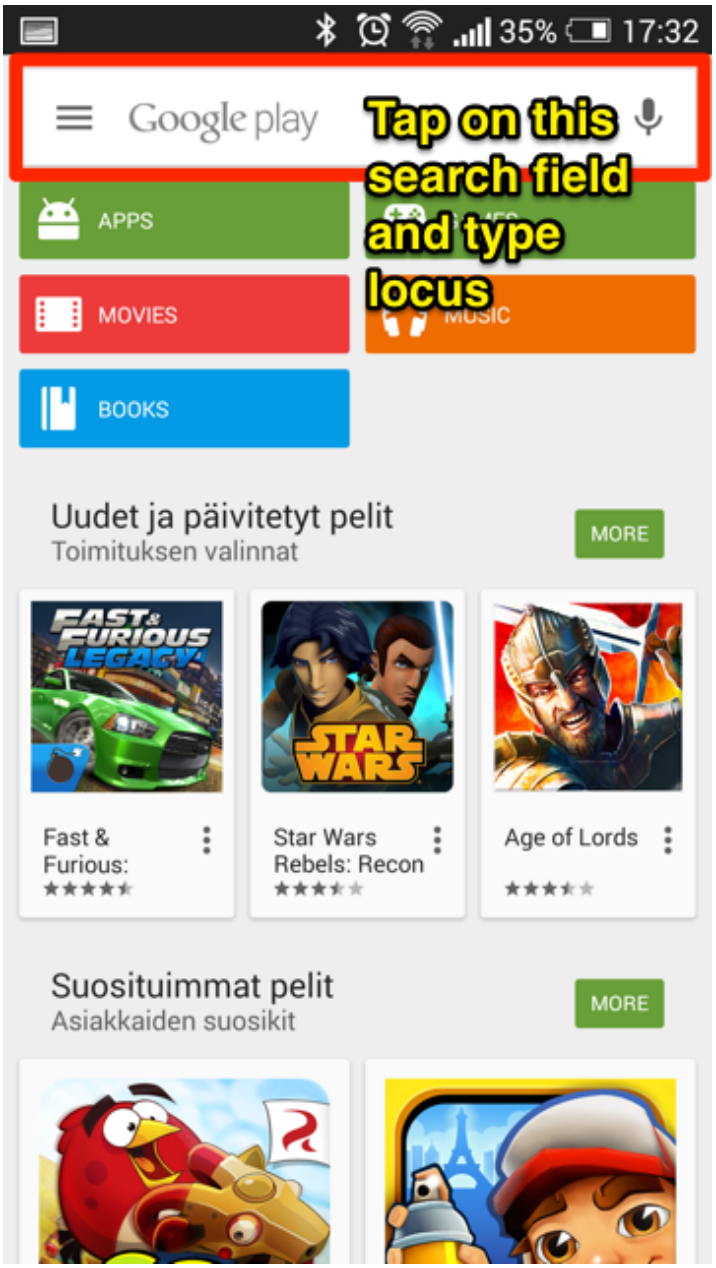
You will be using two main apps for the survey, one for mapping the road network that you will be travelling over to the interview locations, and one for executing the survey interview with the farmers as well as taking the reference photograhps needed for the land use mapping with satellite images. Two more apps will be used to aid in transferring the recorded data, and for calibrating the sensors of the phone.

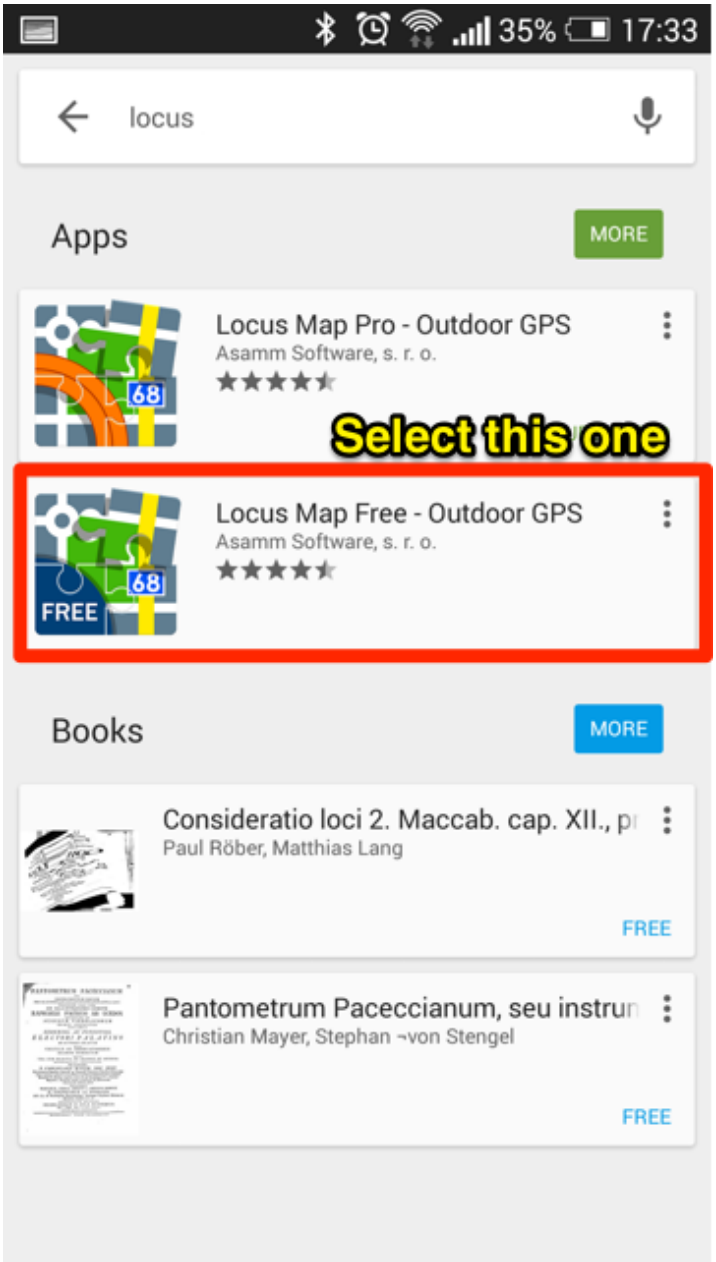
The first step in the process is to set up these apps on the survey phone.

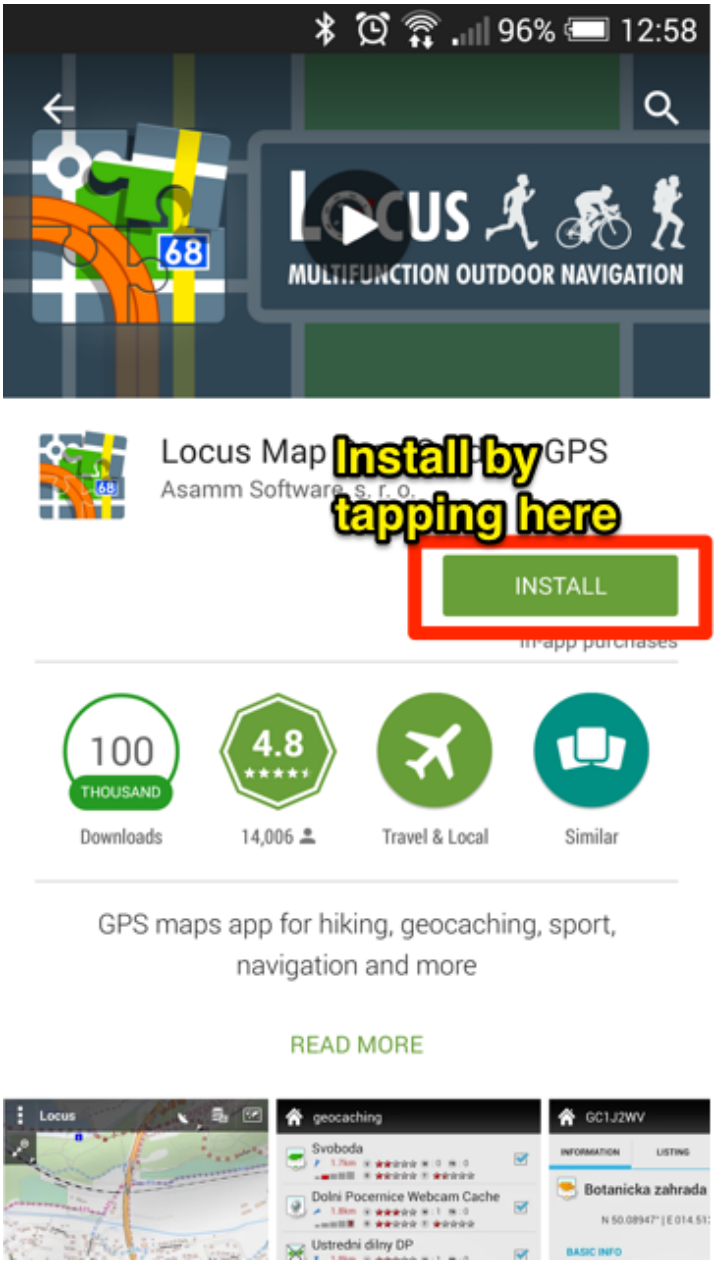
Step 1: Locus Map Free, the app for road network mapping

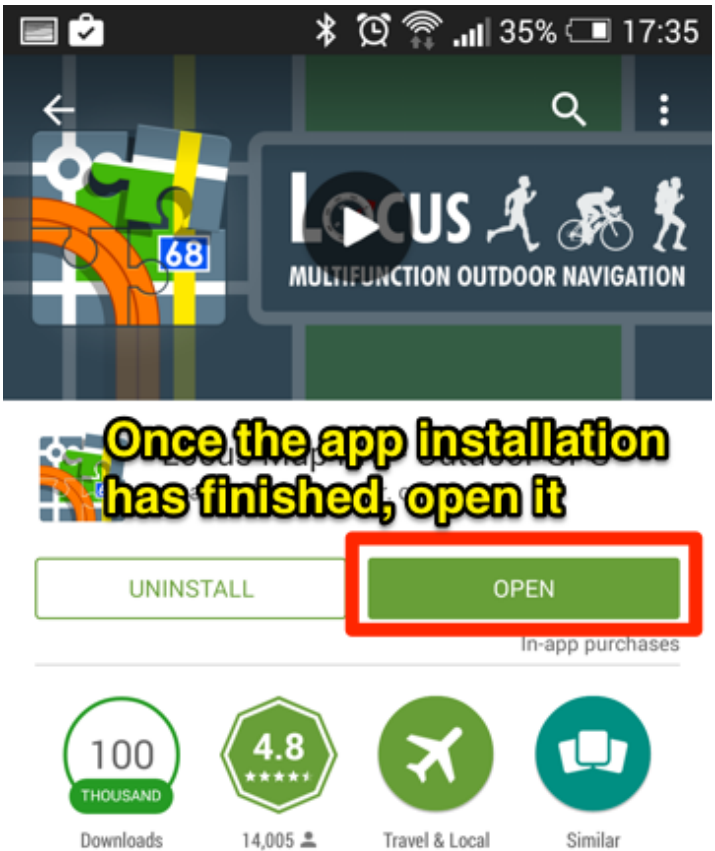
Installing Locus Map Free







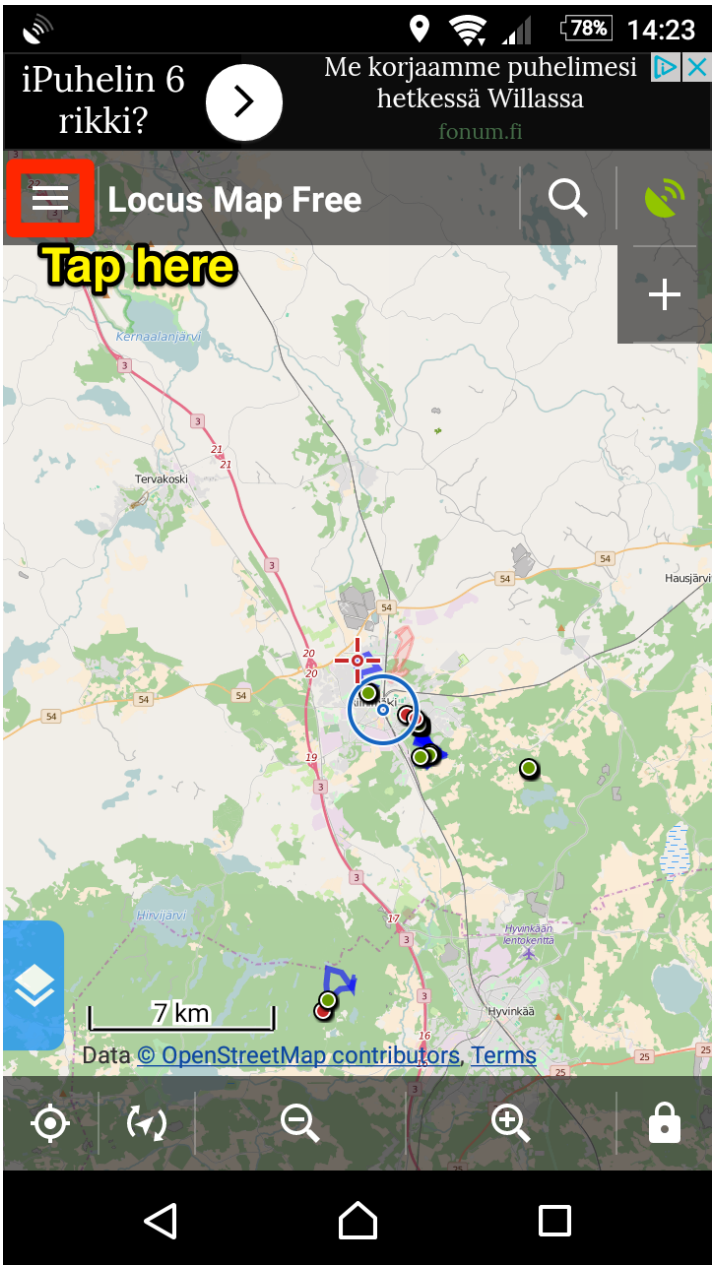


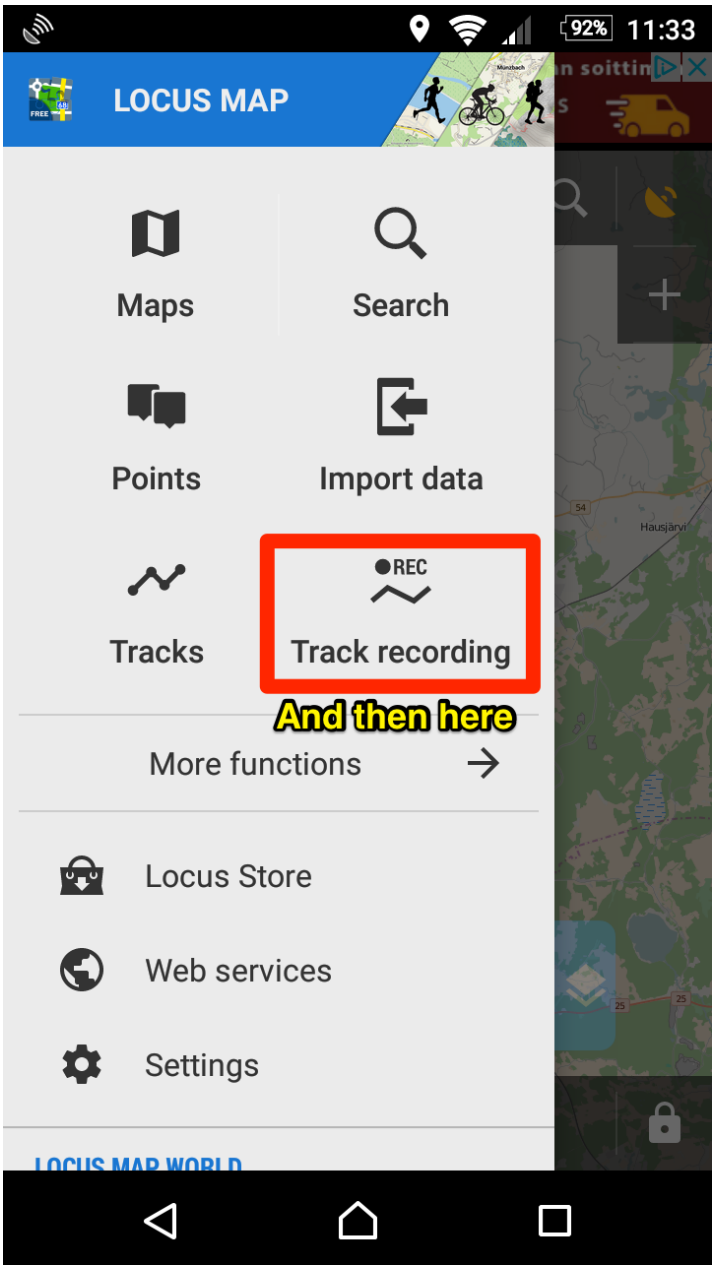


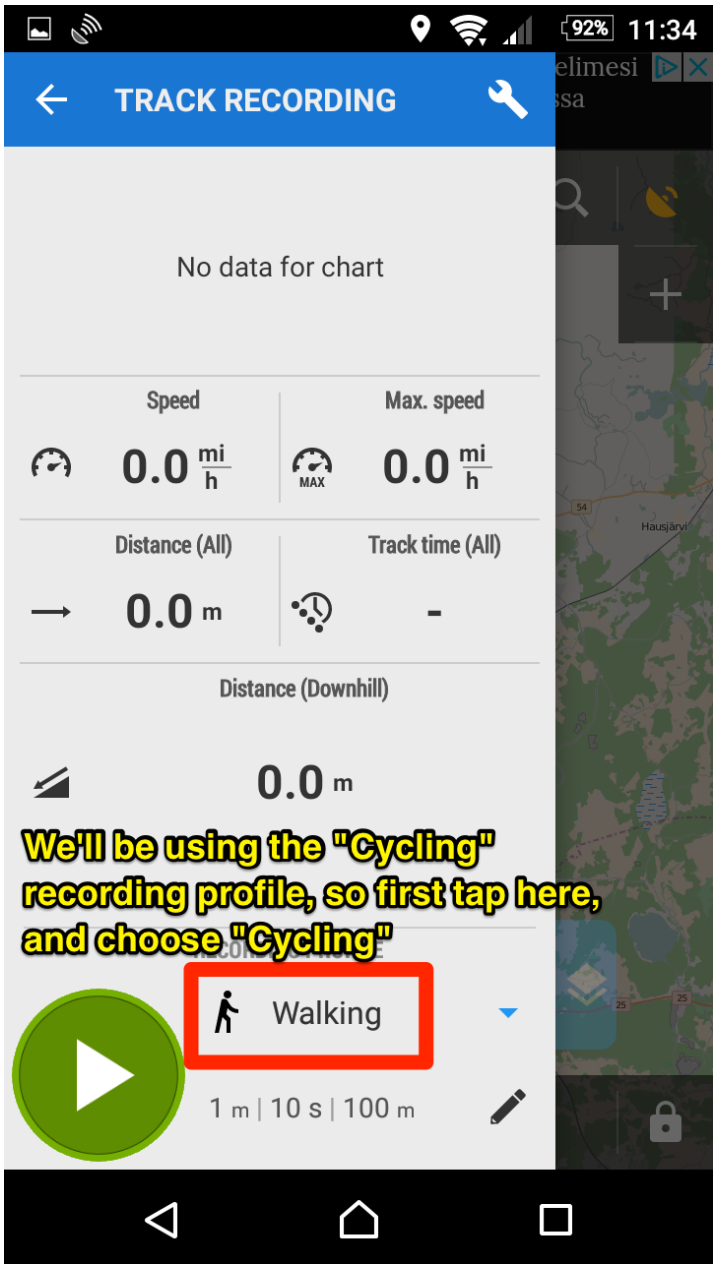
When you open the app for the first time, there will be a sequence of screens where you will execute some additional steps:

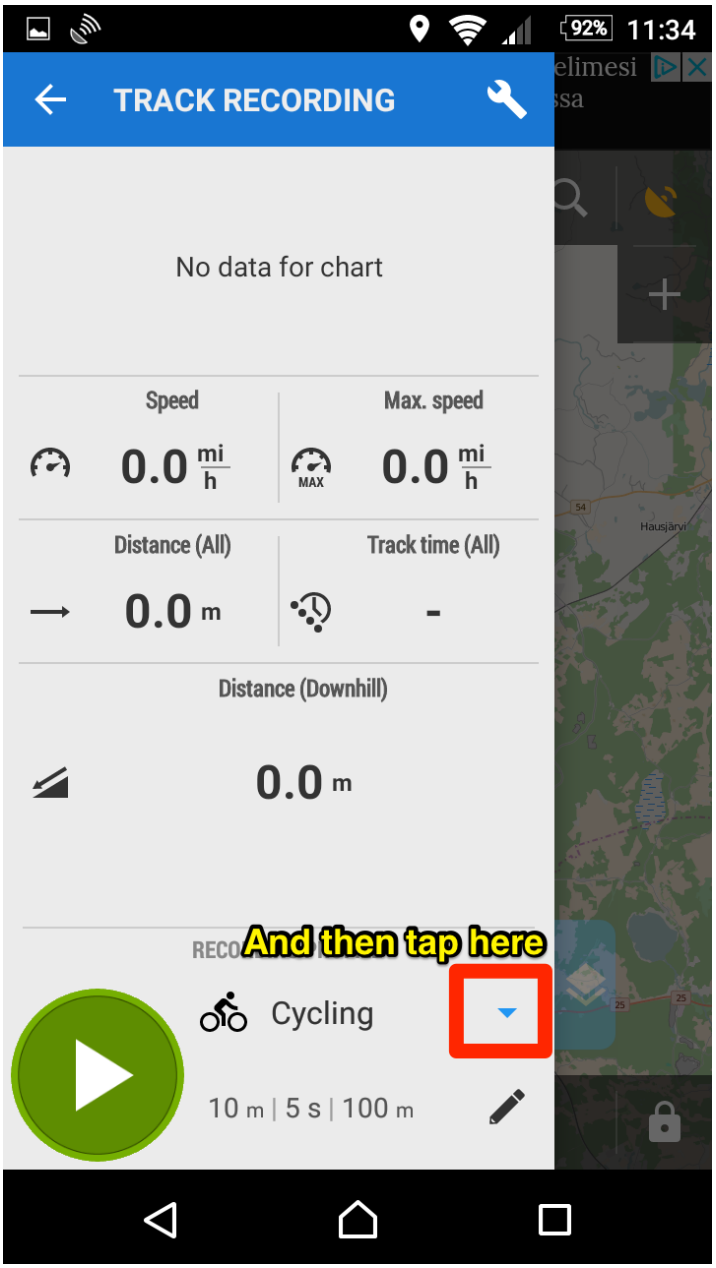
- Accept the EULA, and “Begin”
- “Grant” and “Allow” the permissions required
- Possibly download additional data, and start the app with the default settings

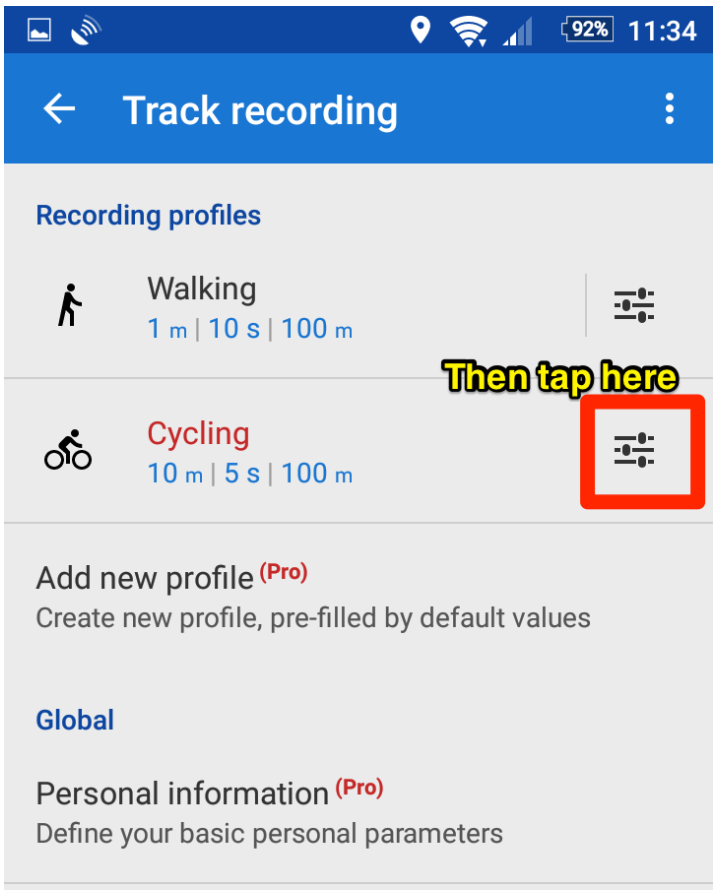
Setting up track recording in Locus Map Free

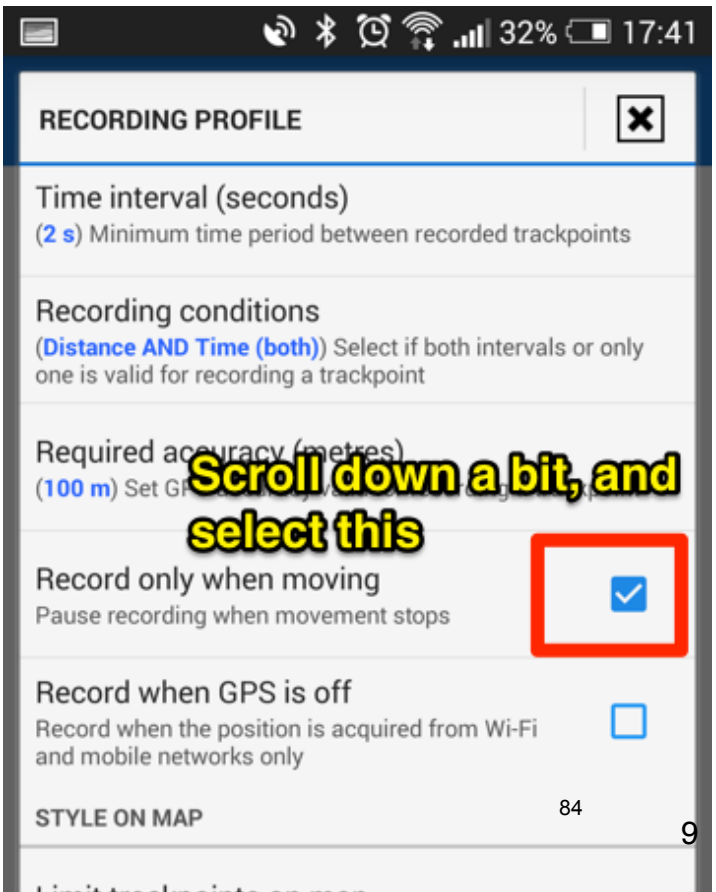


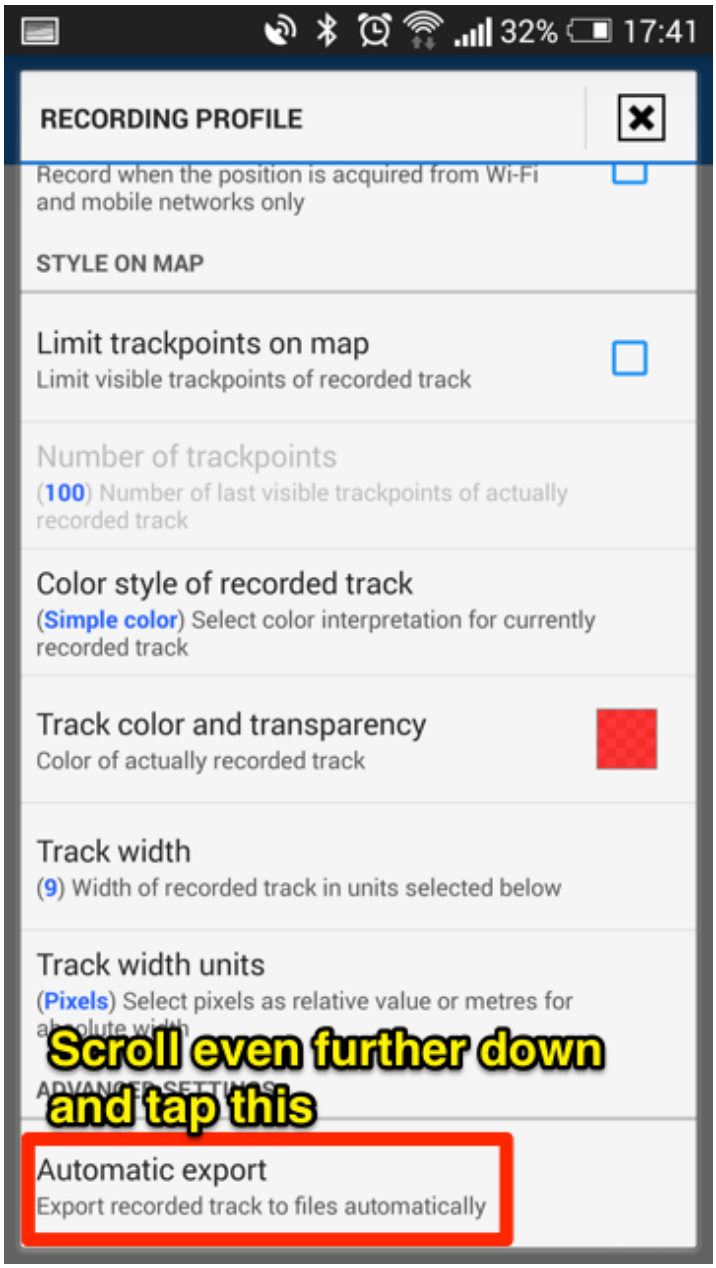


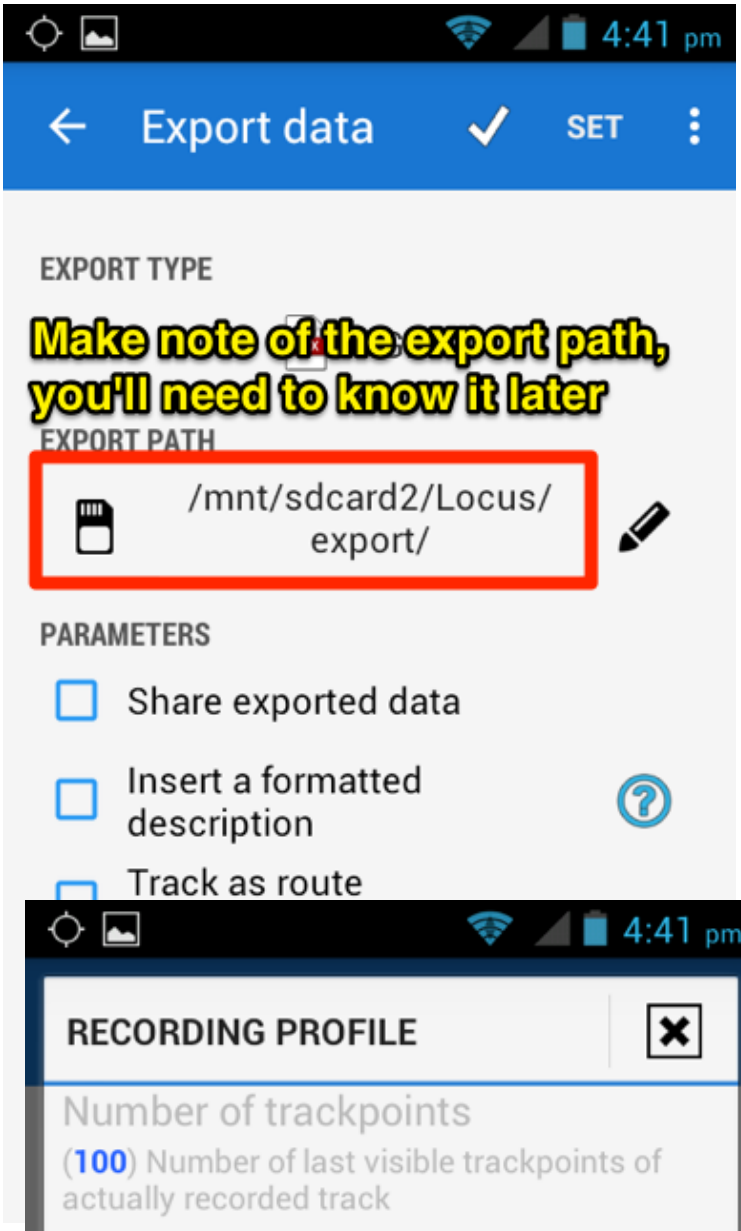

TRACK RECORDING
No data for chart
Speed
0.0 mi/h
Max. speed
0.0 mi/h
Distance (All)
0.0 m
Track time (All)
-
Distance (Downhill)
0.0 m
We'll be using the "Cycling" recording profile, so first tap here, and choose "Cycling"
Walking
1 m | 10 s | 100 m

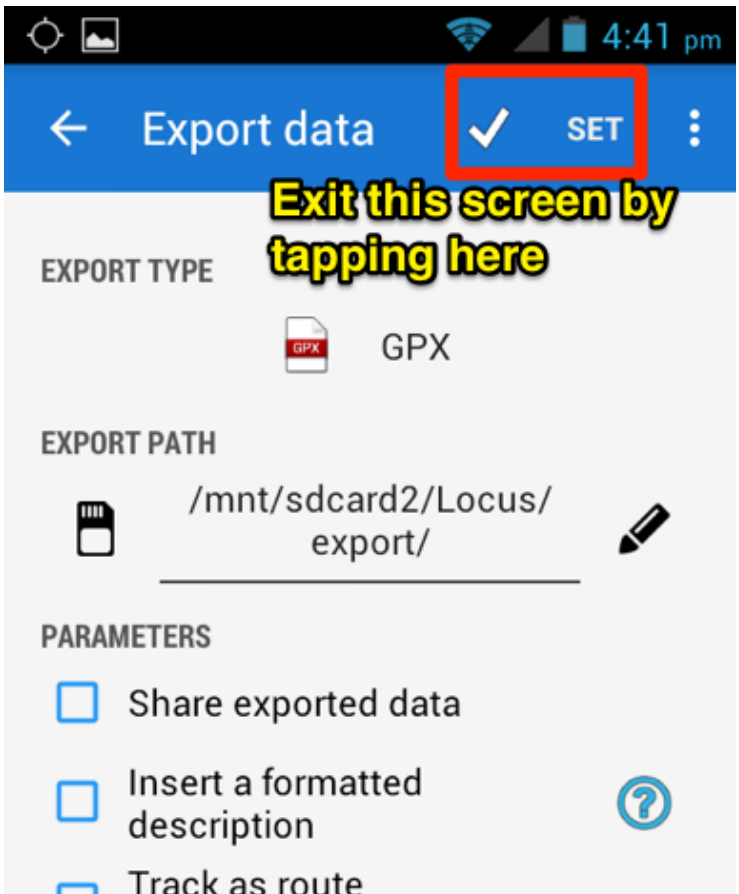

TRACK RECORDING
No data for chart
Speed
0.0 mi/h
Max. speed
0.0 mi/h
Distance (All)
0.0 m
Track time (All)
-
Distance (Downhill)
0.0 m
And then tap here
Cycling
10 m | 5 s | 100 m

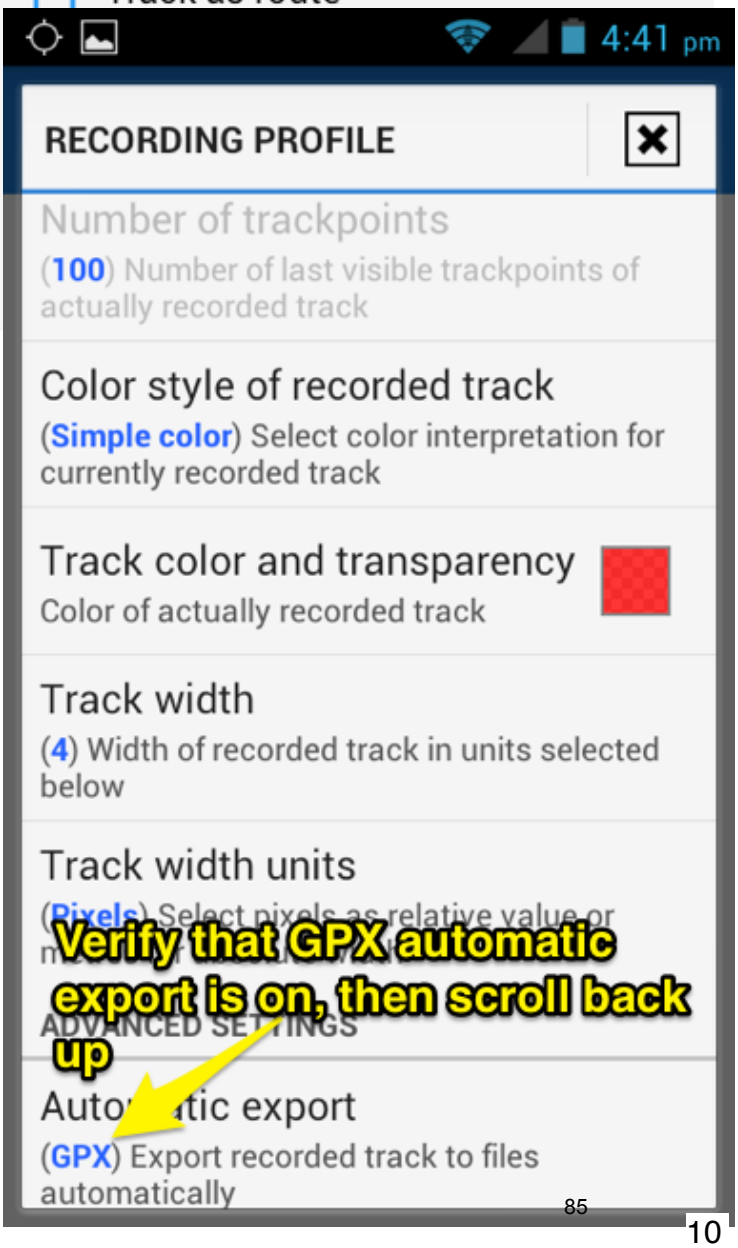

Track recording
Recording profiles
Walking
1 m | 10 s | 100 m
Then tap here
Cycling
10 m | 5 s | 100 m
Add new profile (Pro)
Create new profile, pre-filled by default values
Global
Personal information (Pro)
Define your basic personal parameters

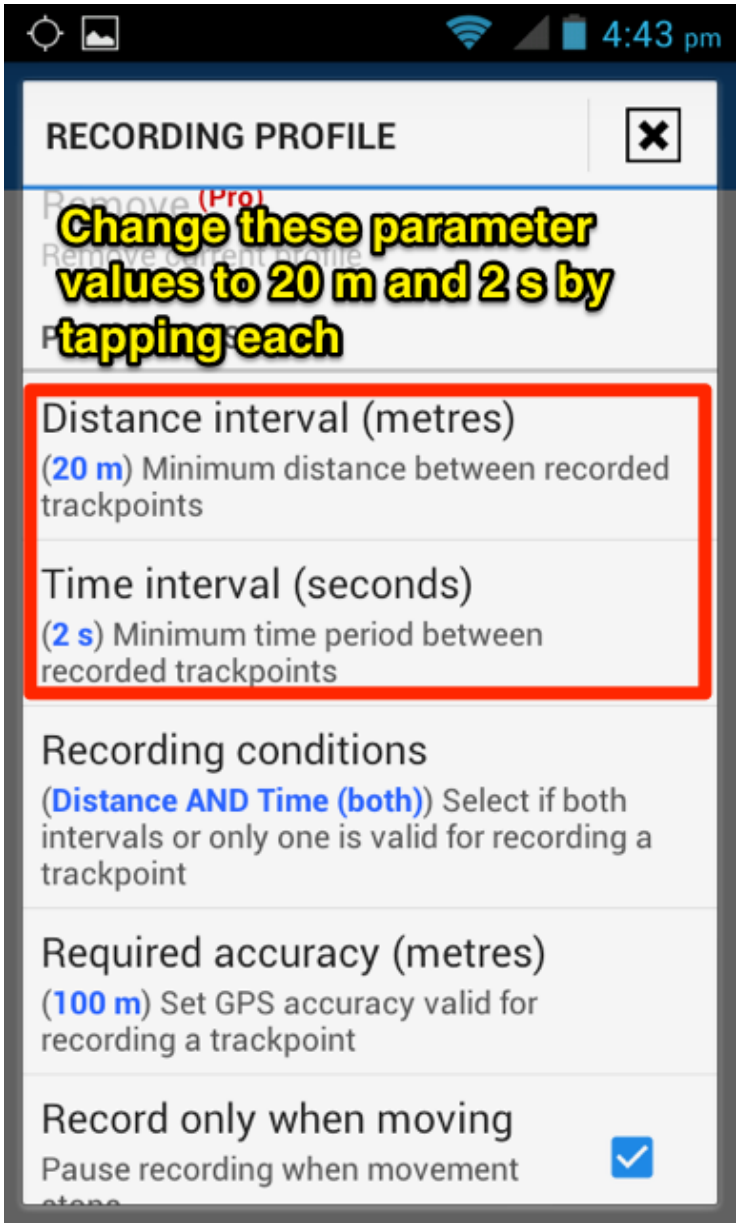

RECORDING PROFILE
Time interval (seconds)
(2 s) Minimum time period between recorded trackpoints
Recording conditions
(Distance AND Time (both)) Select if both intervals or only one is valid for recording a trackpoint
Scroll down a bit, and select this
Record only when moving
Pause recording when movement stops
Record when GPS is off
Record when the position is acquired from Wi-Fi and mobile networks only
STYLE ON MAP

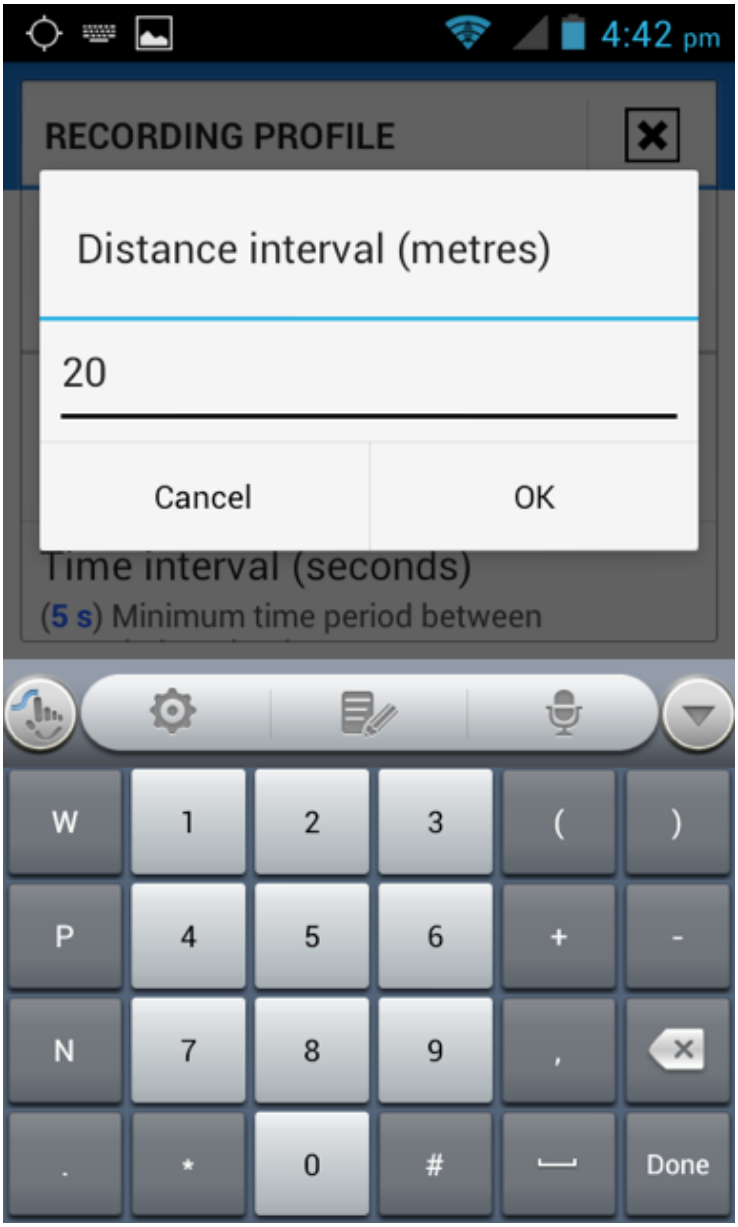

RECORDING PROFILE
Record when the position is acquired from Wi-Fi and mobile networks only
STYLE ON MAP
Limit trackpoints on map
Limit visible trackpoints of recorded track
Number of trackpoints
(100) Number of last visible trackpoints of actually recorded track
Color style of recorded track
(Simple color) Select color interpretation for currently recorded track
Track color and transparency
Color of actually recorded track
Track width
(9) Width of recorded track in units selected below
Track width units
(Pixels) Select pixels as relative value or metres for
Scroll even further down and tap this
Automatic export
Export recorded track to files automatically

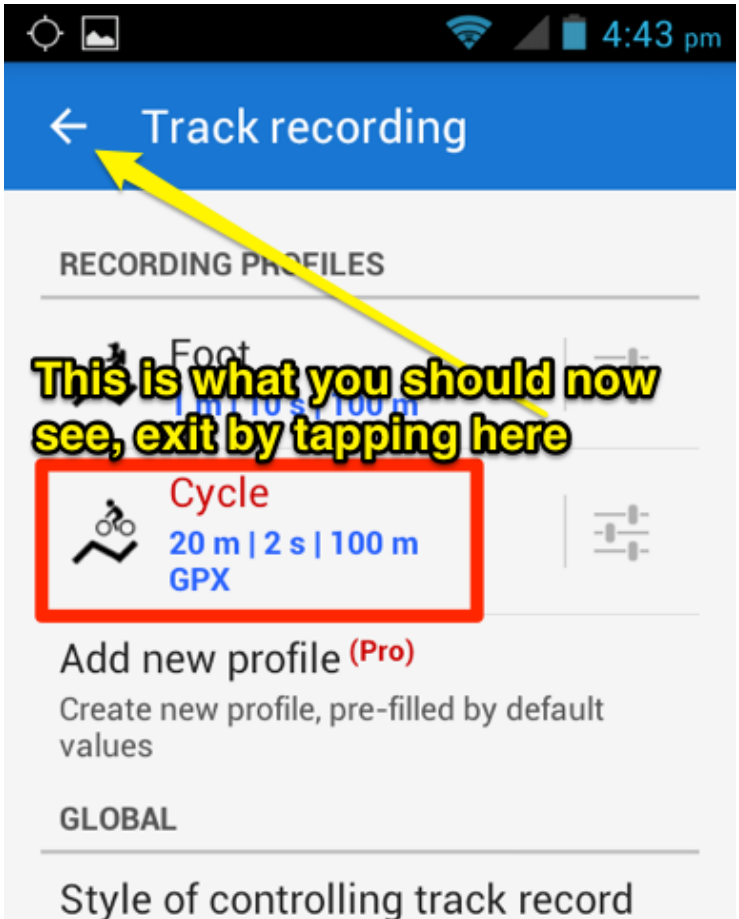

4:41 pm
Export data
SET
EXPORT TYPE
Make note of the export path, you'll need to know it later
EXPORT PATH
/mnt/sdcard2/Locus/export/
PARAMETERS
Share exported data
Insert a formatted description
Track as route


4:41 pm
Export data
SET
Exit this screen by tapping here
EXPORT TYPE
GPX
EXPORT PATH
/mnt/sdcard2/Locus/export/
PARAMETERS
Share exported data
Insert a formatted description
Track as route


4:41 pm
RECORDING PROFILE
Number of trackpoints
(100) Number of last visible trackpoints of actually recorded track
Color style of recorded track
(Simple color) Select color interpretation for currently recorded track
Track color and transparency
Color of actually recorded track
Track width
(4) Width of recorded track in units selected below
Track width units
Verify that GPX automatic export is on, then scroll back up
ADVANCED SETTINGS
Automatic export
(GPX) Export recorded track to files automatically

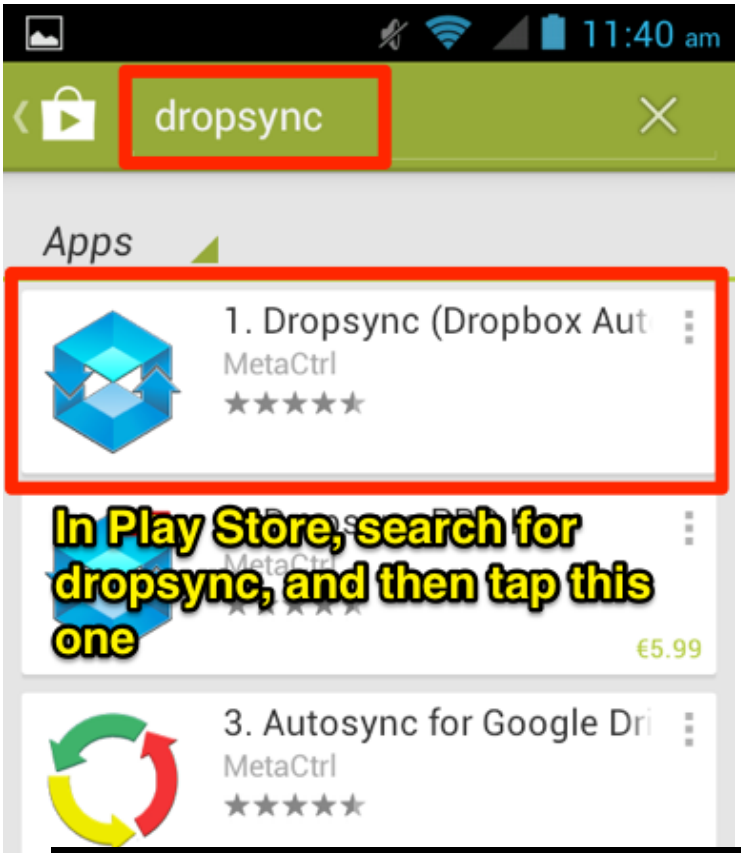

4:43 pm
RECORDING PROFILE
Change these parameter values to 20 m and 2 s by tapping each
Distance interval (metres)
(20 m) Minimum distance between recorded trackpoints
Time interval (seconds)
(2 s) Minimum time period between recorded trackpoints
Recording conditions
(Distance AND Time (both)) Select if both intervals or only one is valid for recording a trackpoint
Required accuracy (metres)
(100 m) Set GPS accuracy valid for recording a trackpoint
Record only when moving
Pause recording when movement

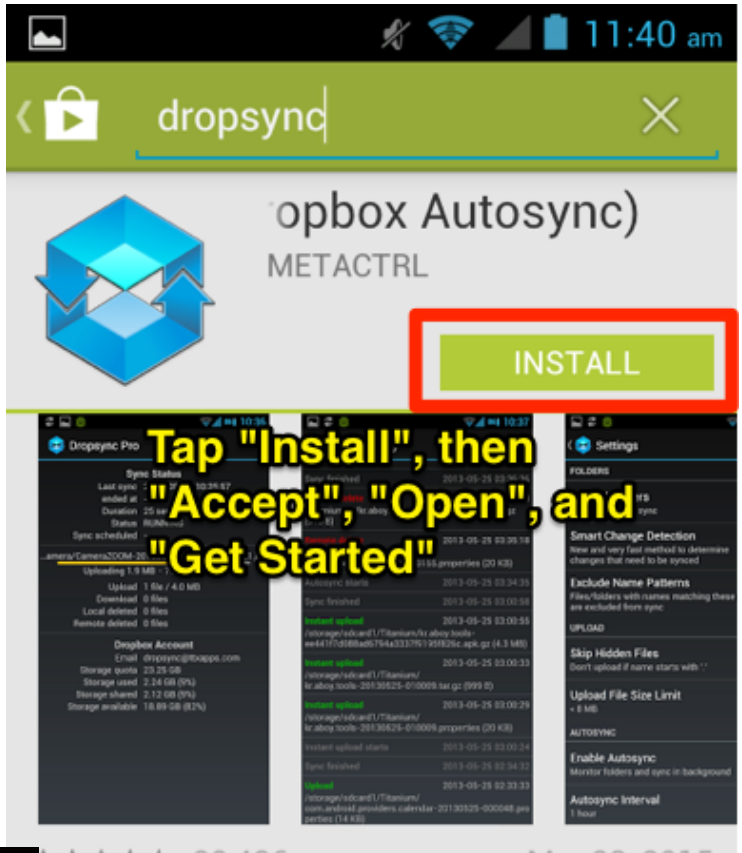

4:42 pm
RECORDING PROFILE
Distance interval (metres)
20
Cancel
OK
Time interval (seconds)
(5 s) Minimum time period between

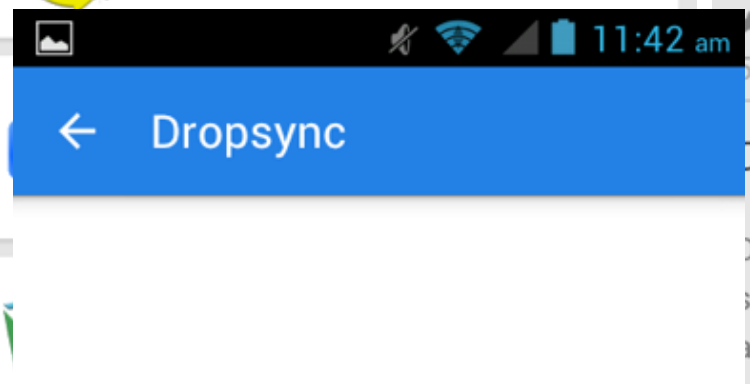

4:43 pm
Track recording
RECORDING PROFILES
This is what you should now see, exit by tapping here
Cycle
20 m | 2 s | 100 m
GPX
Add new profile (Pro)
Create new profile, pre-filled by default values
GLOBAL
Style of controlling track record

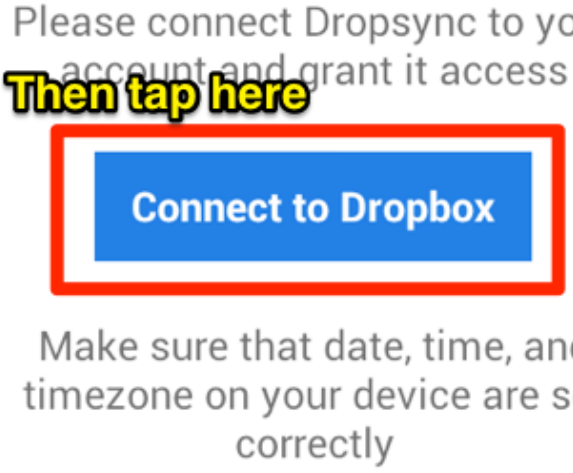
Step 2: Dropsync, the app for uploading the recorded road tracks

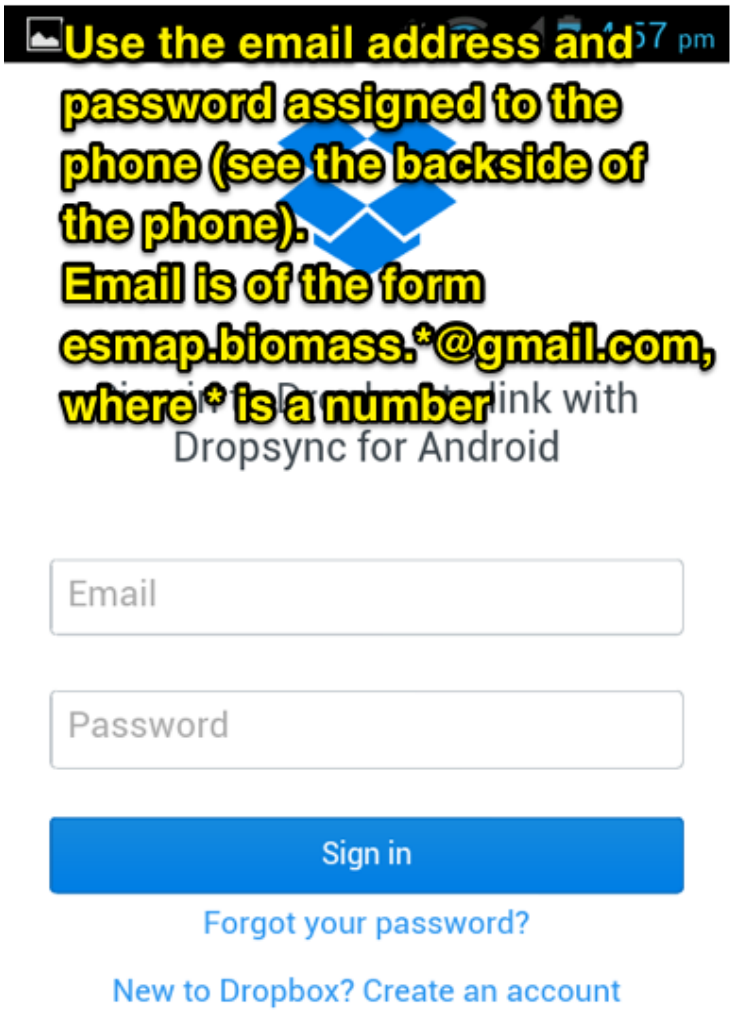
You'll need a separate app for uploading the recorded tracks to Dropbox. Open Play Store again, and then:

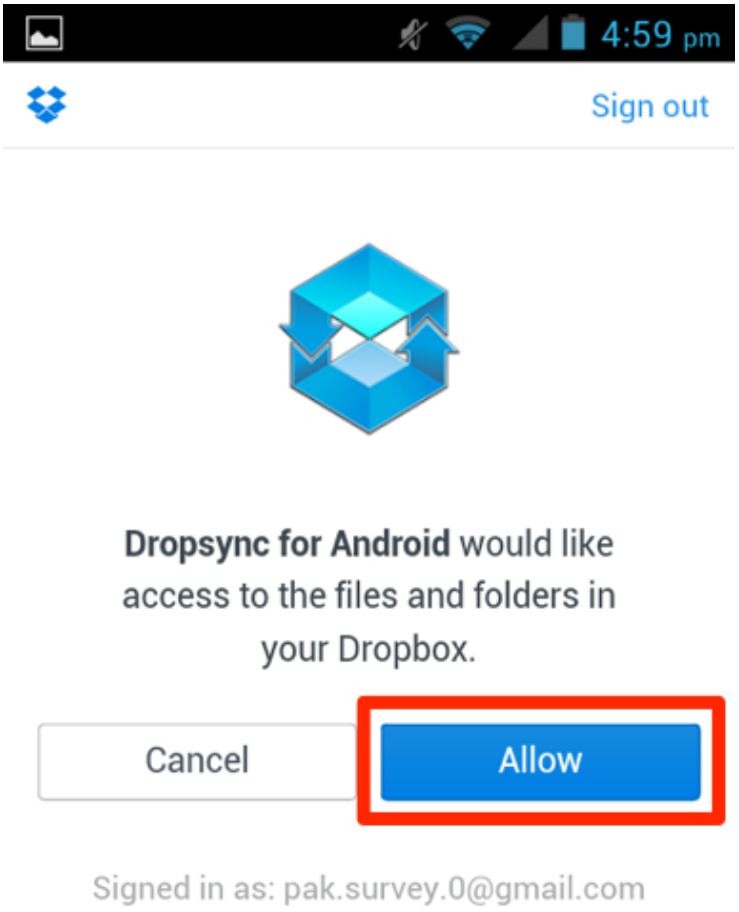


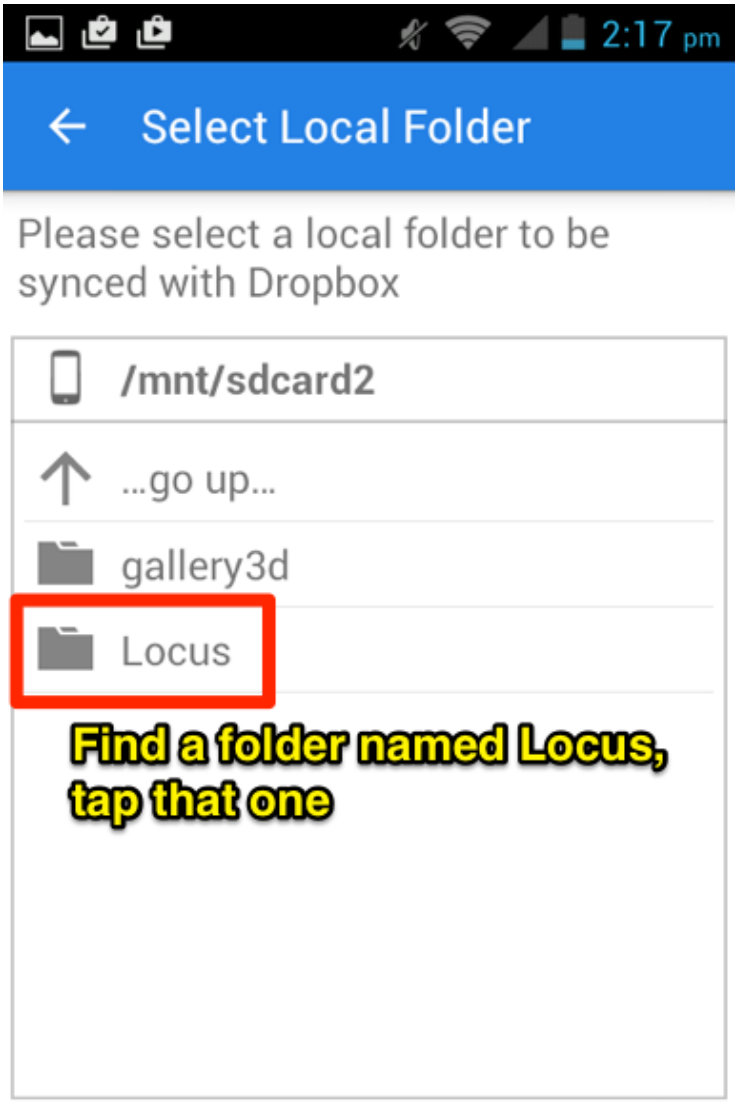


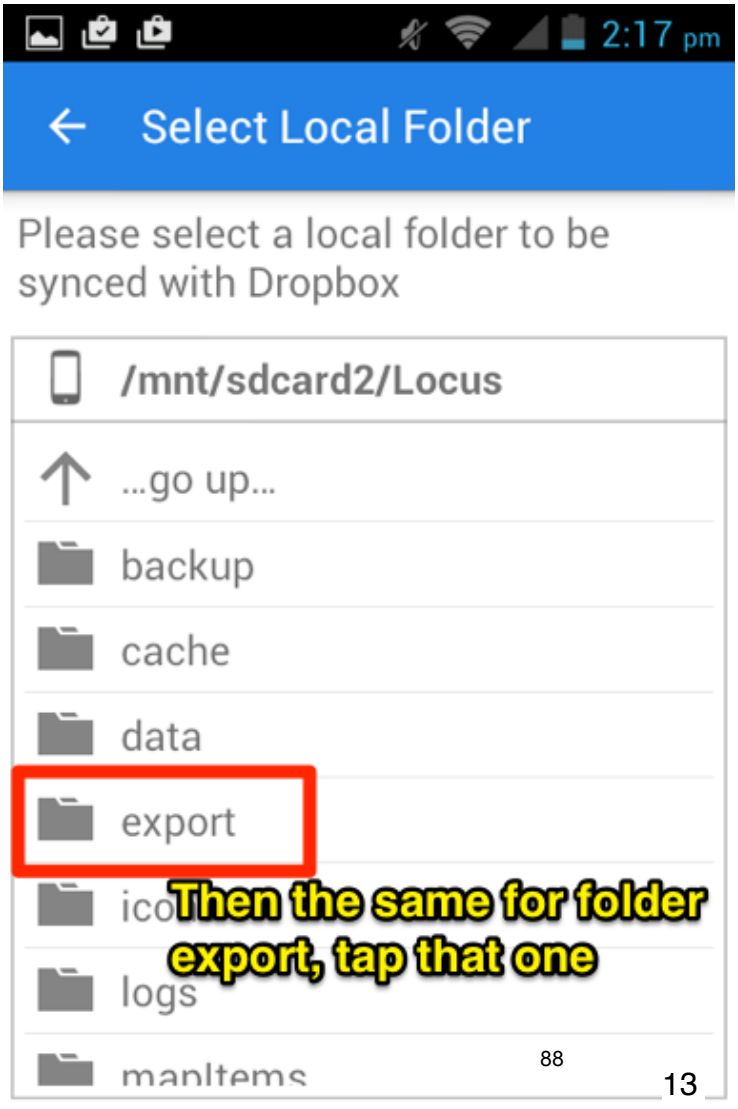


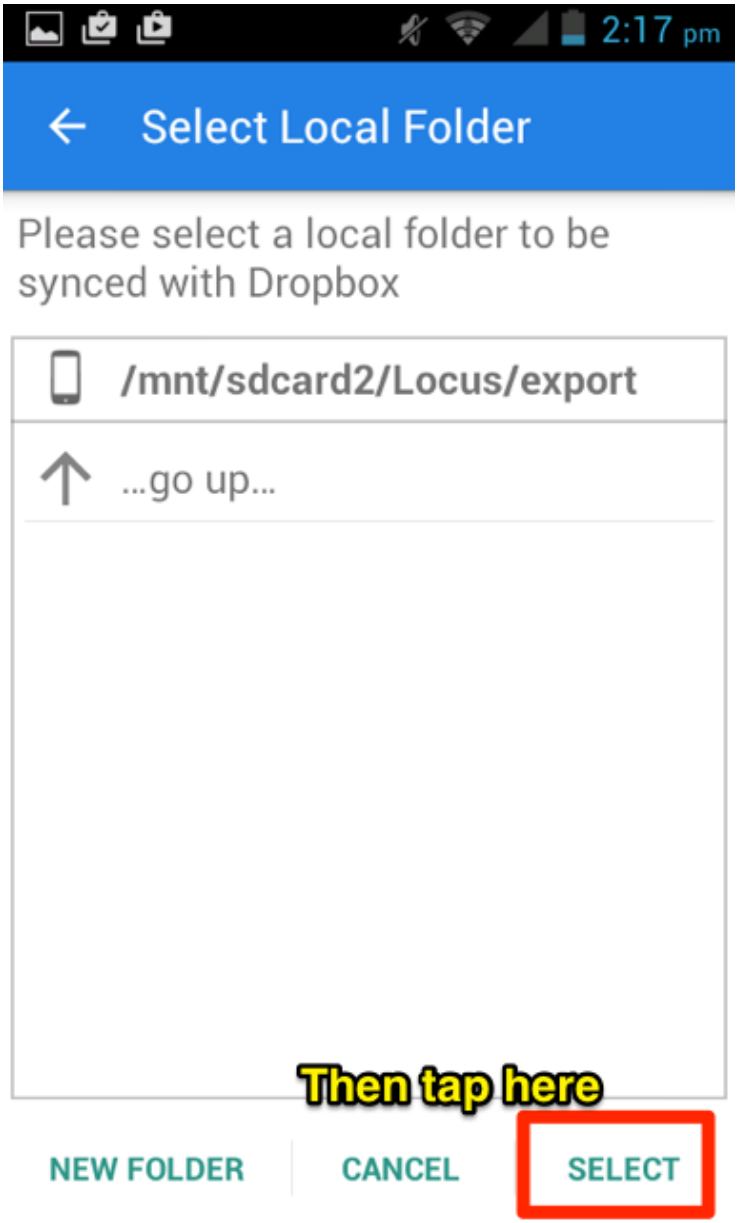


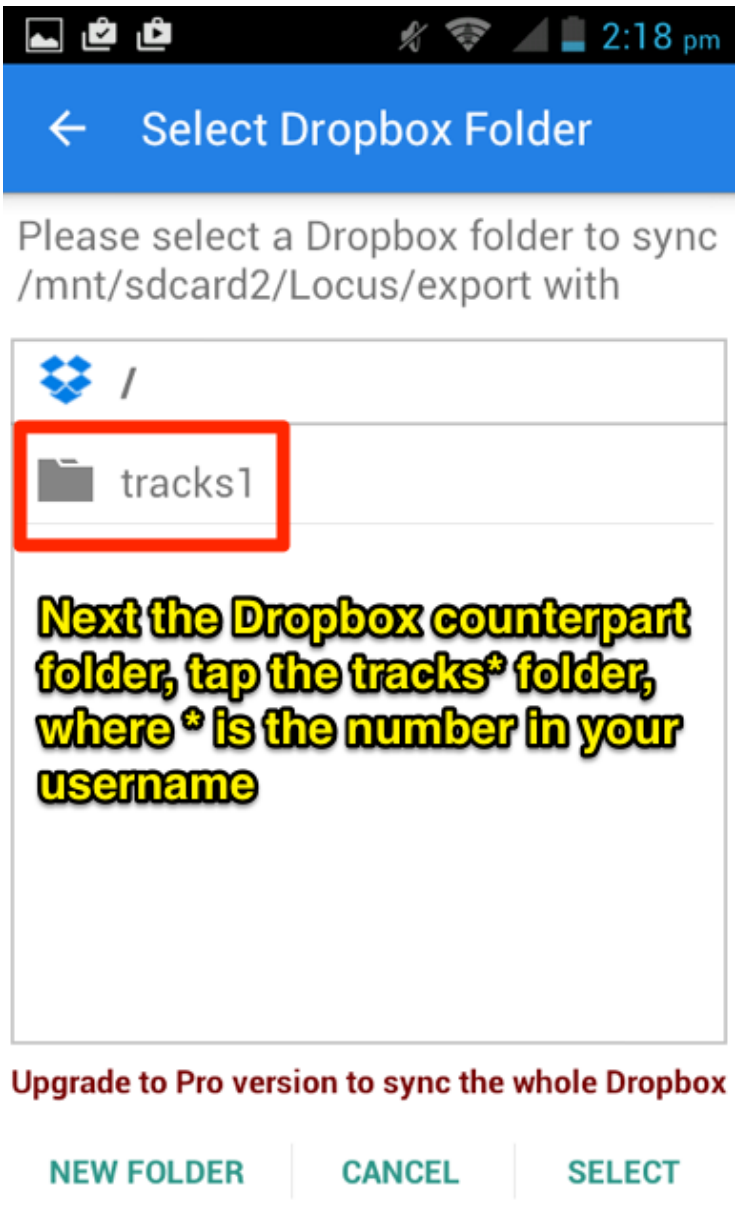

Use the email address and password assigned to the phone (see the backside of the phone).
Email is of the form esmap.biomass.*@gmail.com, where * is a number
Dropsync for Android
Email
Password
Sign in
Forgot your password?
New to Dropbox? Create an account

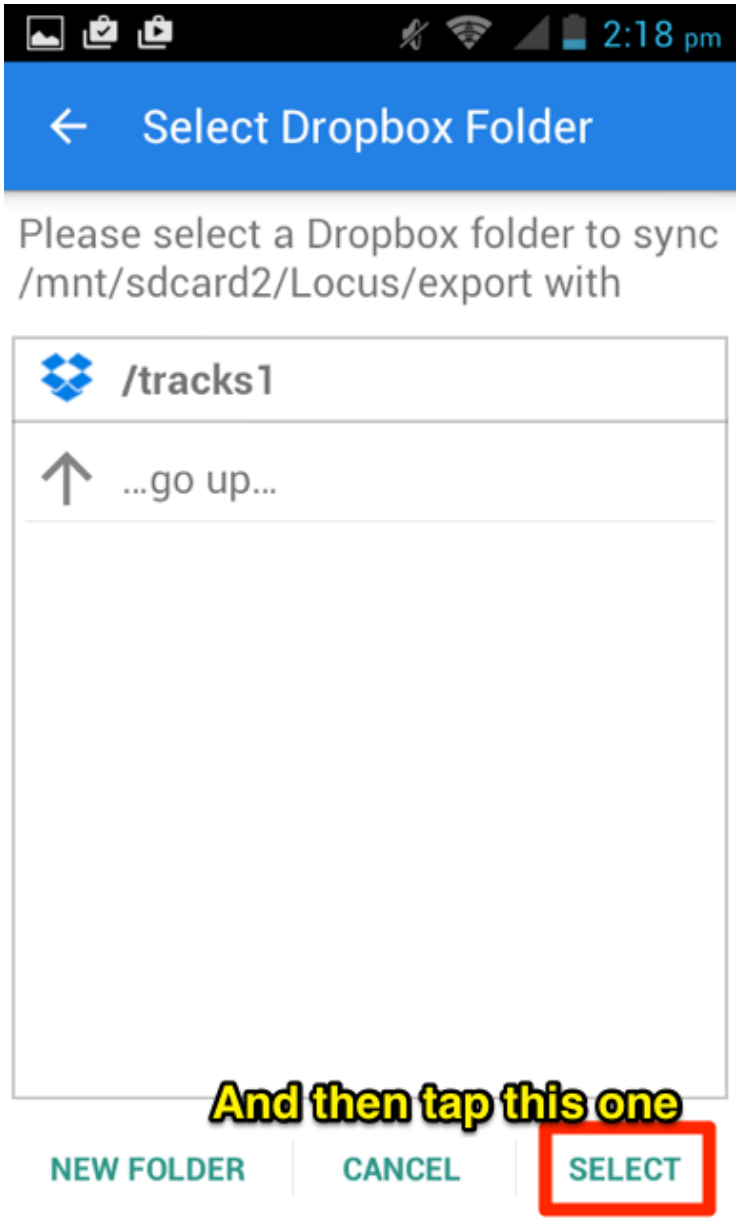

4:59 pm
Sign out
Dropsync for Android would like access to the files and folders in your Dropbox.
Cancel
Allow
Signed in as: pak.survey.0@gmail.com

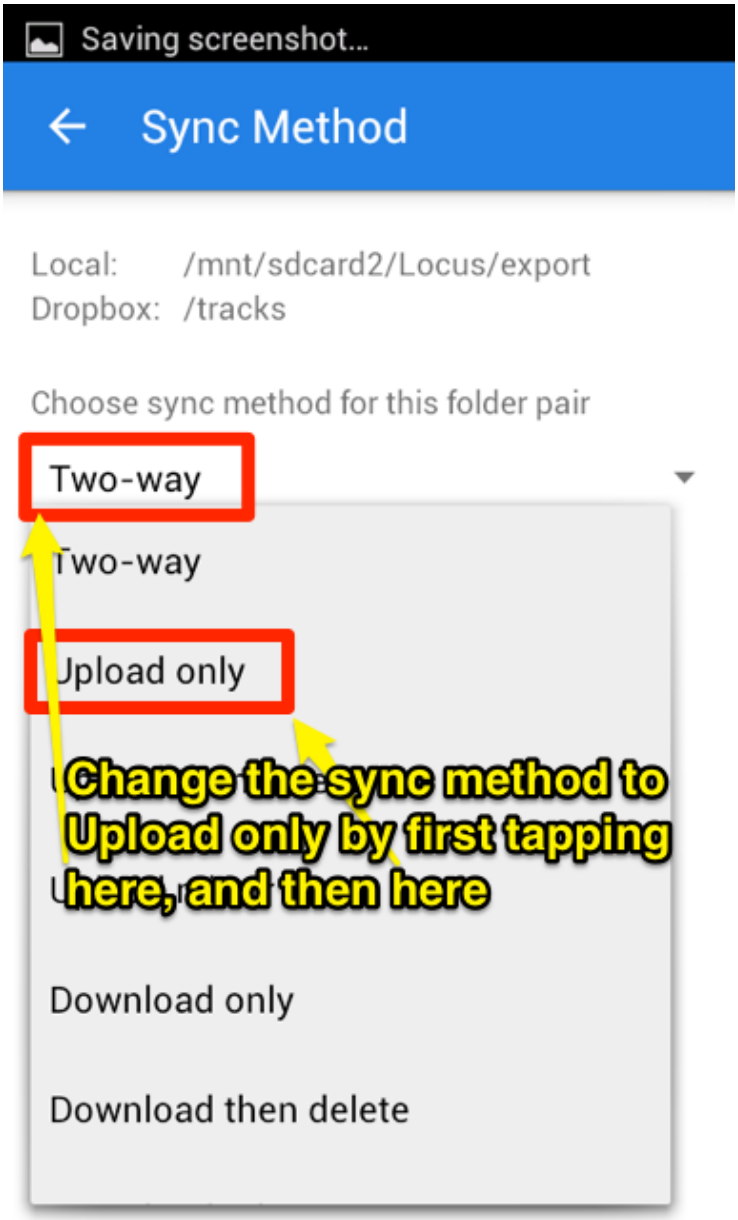

2:17 pm
Select Local Folder
Please select a local folder to be synced with Dropbox
/mnt/sdcard2
...go up...
gallery3d
Locus
Find a folder named Locus, tap that one

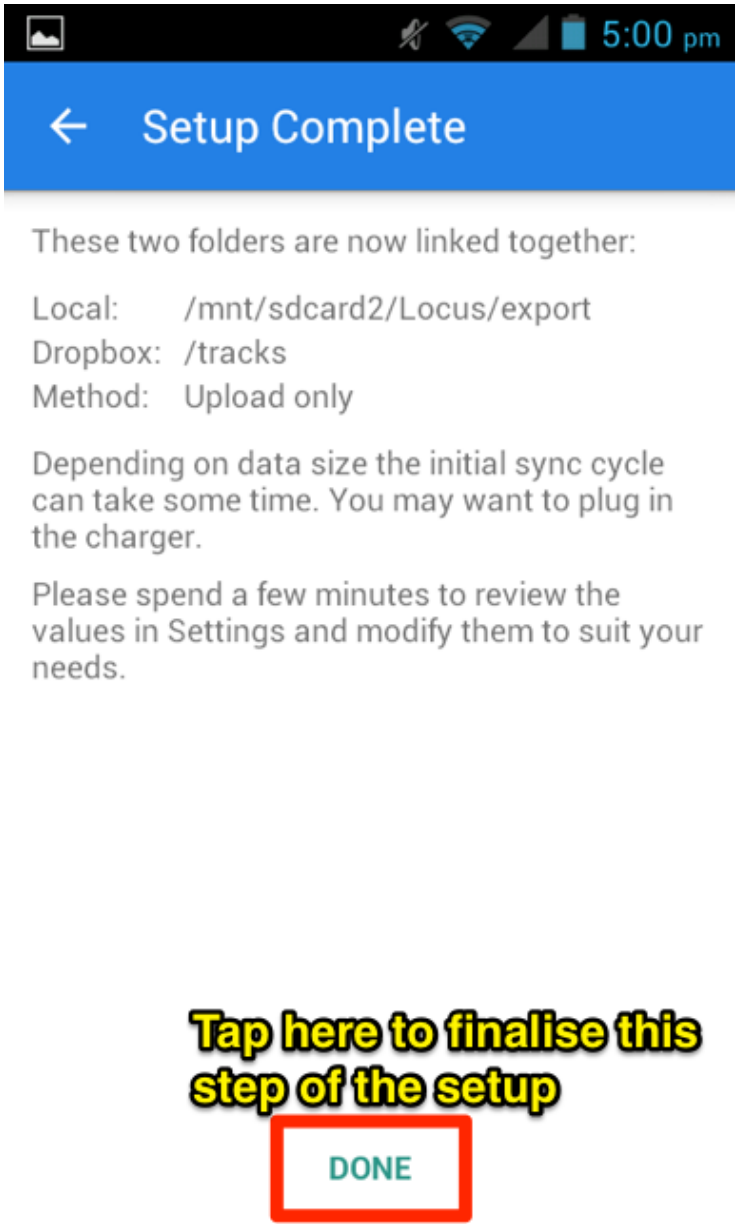

2:17 pm
Select Local Folder
Please select a local folder to be synced with Dropbox
/mnt/sdcard2/Locus
...go up...
backup
cache
data
export
Then the same for folder export, tap that one
logs


2:17 pm
Select Local Folder
Please select a local folder to be synced with Dropbox
/mnt/sdcard2/Locus/export
...go up...
Then tap here
NEW FOLDER
CANCEL
SELECT

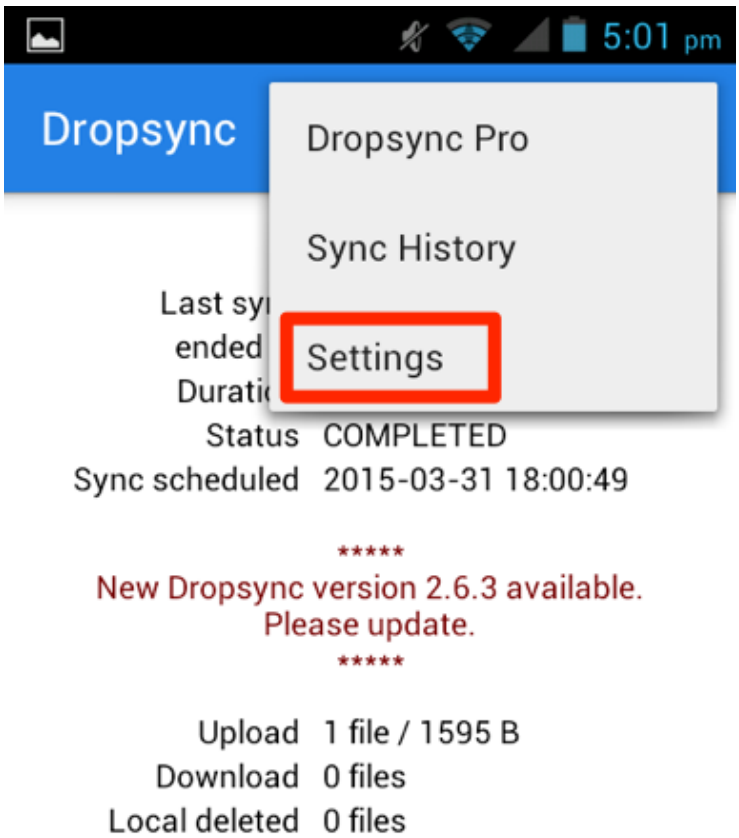

2:18 pm
Select Dropbox Folder
Please select a Dropbox folder to sync /mnt/sdcard2/Locus/export with
/
tracks1
Next the Dropbox counterpart folder, tap the tracks* folder, where * is the number in your username
Upgrade to Pro version to sync the whole Dropbox
NEW FOLDER
CANCEL
SELECT

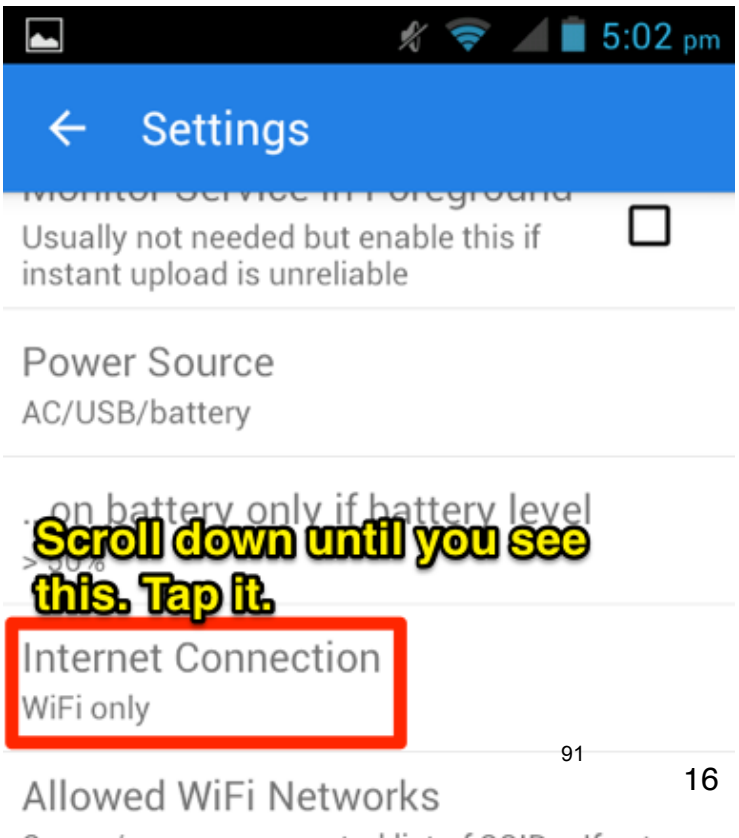

2:18 pm
Select Dropbox Folder
Please select a Dropbox folder to sync /mnt/sdcard2/Locus/export with
/tracks1
...go up...
And then tap this one
NEW FOLDER
CANCEL
SELECT

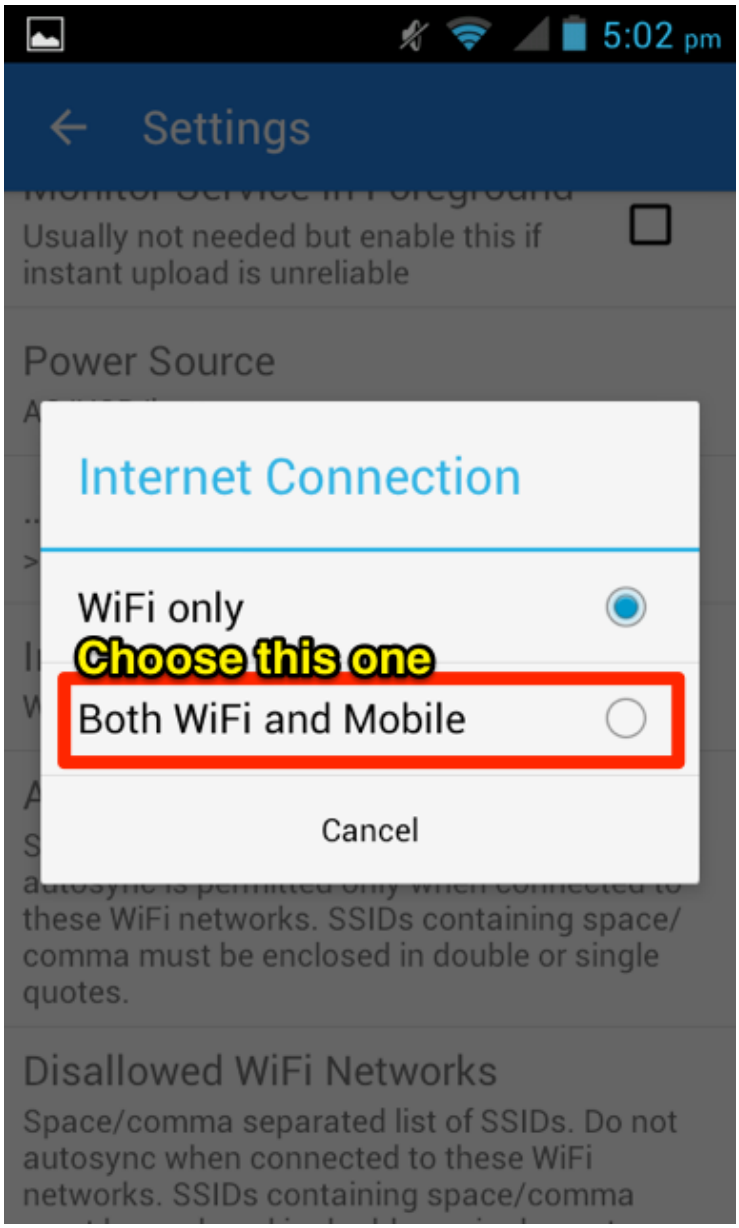

Saving screenshot...
Sync Method
Local: /mnt/sdcard2/Locus/export
Dropbox: /tracks
Choose sync method for this folder pair
Two-way
Two-way
Upload only
Change the sync method to Upload only by first tapping here, and then here
Download only
Download then delete

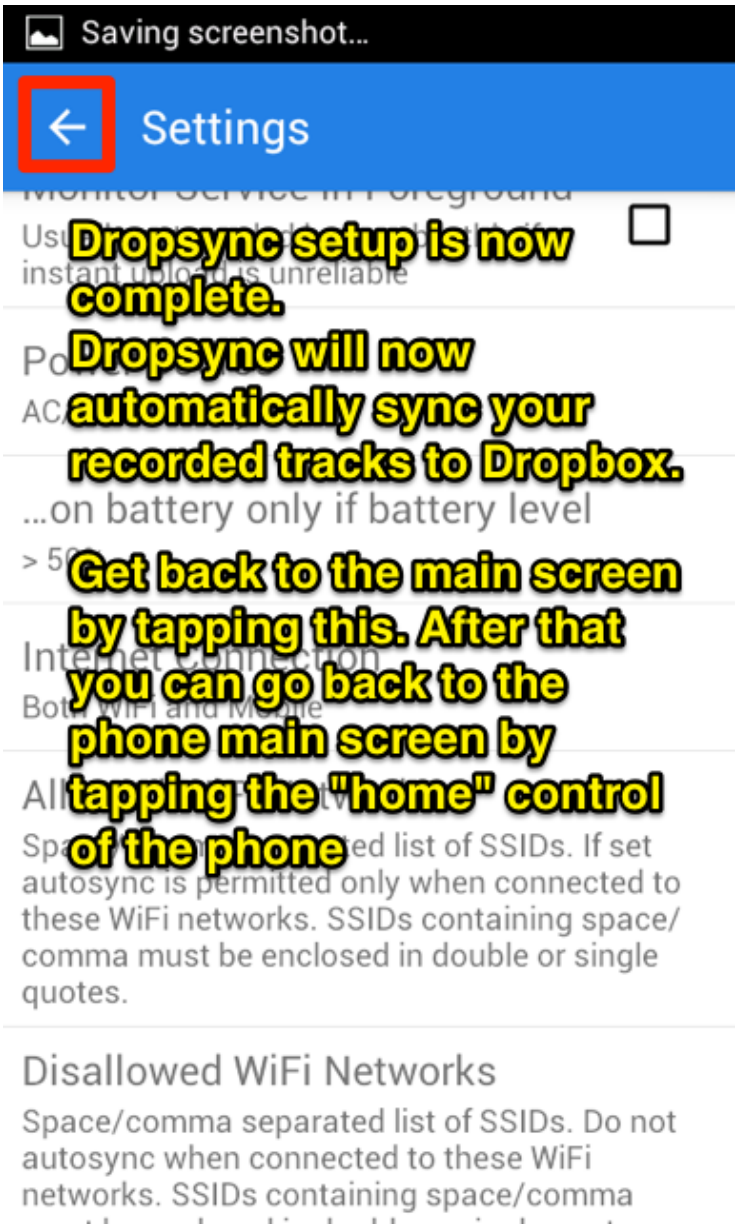

5:00 pm
Setup Complete
These two folders are now linked together:
Local: /mnt/sdcard2/Locus/export
Dropbox: /tracks
Method: Upload only
Depending on data size the initial sync cycle can take some time. You may want to plug in the charger.
Please spend a few minutes to review the values in Settings and modify them to suit your needs.
Tap here to finalise this step of the setup
DONE


5:00 pm
Dropsync
One more thing to set up
Sync Status
Last sync 2015-03-31 17:00:29
ended at -
Duration 4 seconds
Status RUNNING
Sync scheduled -
Examining Dropbox folders
Upload 0 files
Download 0 files
Local deleted 0 files
Remote deleted 0 files
Dropbox Account
Email pak.survey.0@gmail.com
Storage quota 2.00 GB
Storage used 2654 B (0%)
Storage shared 0 (0%)
Storage available 2.00 GB (100%)


5:01 pm
Dropsync
Dropsync Pro
Sync History
Settings
Status COMPLETED
Sync scheduled 2015-03-31 18:00:49
*****
New Dropsync version 2.6.3 available.
Please update.
*****
Upload 1 file / 1595 B
Download 0 files
Local deleted 0 files

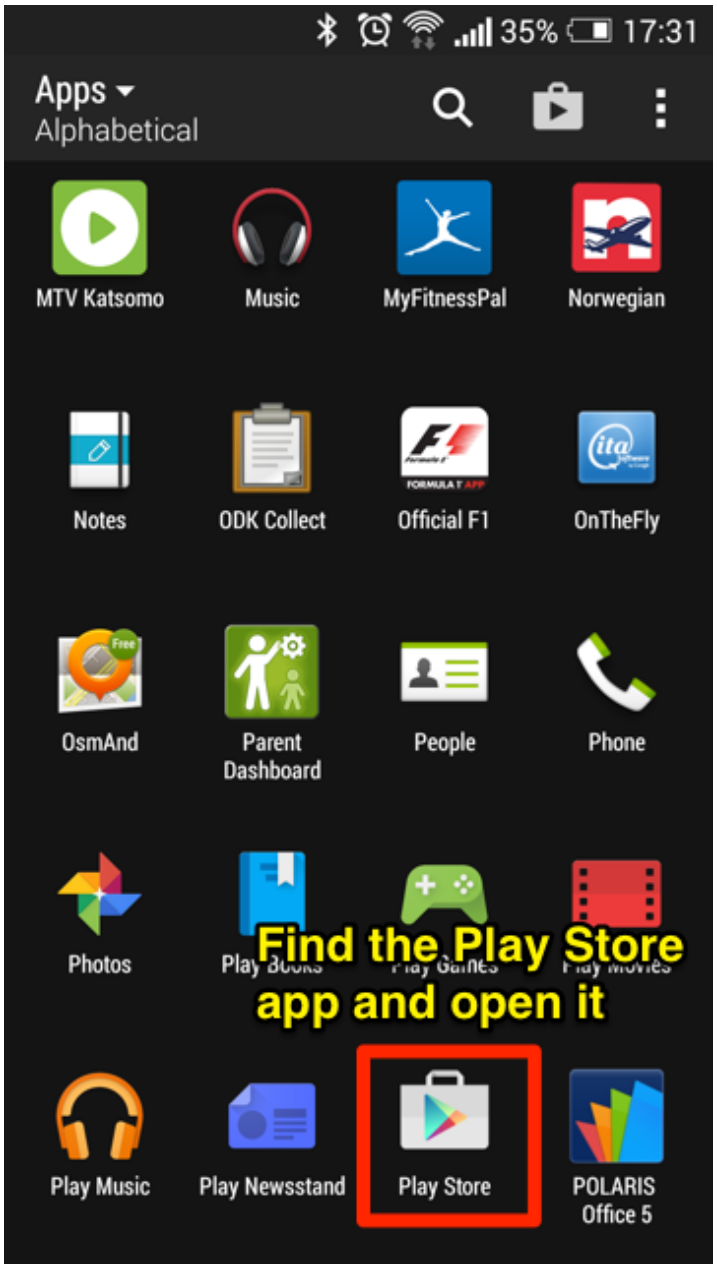

5:02 pm
Settings
Usually not needed but enable this if instant upload is unreliable
Power Source
AC/USB/battery
Scroll down until you see this. Tap it.
Internet Connection
WiFi only
Allowed WiFi Networks

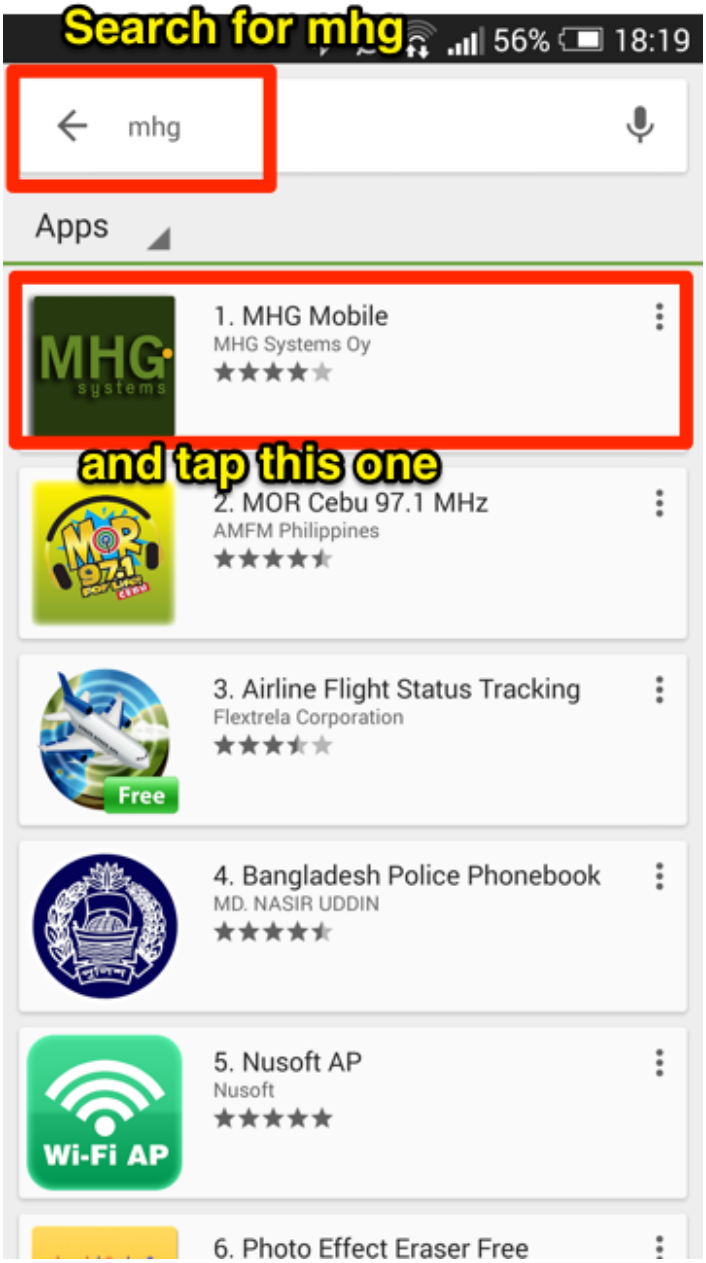

5:02 pm
Settings
Usually not needed but enable this if instant upload is unreliable
Power Source
Internet Connection
WiFi only
Choose this one
Both WiFi and Mobile
Cancel
these WiFi networks. SSIDs containing space/ comma must be enclosed in double or single quotes.
Disallowed WiFi Networks
Space/comma separated list of SSIDs. Do not autosync when connected to these WiFi networks. SSIDs containing space/comma

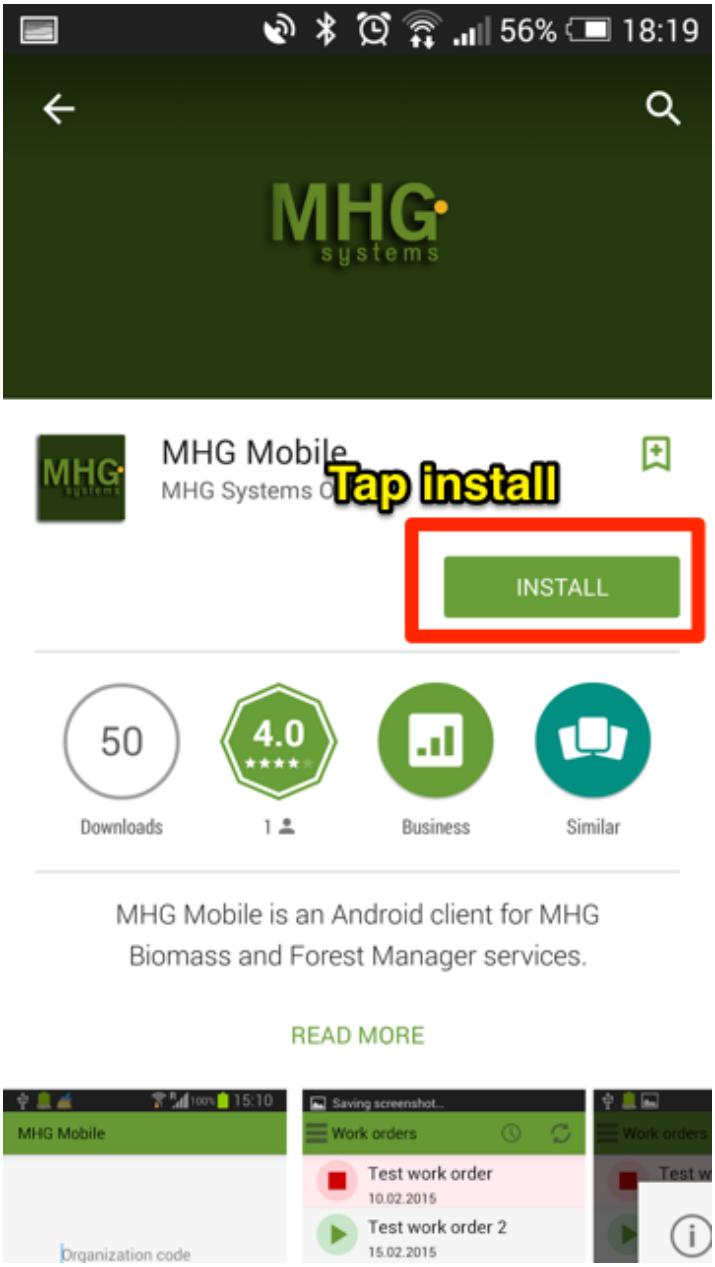

Saving screenshot...
Settings
Dropsync setup is now complete.
Dropsync will now automatically sync your recorded tracks to Dropbox.
Get back to the main screen by tapping this. After that you can go back to the phone main screen by tapping the "home" control of the phone
...on battery only if battery level
these WiFi networks. SSIDs containing space/ comma must be enclosed in double or single quotes.
Disallowed WiFi Networks
Space/comma separated list of SSIDs. Do not autosync when connected to these WiFi networks. SSIDs containing space/comma

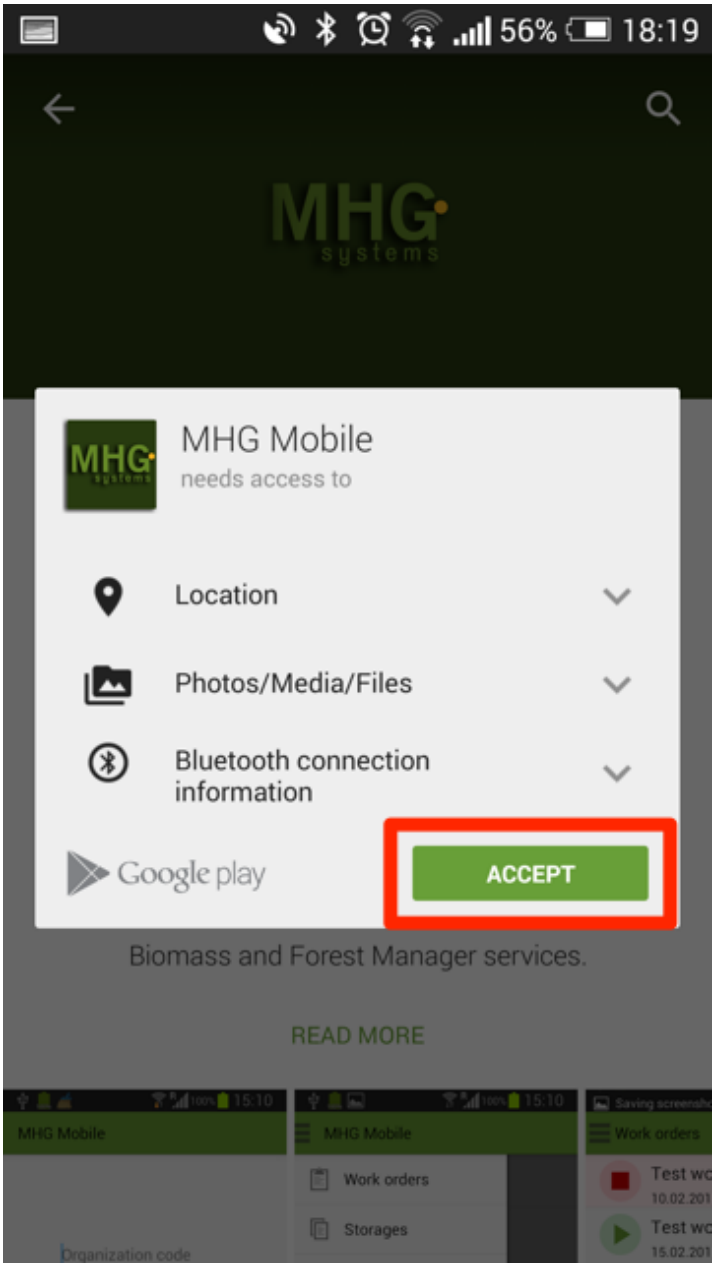
Step 3: MHG Mobile, the app for the survey

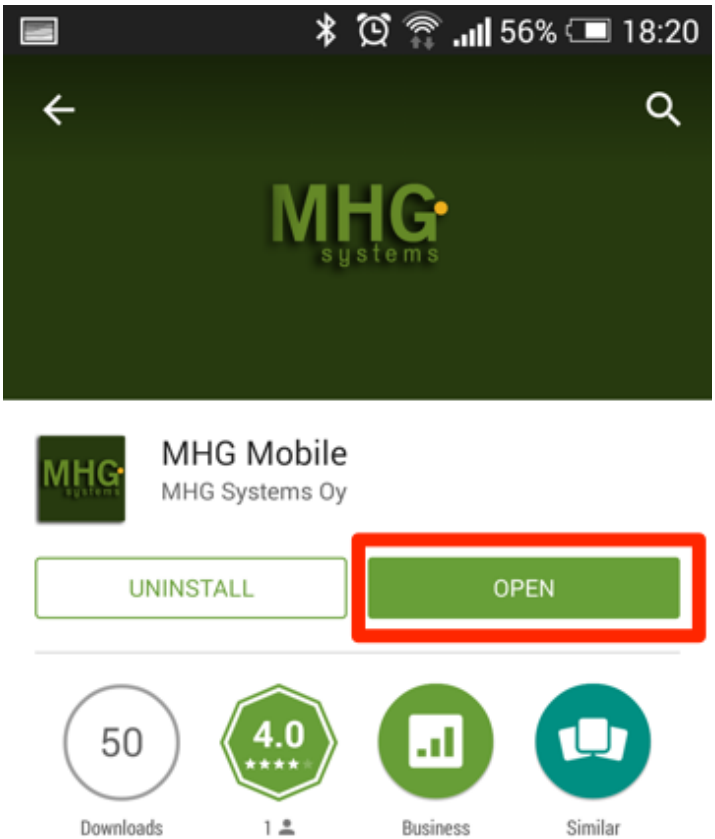
Installing MHG Mobile

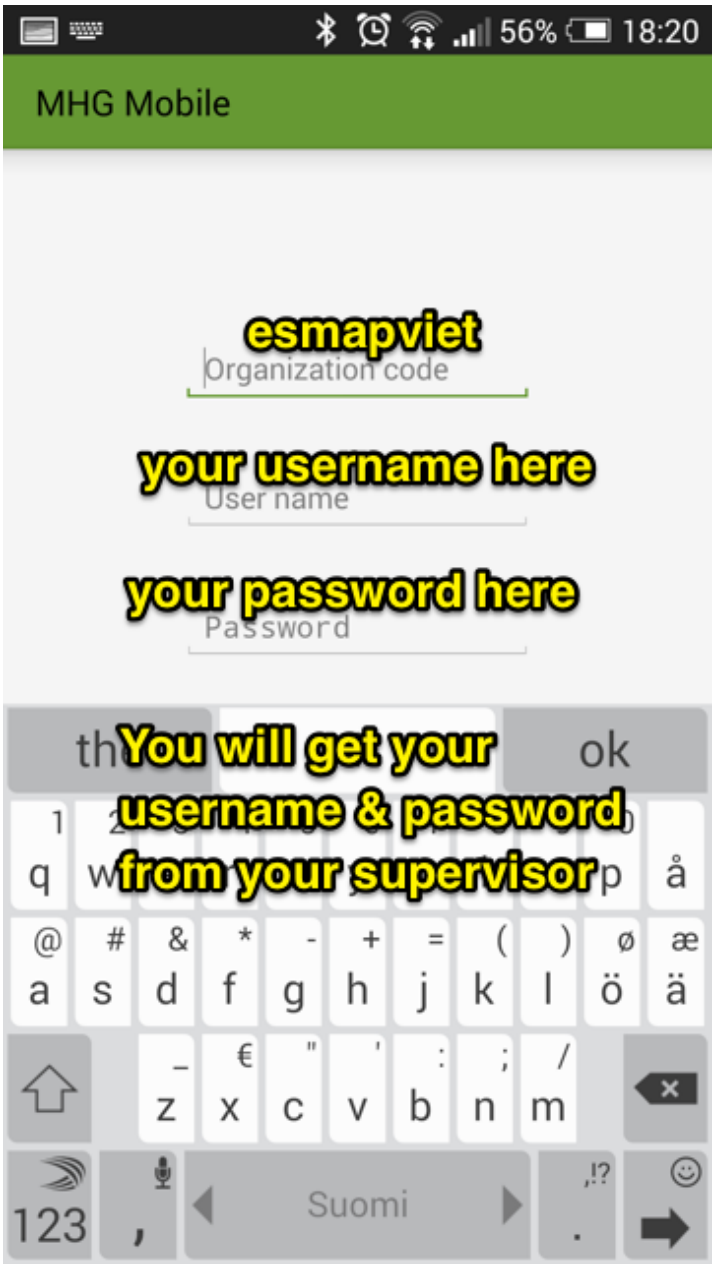


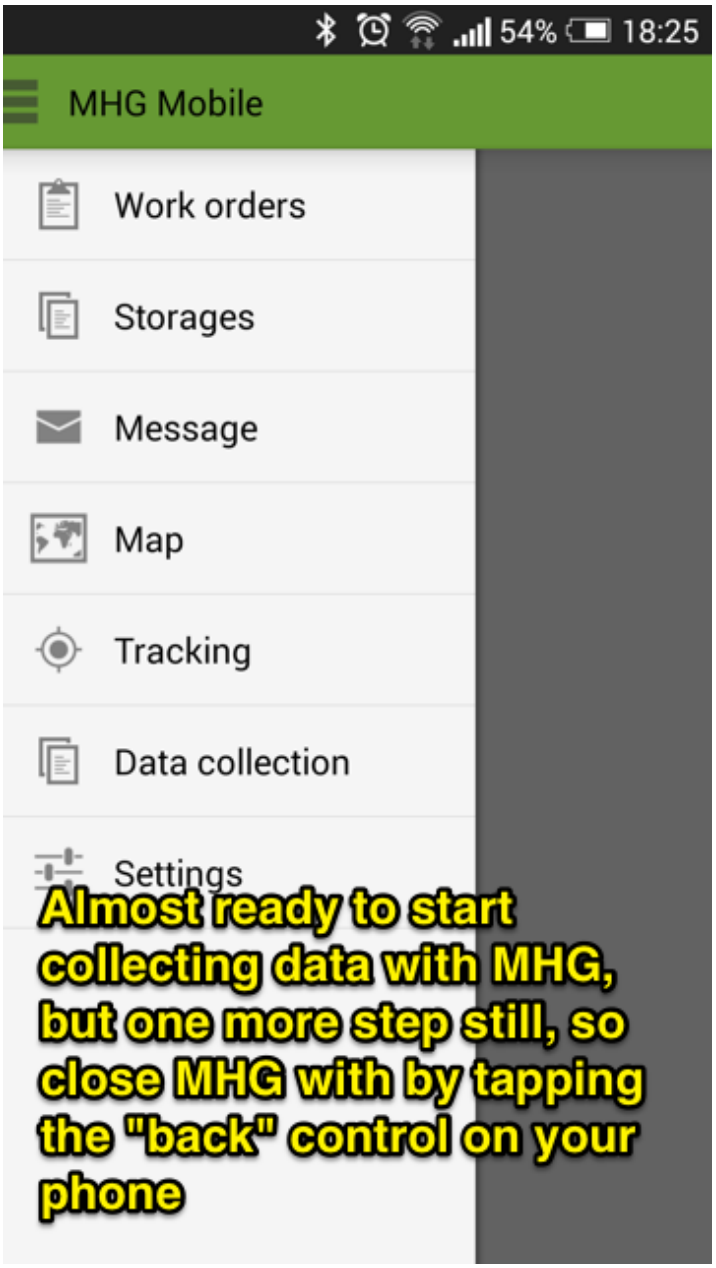


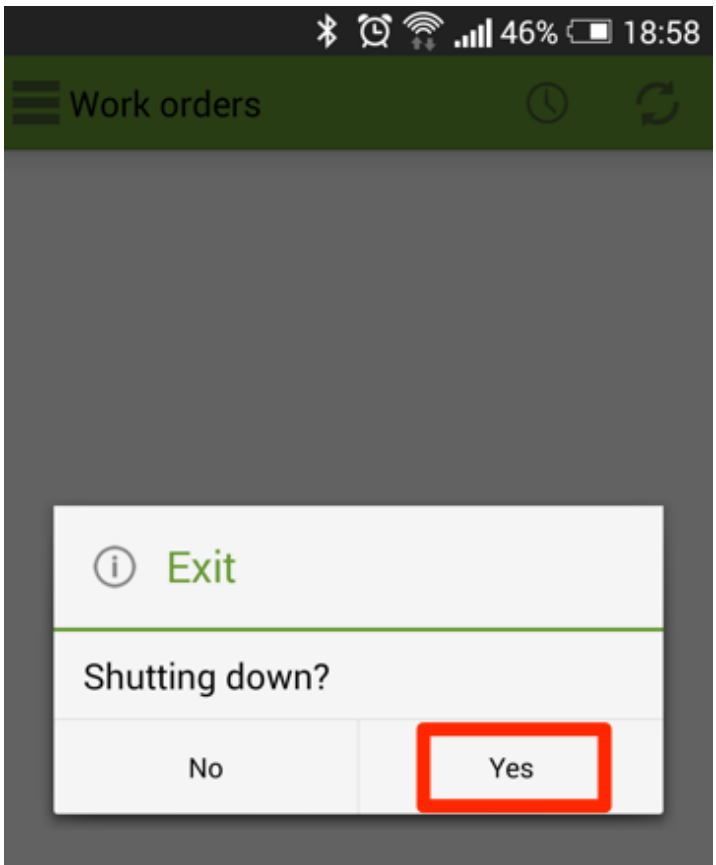

56% 18:19
MHG systems
MHG Mobile
MHG Systems O
Tap install
INSTALL
50
Downloads
4.0
1
Business
Similar
MHG Mobile is an Android client for MHG Biomass and Forest Manager services.
READ MORE
MHG Mobile
Work orders
Test work order
10.02.2015
Test work order 2
15.02.2015
Organization code


56% 18:19
MHG systems
MHG Mobile
needs access to
Location
Photos/Media/Files
Bluetooth connection information
Google play
ACCEPT
Biomass and Forest Manager services.
READ MORE
MHG Mobile
Work orders
Storages
Organization code


56% 18:20
MHG systems
MHG Mobile
MHG Systems Oy
UNINSTALL
OPEN
50
Downloads
4.0
1
Business
Similar


MHG Mobile
esmapviet
Organization code
your username here
User name
your password here
Password
You will get your username & password from your supervisor


MHG Mobile
Work orders
Storages
Message
Map
Tracking
Data collection
Settings
Almost ready to start collecting data with MHG, but one more step still, so close MHG with by tapping the "back" control on your phone

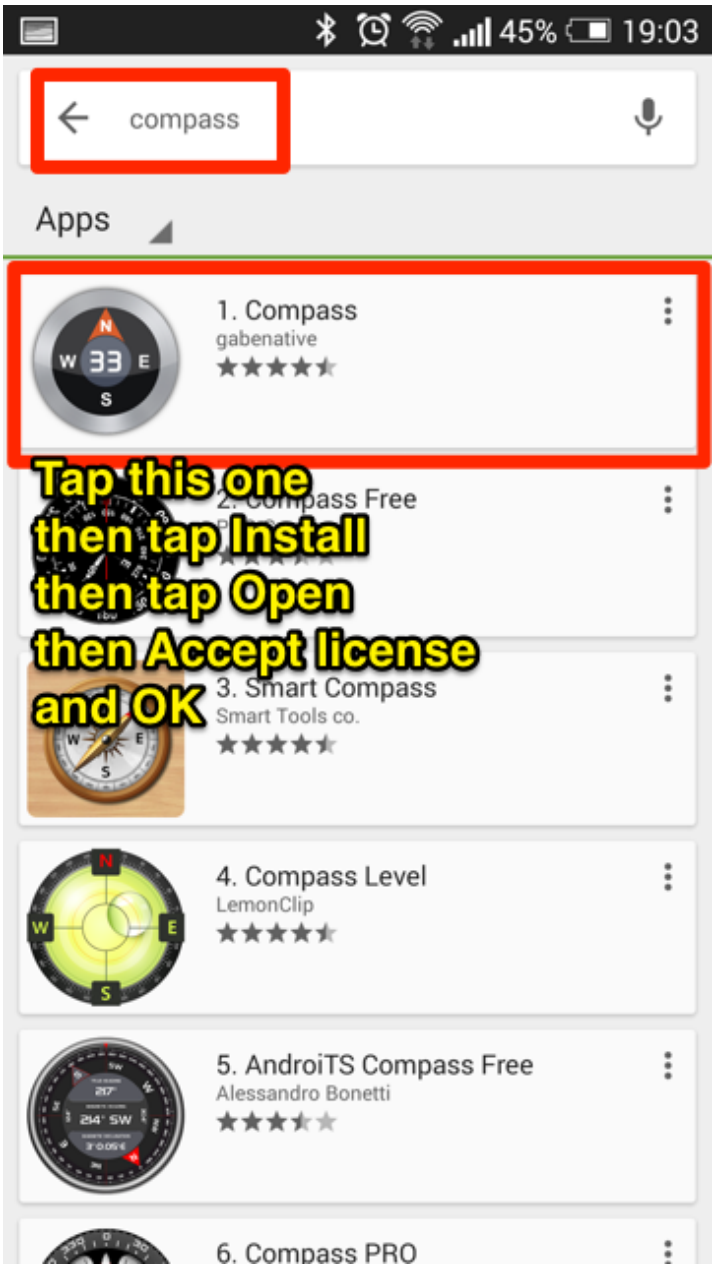

Work orders
Exit
Shutting down?
No
Yes

Step 4: The fourth, and final, needed app – Compass

You will be taking photos of fields with MHG, and when you take the photo the location of the place and the compass bearing into which your facing will be recorded.

These photos will be used for satellite image analysis for land use classification, and it is extremely important that the bearing is recorded correctly. Therefore the compass on your phone needs to be calibrated. We'll be using a Compass app for this calibration, so let's install still that one on your phone:

Again, open the Play Store app on your phone, and search for "compass":



Biomass Resource Mapping in Vietnam 2016-09-07

Field Survey Daily Checklist

In the morning, before leaving to field:
- Start Locus Free, and start Track recording (for details, see Training Manual, p. 6)
- Start Compass, calibrate the compass with it (for details, see Training Manual, p. 8)

During the day: Executing the interview with MHG Mobile
- Start MHG Mobile, select “Data collection” from menu
- For each interview, select “Crop residue survey” in the Data collection view. Fill the survey questions, take a photo of the single reference field (for details, see Training Manual, p. 10)

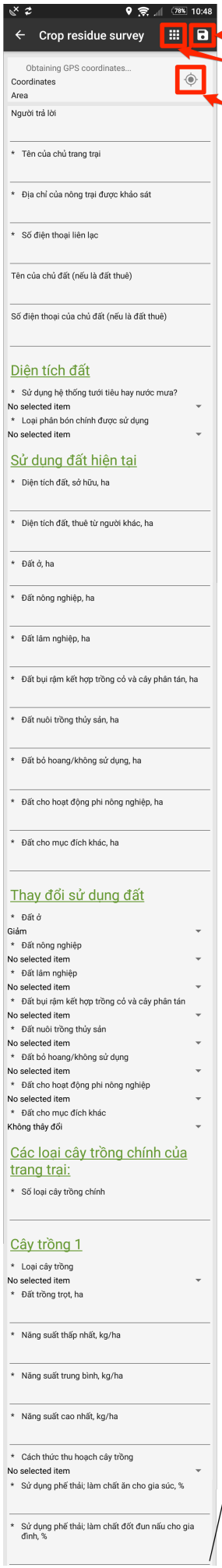
In the evening, after returning from the field
- Stop track recording in Locus Free, and save the track (for details, see Training Manual, p. 17).

FAQ for MHG Mobile

"Saved forms disappearing"
MHG Mobile starts uploading the saved survey forms whenever it has a network connection. Therefore the saved forms count can start decreasing all of a sudden. Don’t worry, this just means that the forms have been now securely stored on the server.

"Can’t execute the next interview, because the previous is still uploading, and it’s taking a long time"
Turn off mobile data when you’re in an area with poor network coverage. That way you can start the next interview straight away.

"The camera icon is inactive, I can’t take the photo of the field"
Fall back to recording the coordinates only. See next page for instructions. Do **NOT** do this if you were able to take the photo, and you have the coordinate values on the form.



To save the form, tap here

To take the photo, tap here

Use this for recording coordinates, IF taking the photo fails. BUT ONLY THEN, NOT NORMALLY

Form continues here

After filling information for one crop, tap here to add the next one, if there are more crops to fill

These you fill for the reference field

After which you take a photo of the field, see above for how to do that

WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program

BỘ CÔNG THƯƠNG VIỆT NAM
MINISTRY OF INDUSTRY AND TRADE OF THE SOCIALIST REPUBLIC OF VIETNAM

Biomass Resource Mapping in Vietnam

Field Survey Training Material – Using The Survey Smartphone

September 2016

Prepared by:
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VTT Technical Research Center of Finland (VTT)
Enerteam, Vietnam
Institute of Energy, Vietnam
PITCO (Private) Limited, Pakistan

Date: 6 September 2016

Country:

Vietnam

Project title and ID:

Renewable Energy Resource Mapping: Biomass [Phases 1-3] - Pakistan
Project ID: 1178842

Implementing agency:

The World Bank (Vietnam) in close coordination with the General Department of Energy, Ministry of Industry and Trade of Vietnam (GDE/MOIT)

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Date of report:

6th September 2016

Table of Contents

Introduction

This document contains the training material for the execution of the field survey for crop production. The field survey is conducted as part of a technical assistance project being implemented by the World Bank in Vietnam. The project aims to support renewable energy mapping and geospatial planning for biomass, solar and wind. It is being undertaken in close coordination with the Ministry of Industry and Trade (MOIT), Government of Vietnam. The project is funded by the Energy Sector Management Assistance Program (ESMAP), a global knowledge and technical assistance program administered by the WB and supported by 11 bilateral donors, and is part of a major ESMAP initiative in support of renewable energy resource mapping and geospatial planning across multiple countries.

The field survey will be performed as a person-to-person interview by the survey team with the farmers using smartphones as survey tool. They will be using a phone application that can record their responses, indicate the location of the interview, and attach a geographically tagged photograph of a reference field on the farm. The second objective of the field survey is to partially map the road network over the survey area. This will be executed by tracking the location of the survey smartphones during the survey execution field trips.

The survey will cover the whole of Vietnam. Vietnam National University of Agriculture (VNUA) and Nong Lam University (NLU) hired by GDE/MOIT will conduct the survey.

The survey has two objectives: (i) to provide data to estimate the harvest residue potential for energy production use, and (ii) to collect reference ground observations for satellite image based land use classification. For the first objective the survey interview will target the following “per hectare” factors for each region and crop species:

- Crop production level
- Residue-to-crop ratio
- Amount of crop residues that should be left in the field
- Amount of crop residues used for other purposes
- Accessibility to the harvest residues related to farm activities such as harvesting method and types of available machinery
- Current market prices for the harvest residues

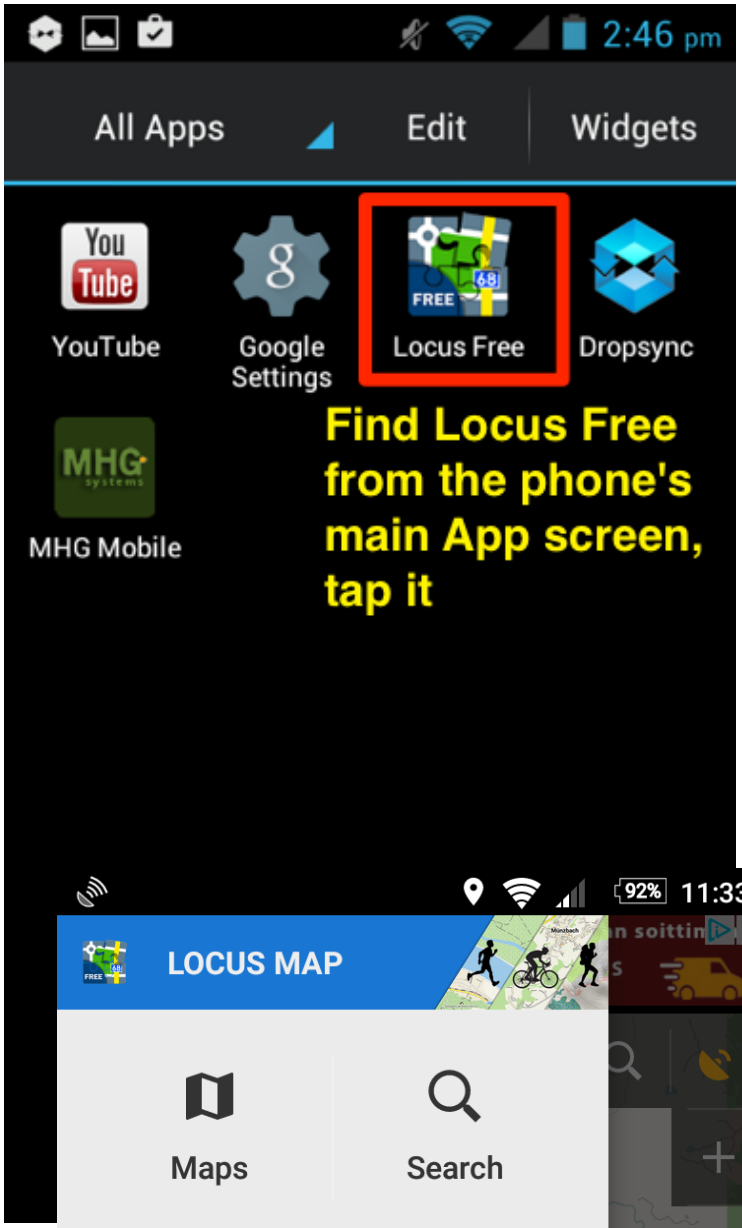
For the second objective, one field on the farm will be selected as a reference field. A geotagged photo will be taken with the smartphone survey application of that field, and the crop species for the six previous cropping seasons will recorded during the interview. This information will then be used as the ground reference data in the satellite image interpretation process for land use classification. Besides the farm locations, land cover class ground observations are collected for land cover classes outside of agricultural land. For these locations the smartphone app will be used as a tool to record the location and land cover class associated with that as well as a geotagged photograph.

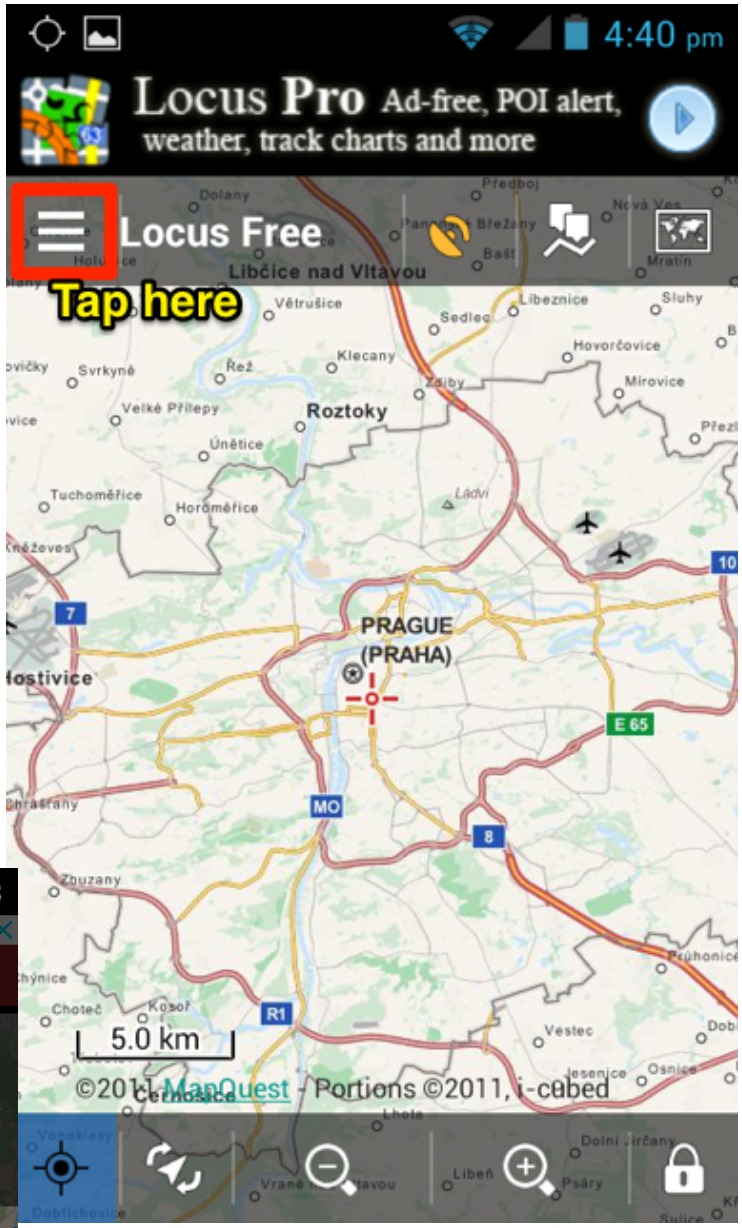
Executing the field survey

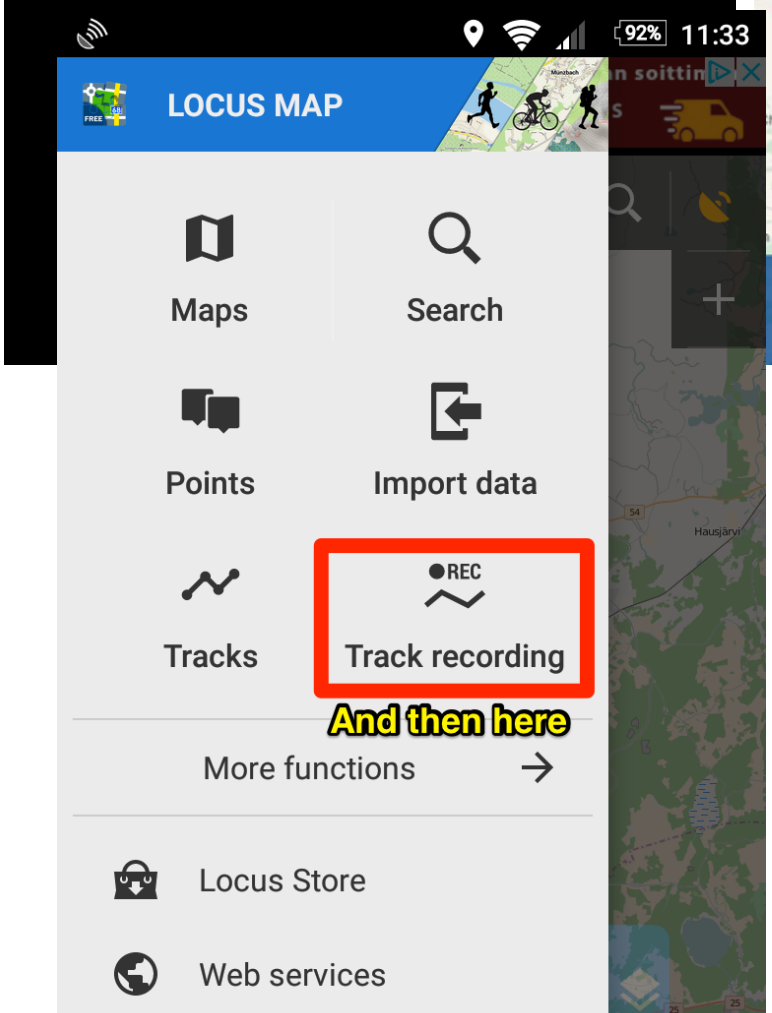
Using your phone to execute the survey

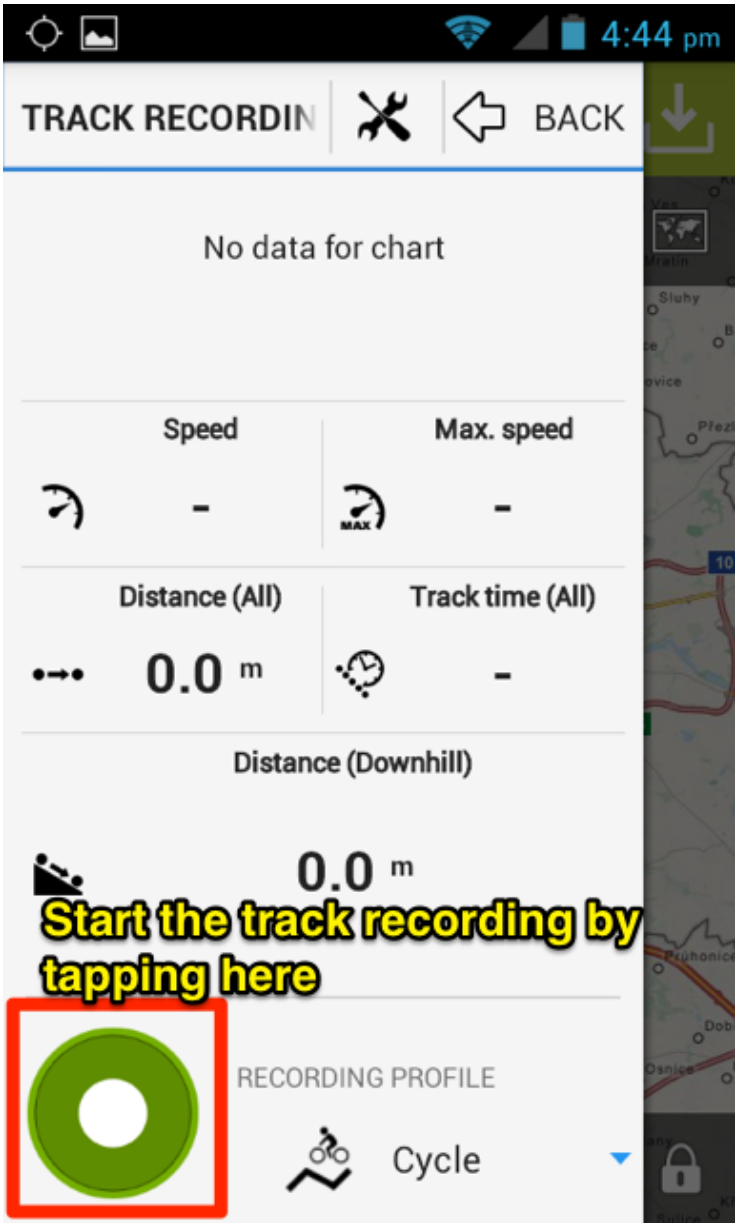
Daily steps to take.

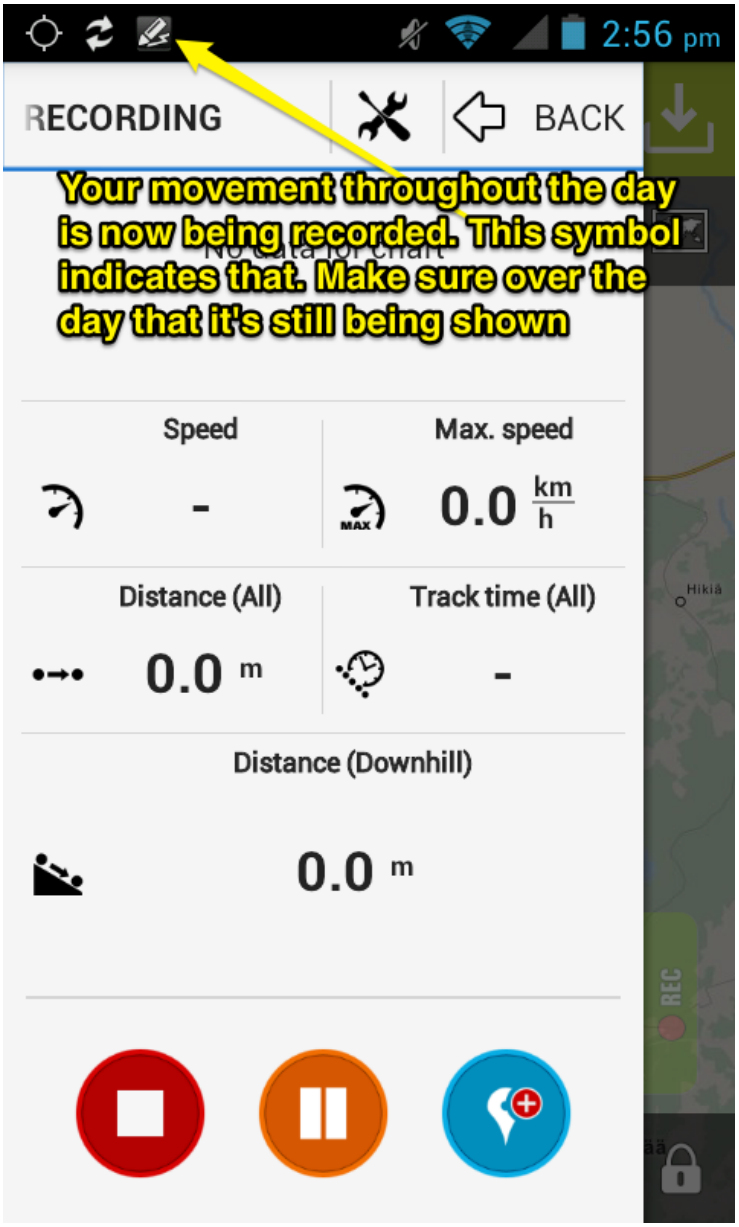
Step 1: Open up Locus Free; start track recording



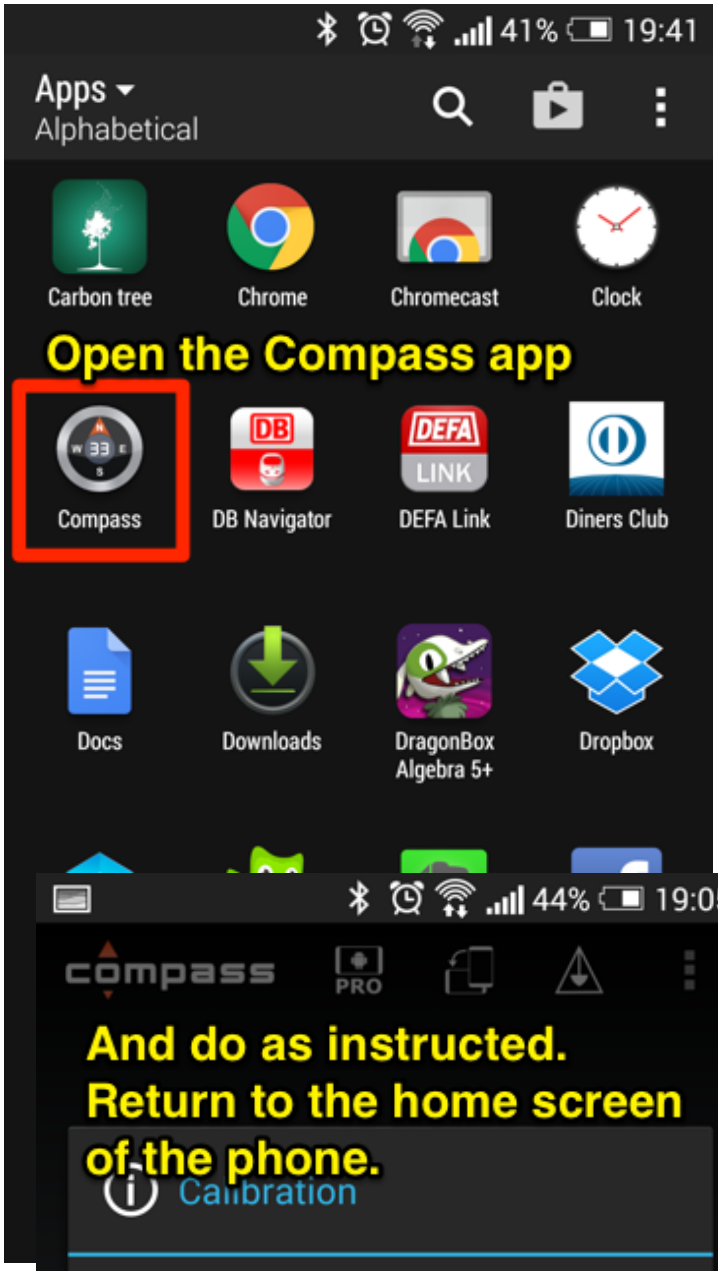




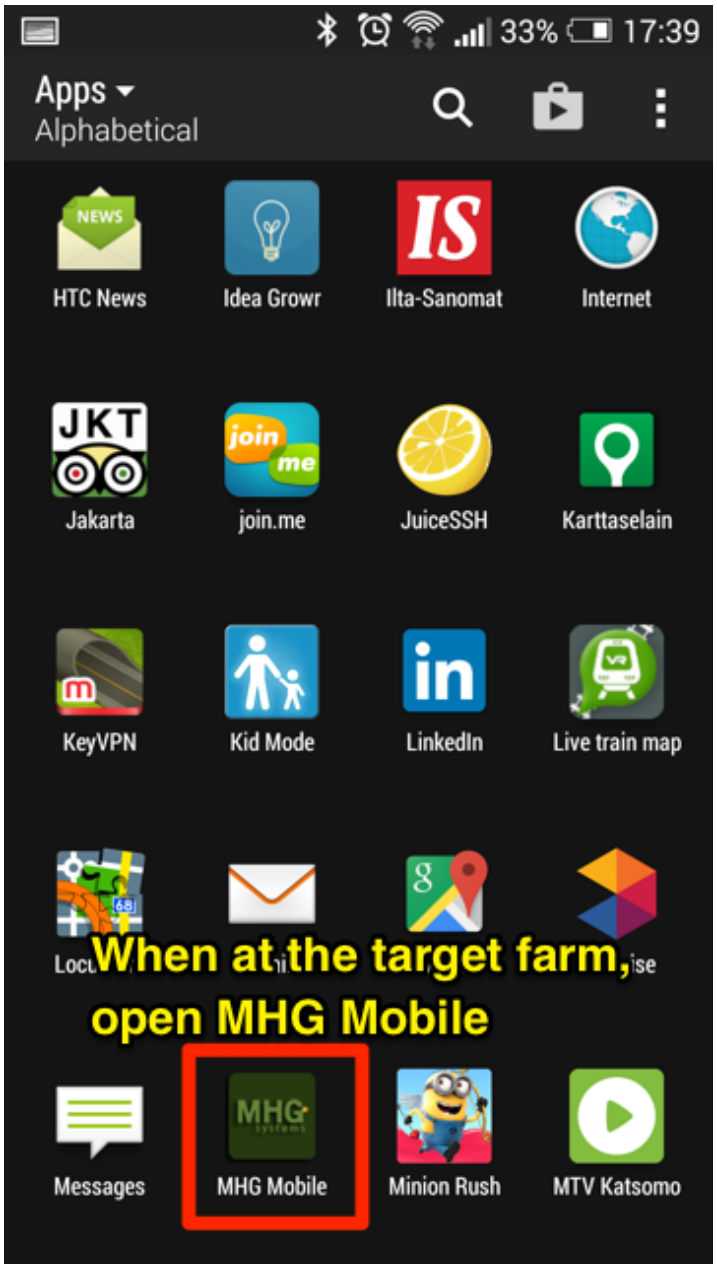

4:44 pm
TRACK RECORDIN
BACK
No data for chart
Speed
Max. speed
-
-
Distance (All)
Track time (All)
0.0 m
-
Distance (Downhill)
0.0 m
Start the track recording by tapping here
RECORDING PROFILE
Cycle

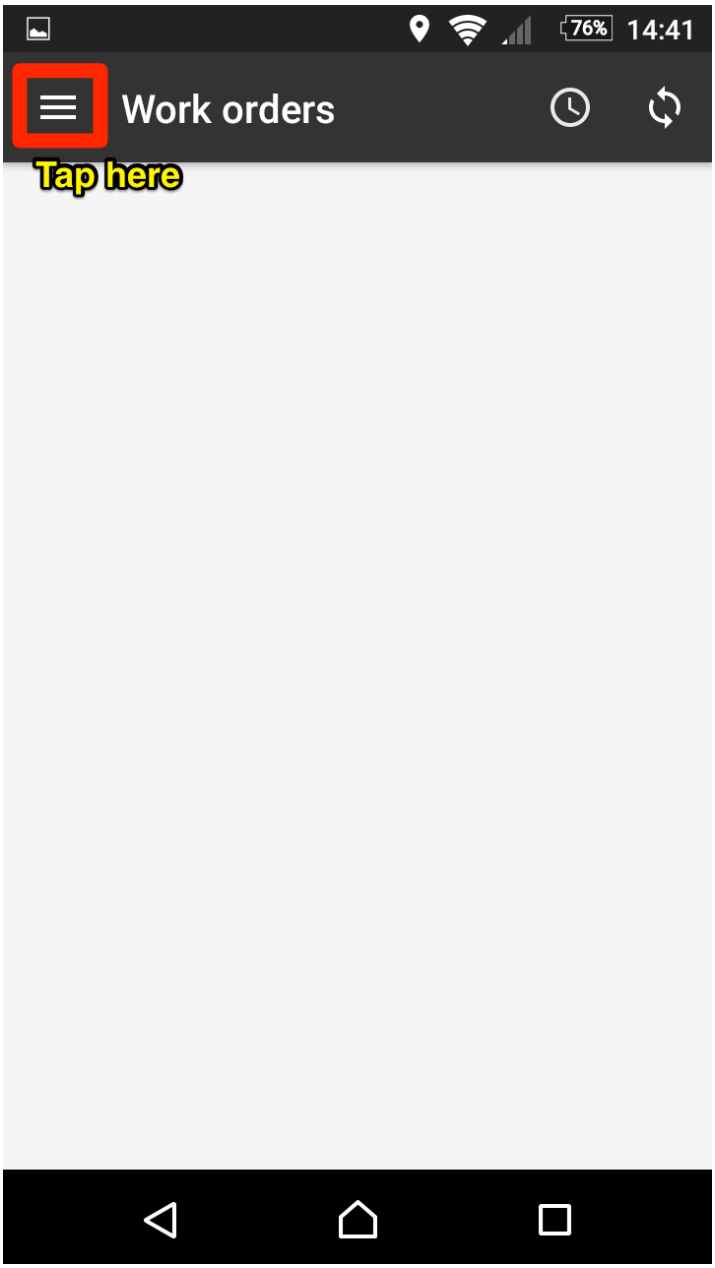

2:56 pm
RECORDING
BACK
Your movement throughout the day is now being recorded. This symbol indicates that. Make sure over the day that it's still being shown
Speed
Max. speed
-
0.0 km/h
Distance (All)
Track time (All)
0.0 m
-
Distance (Downhill)
0.0 m

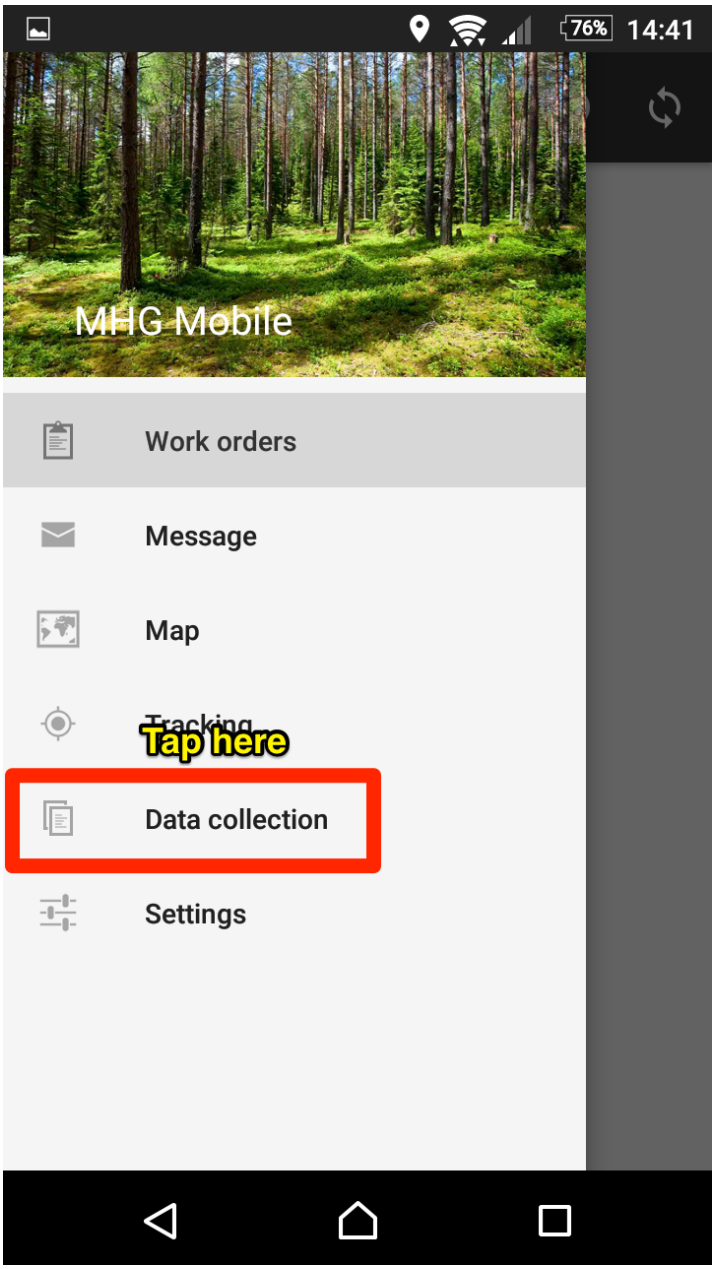
Step 2: Calibrate your compass

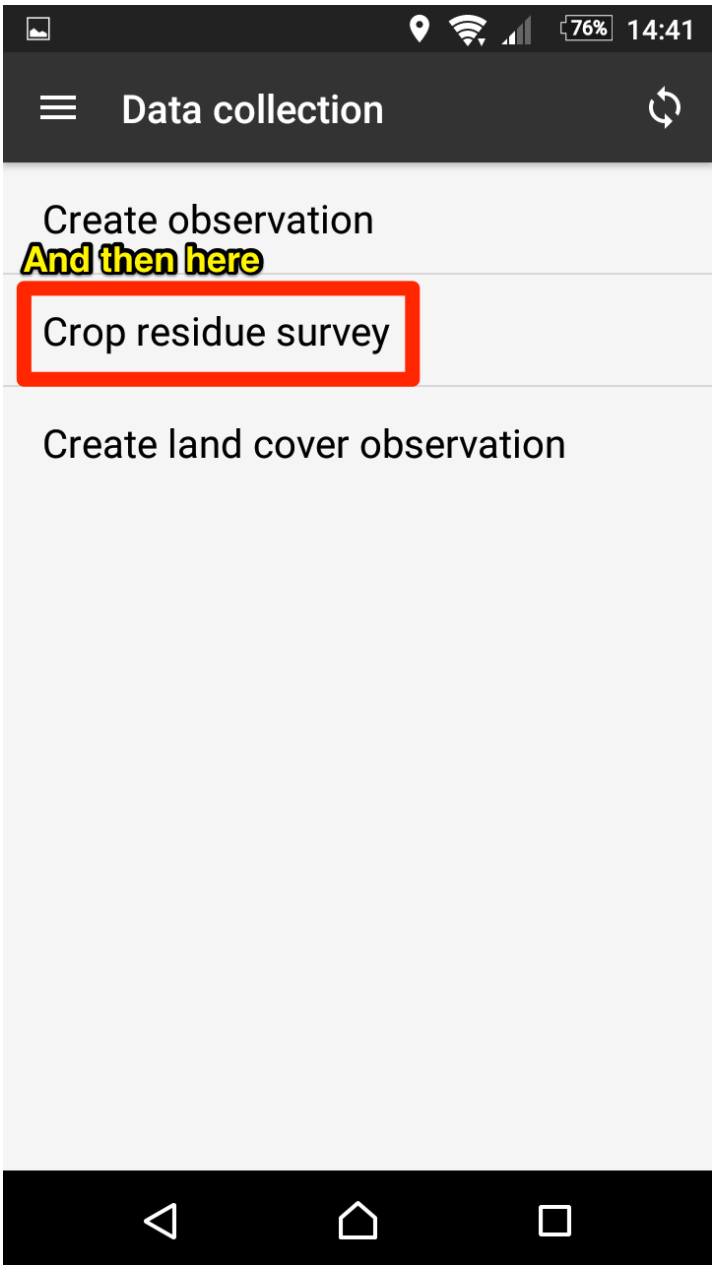


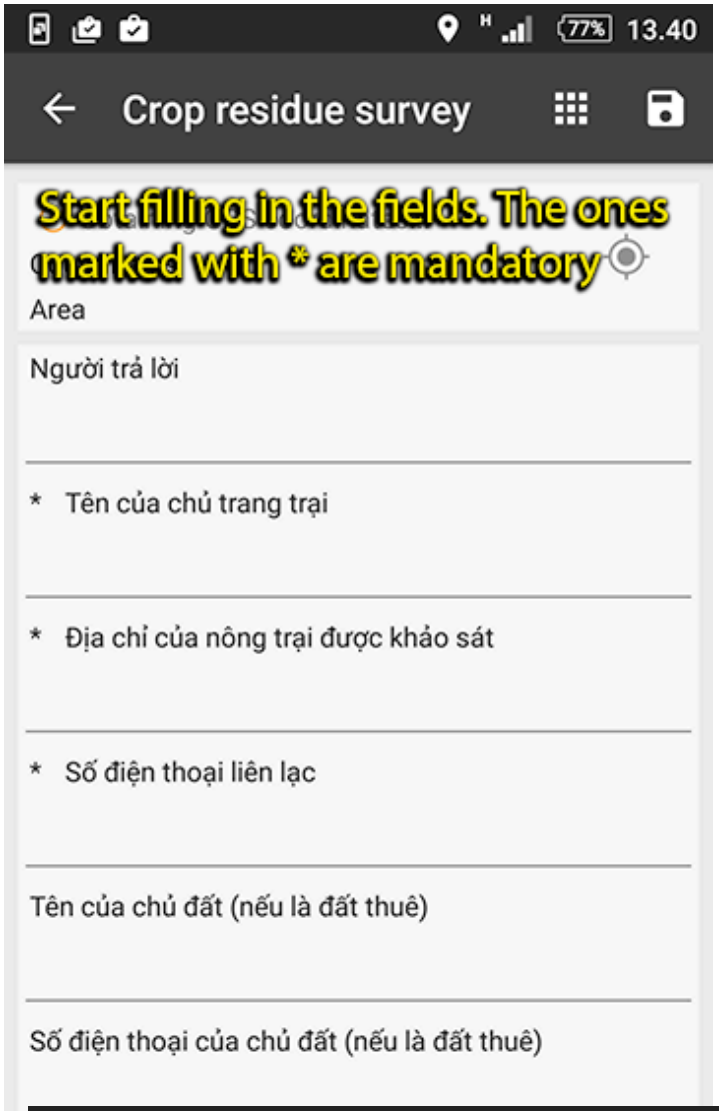
Step 3: Execute the interviews

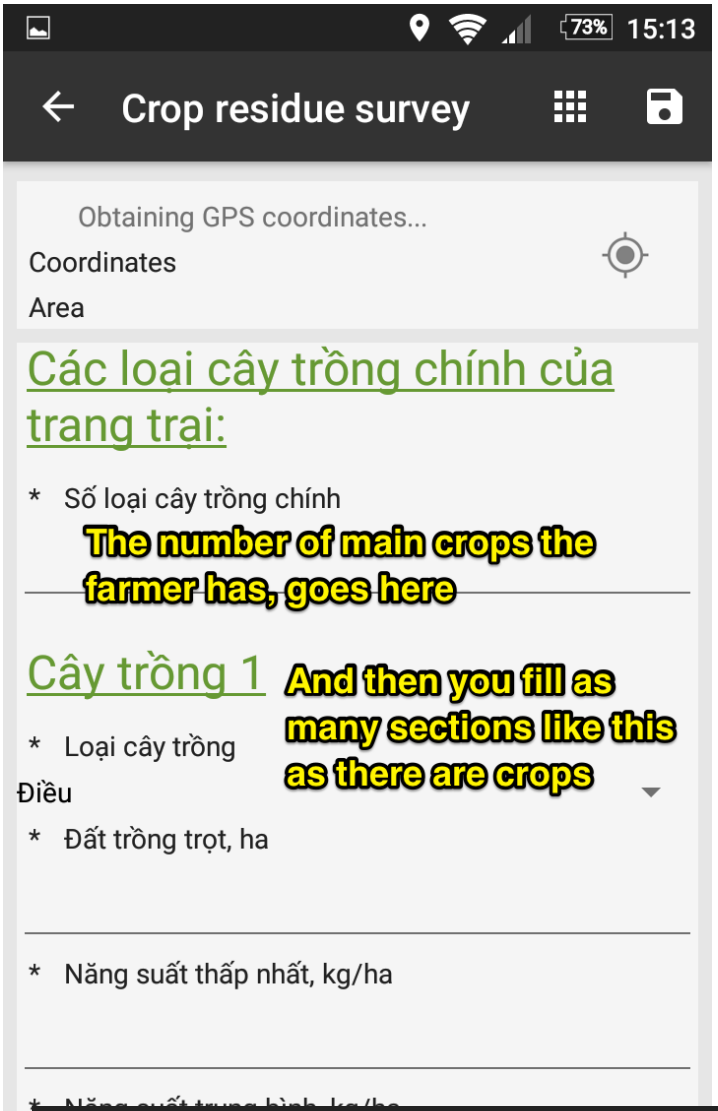


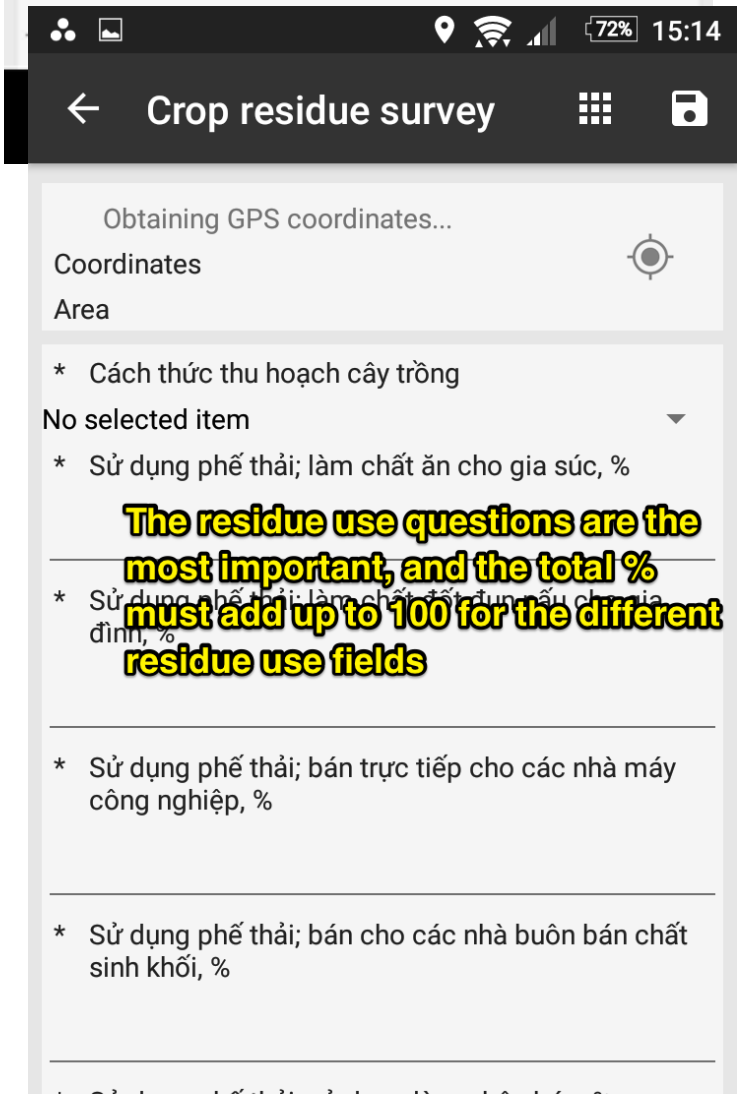


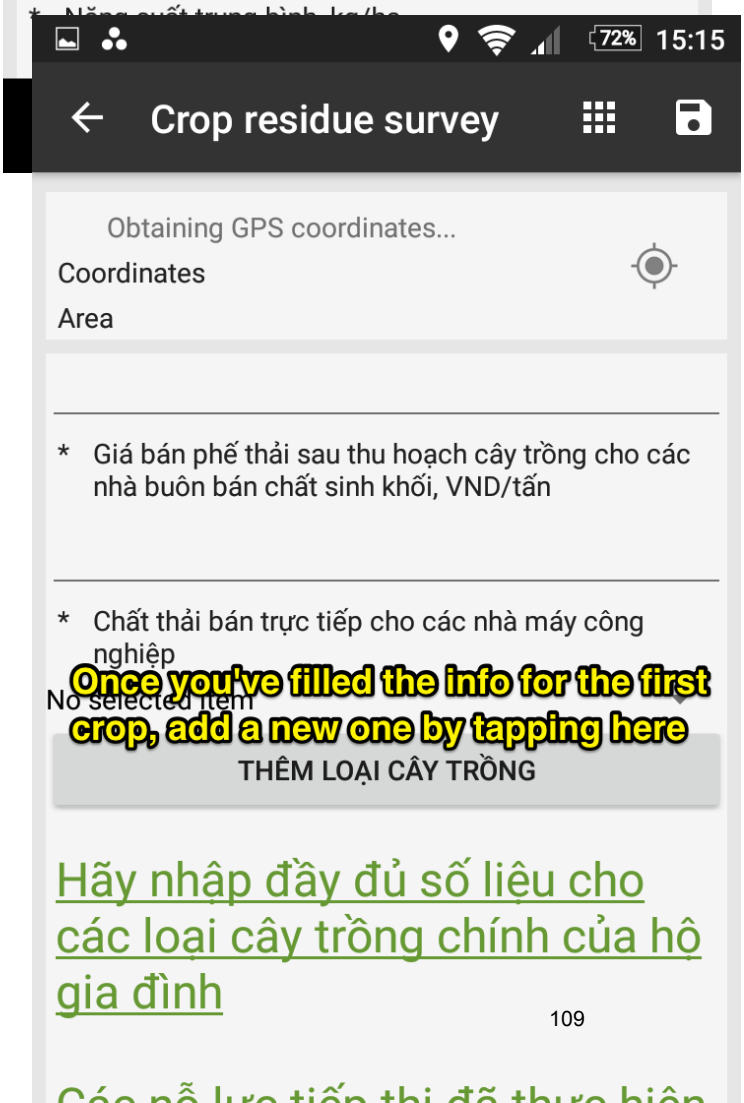

14:41
MHG Mobile
Work orders
Message
Map
Tracking
Tap here
Data collection
Settings


14:41
Data collection
Create observation
And then here
Crop residue survey
Create land cover observation


Crop residue survey
Start filling in the fields. The ones marked with * are mandatory
Area
Người trả lời
* Tên của chủ trang trại
* Địa chỉ của nông trại được khảo sát
* Số điện thoại liên lạc
Tên của chủ đất (nếu là đất thuê)
Số điện thoại của chủ đất (nếu là đất thuê)


Crop residue survey
Obtaining GPS coordinates...
Coordinates
Area
Các loại cây trồng chính của trang trại:
* Số loại cây trồng chính
The number of main crops the farmer has, goes here
Cây trồng 1
And then you fill as many sections like this as there are crops
* Loại cây trồng
Điều
* Đất trồng trọt, ha
* Năng suất thấp nhất, kg/ha

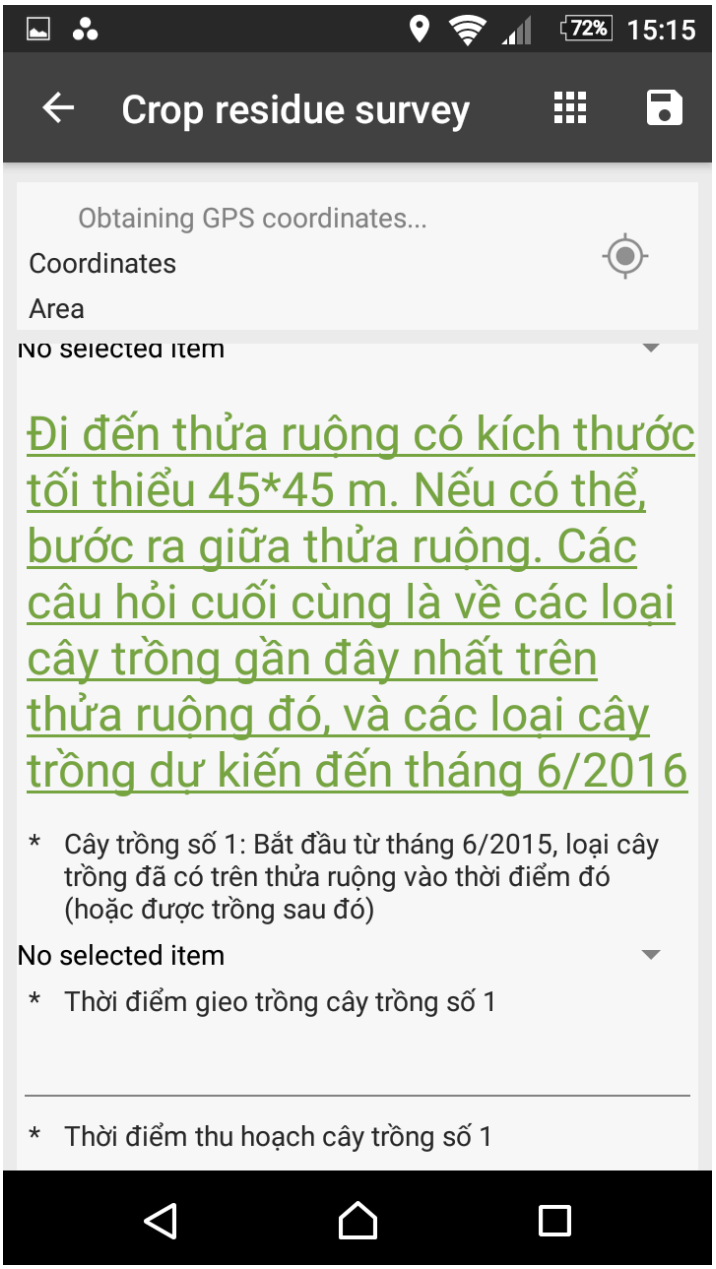

Crop residue survey
Obtaining GPS coordinates...
Coordinates
Area
* Cách thức thu hoạch cây trồng
No selected item
* Sử dụng phế thải; làm chất ăn cho gia súc, %
The residue use questions are the most important, and the total % must add up to 100 for the different residue use fields
* Sử dụng phế thải; bán trực tiếp cho các nhà máy công nghiệp, %
* Sử dụng phế thải; bán cho các nhà buôn bán chất sinh khối, %

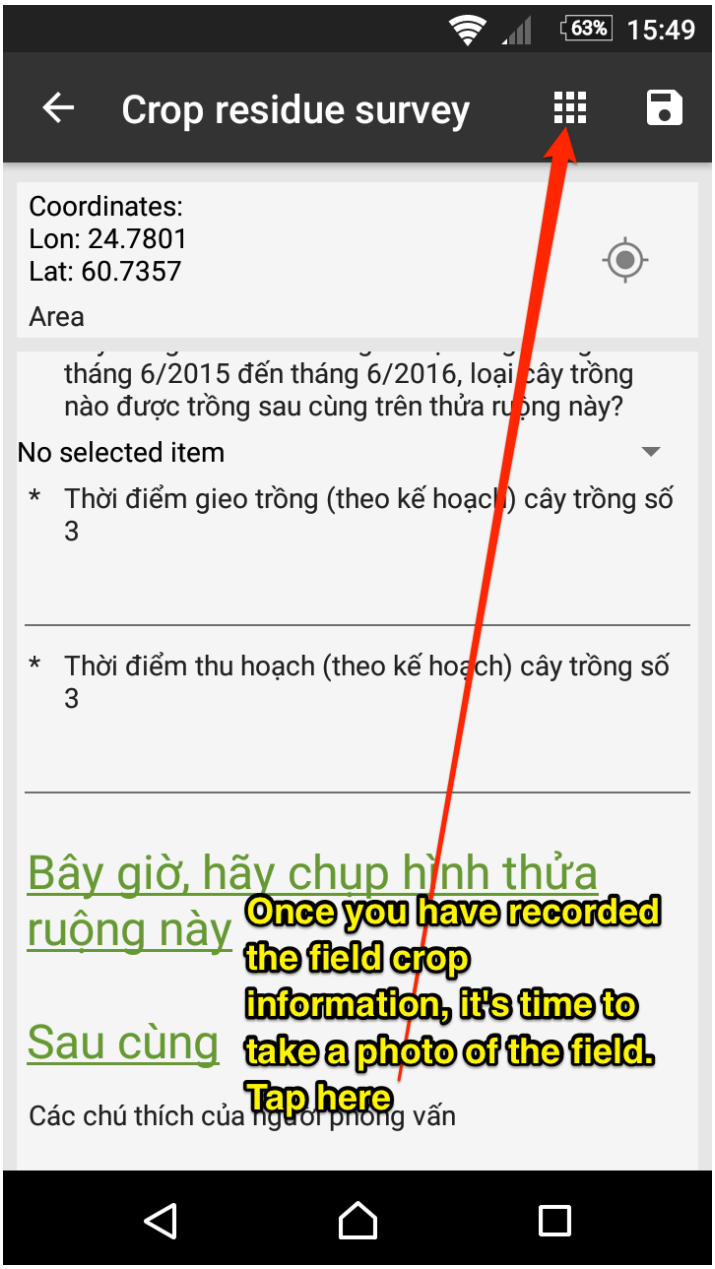

Crop residue survey
Obtaining GPS coordinates...
Coordinates
Area
* Giá bán phế thải sau thu hoạch cây trồng cho các nhà buôn bán chất sinh khối, VND/tấn
* Chất thải bán trực tiếp cho các nhà máy công nghiệp
No selected item
Once you've filled the info for the first crop, add a new one by tapping here
THÊM LOẠI CÂY TRỒNG
Hãy nhập đầy đủ số liệu cho các loại cây trồng chính của hộ gia đình

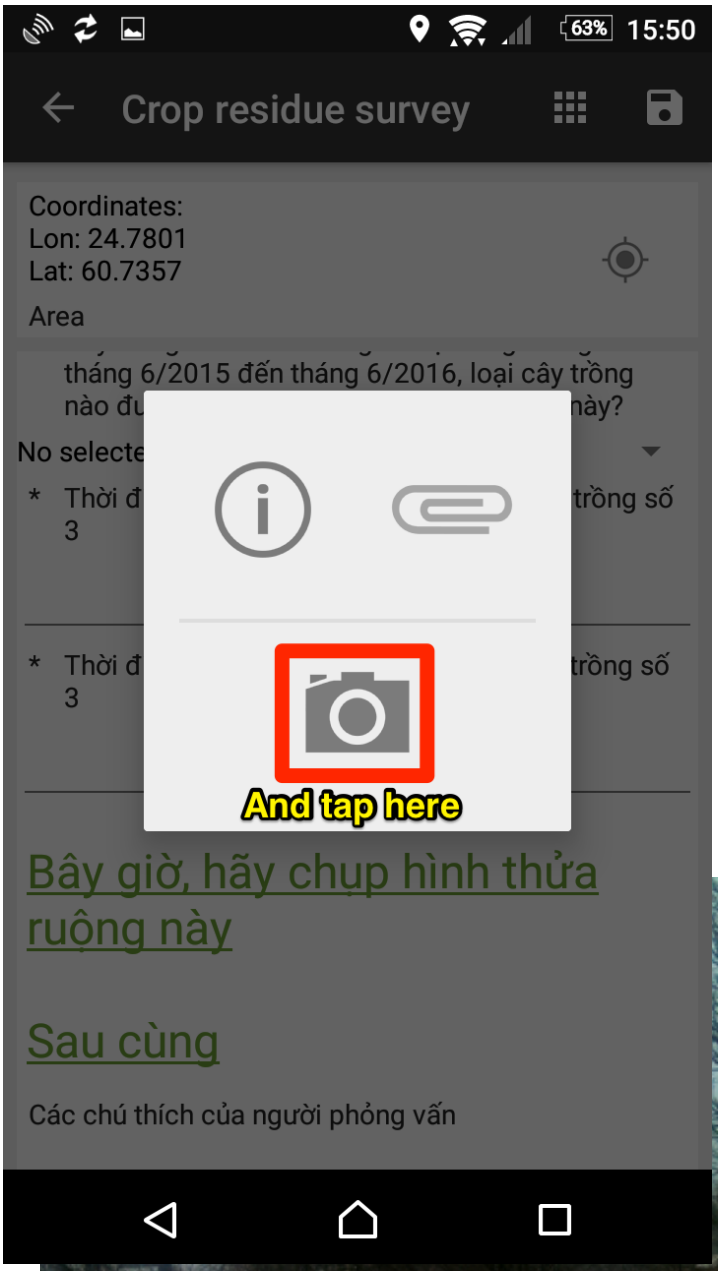
The final step in the interview is **extremely important** for the satellite image based land use classification, so pay attention here:

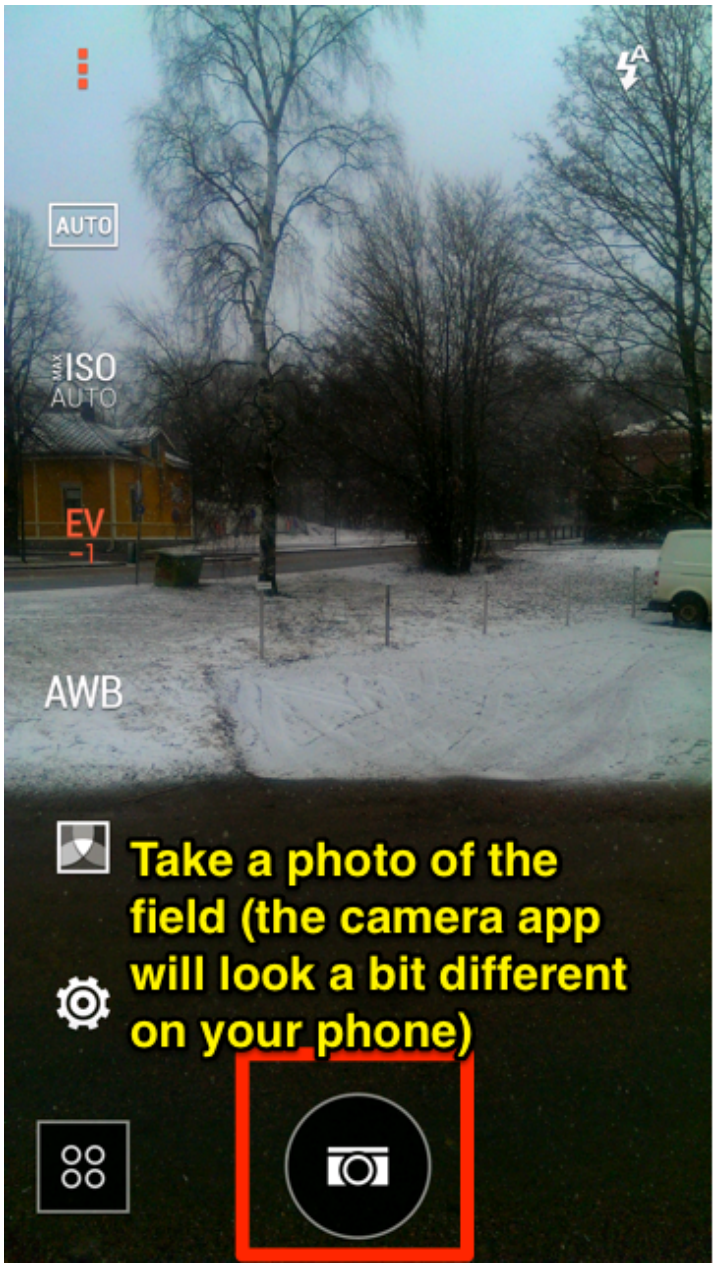
Walk with the farmer to a field that is at least 45 m x 45 m in size, or if all fields are smaller, to the biggest one he has. This is then the reference field for the satellite image inventory. **Walk as close to the middle of the field as possible**.

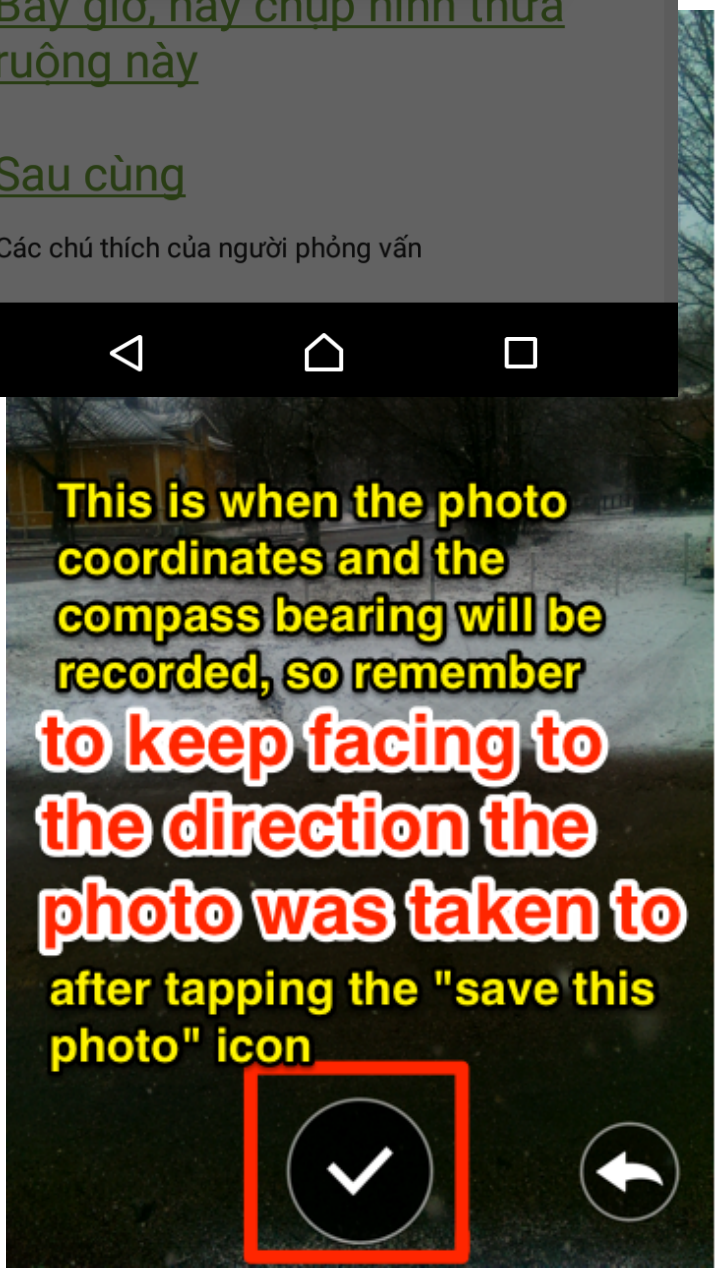
There you will ask three questions about crops cultivated on that field, and take a reference photograph of the field.

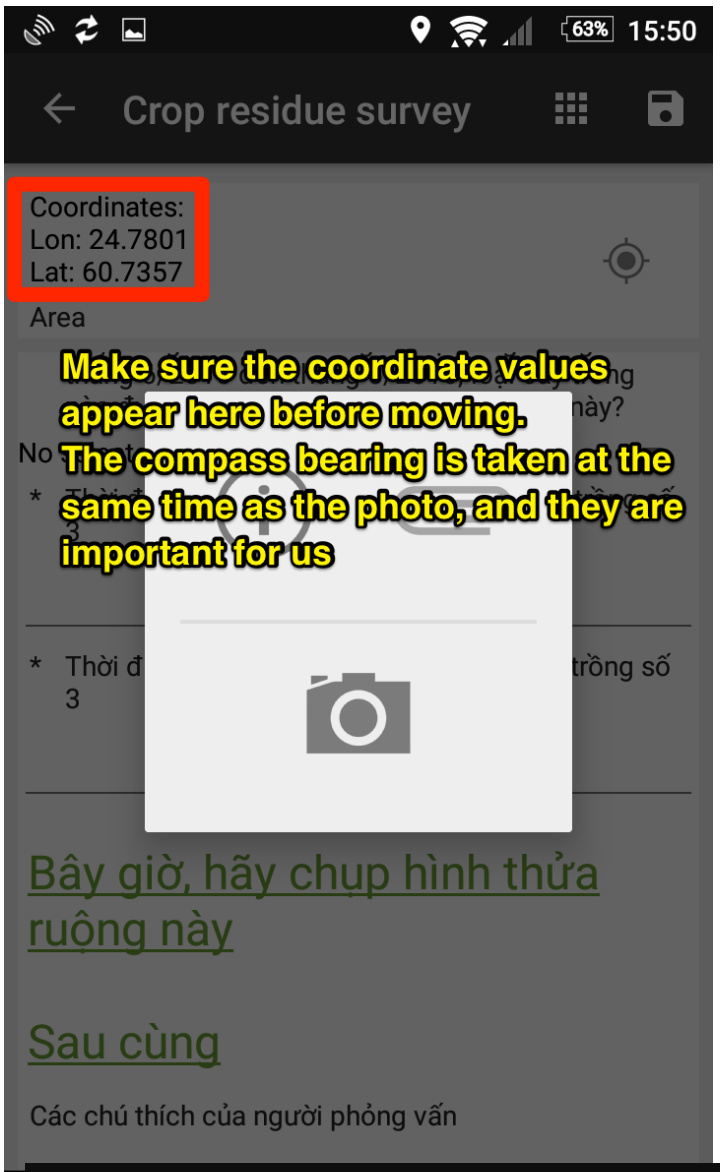


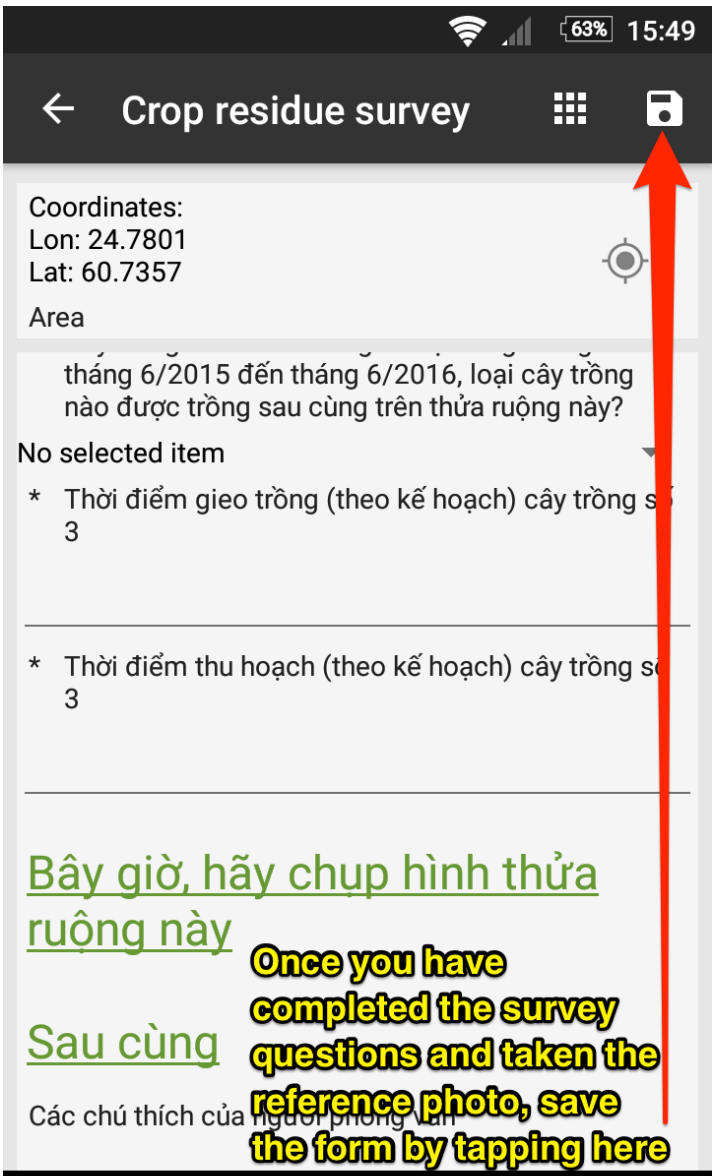


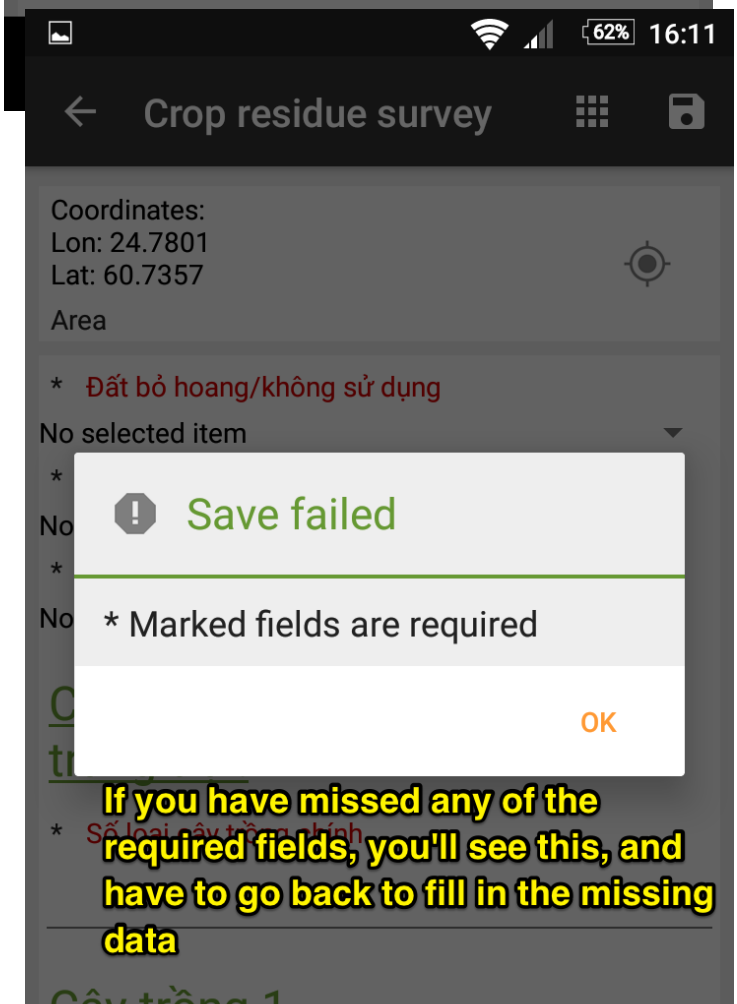

63% 15:50
Crop residue survey
Coordinates:
Lon: 24.7801
Lat: 60.7357
Area
tháng 6/2015 đến tháng 6/2016, loại cây trồng
No selecte
trồng số
3
And tap here
Bây giờ, hãy chụp hình thửa ruộng này
Sau cùng
Các chú thích của người phỏng vấn

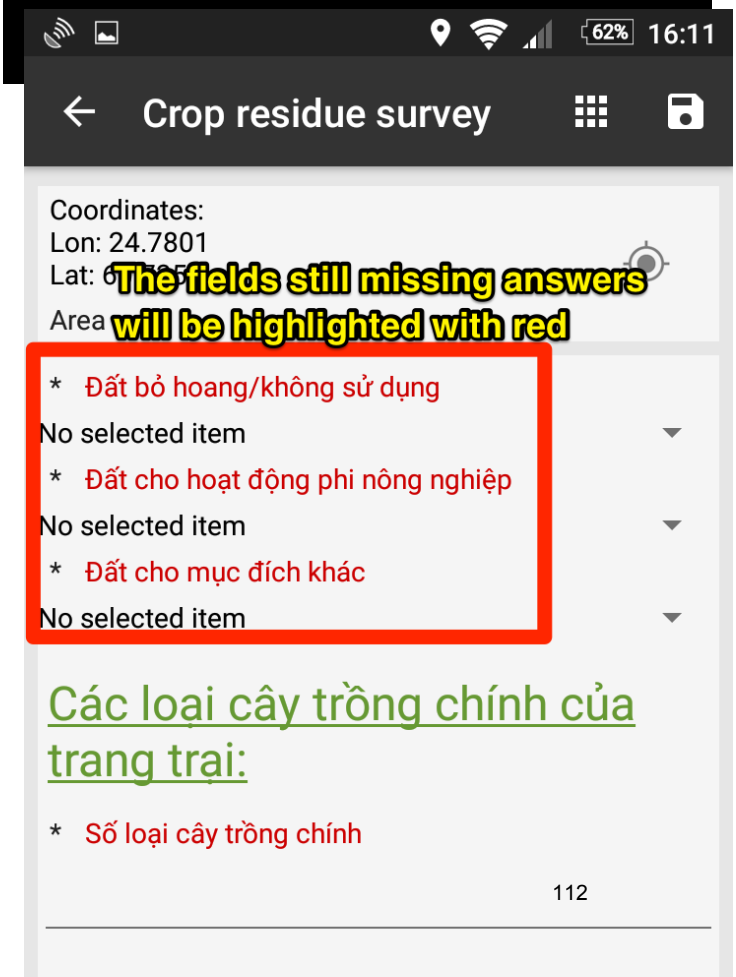

AUTO
ISO
AUTO
EV
-1
AWB
Take a photo of the field (the camera app will look a bit different on your phone)

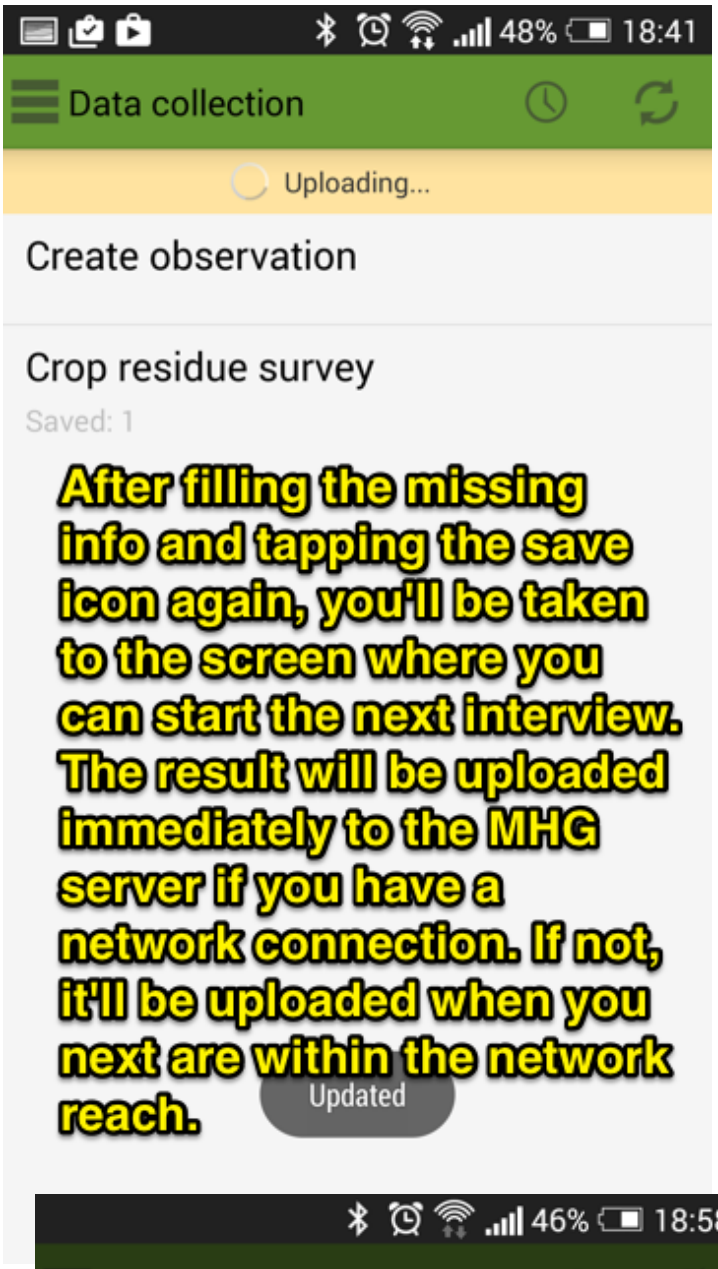

This is when the photo coordinates and the compass bearing will be recorded, so remember
to keep facing to the direction the photo was taken to
after tapping the "save this photo" icon

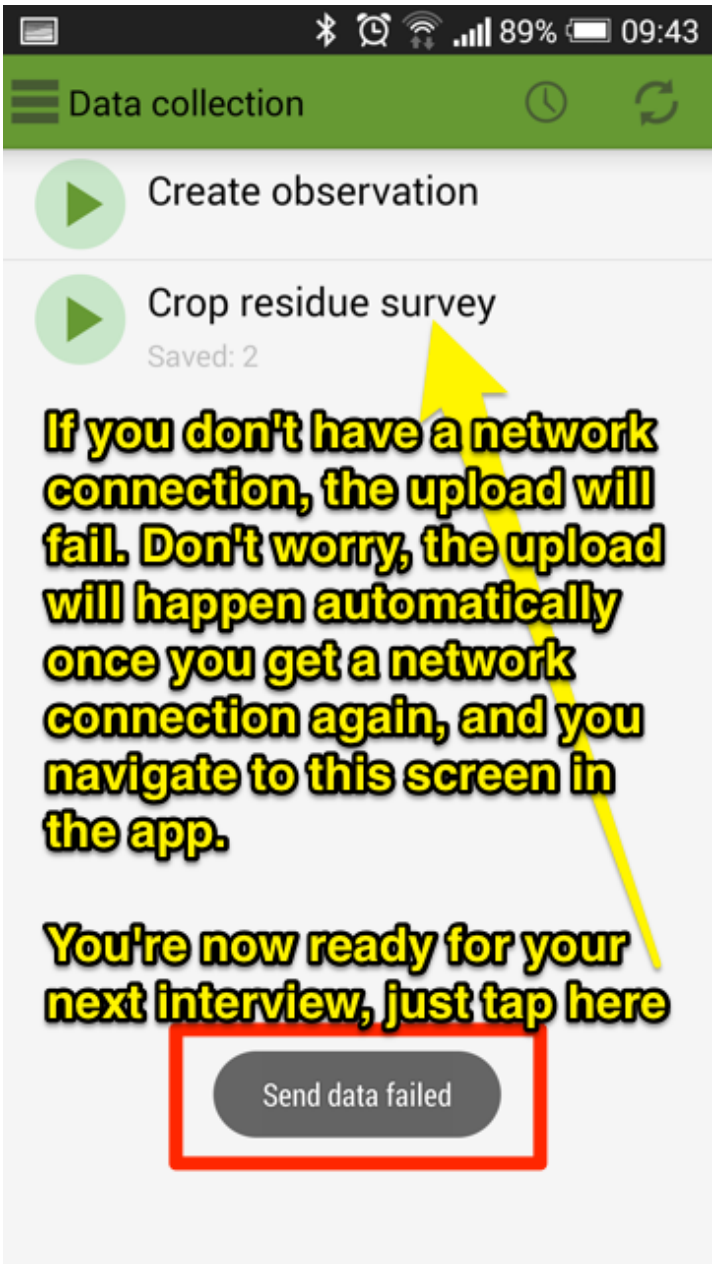

15:50
Crop residue survey
Coordinates:
Lon: 24.7801
Lat: 60.7357
Area
Make sure the coordinate values appear here before moving.
The compass bearing is taken at the same time as the photo, and they are important for us
Bây giờ, hãy chụp hình thửa ruộng này
Sau cùng
Các chú thích của người phỏng vấn

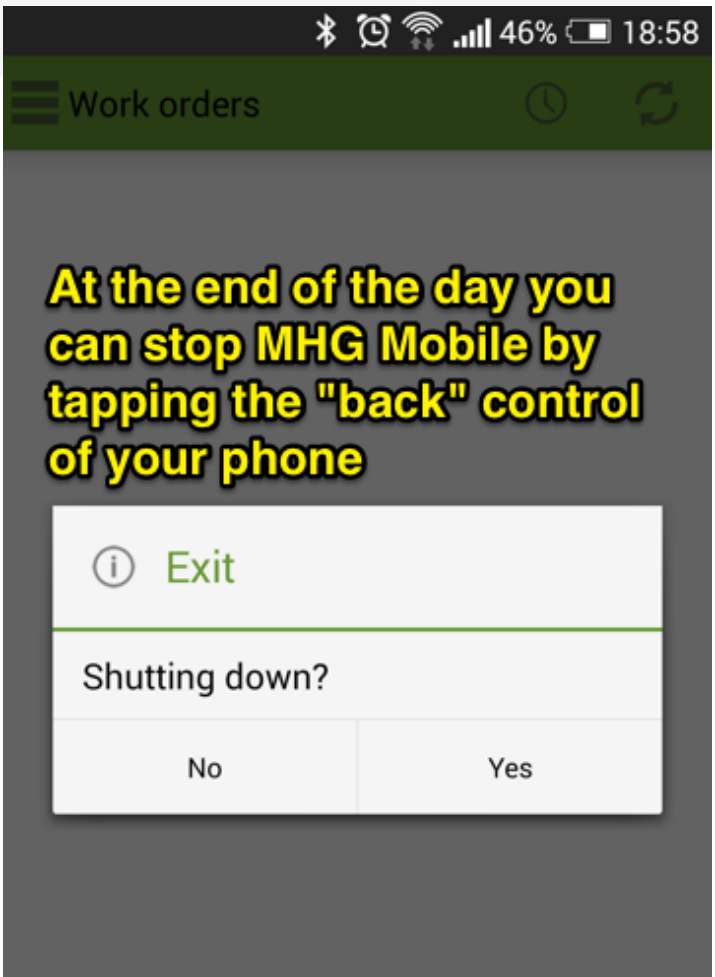

15:49
Crop residue survey
Coordinates:
Lon: 24.7801
Lat: 60.7357
Area
tháng 6/2015 đến tháng 6/2016, loại cây trồng nào được trồng sau cùng trên thửa ruộng này?
No selected item
* Thời điểm gieo trồng (theo kế hoạch) cây trồng số 3
* Thời điểm thu hoạch (theo kế hoạch) cây trồng số 3
Bây giờ, hãy chụp hình thửa ruộng này
Sau cùng
Các chú thích của người phỏng vấn
Once you have completed the survey questions and taken the reference photo, save the form by tapping here


16:11
Crop residue survey
Coordinates:
Lon: 24.7801
Lat: 60.7357
Area
* Đất bỏ hoang/không sử dụng
No selected item
Save failed
* Marked fields are required
OK
If you have missed any of the required fields, you'll see this, and have to go back to fill in the missing data


16:11
Crop residue survey
Coordinates:
Lon: 24.7801
Area
The fields still missing answers will be highlighted with red
* Đất bỏ hoang/không sử dụng
No selected item
* Đất cho hoạt động phi nông nghiệp
No selected item
* Đất cho mục đích khác
No selected item
Các loại cây trồng chính của trang trại:
* Số loại cây trồng chính
112

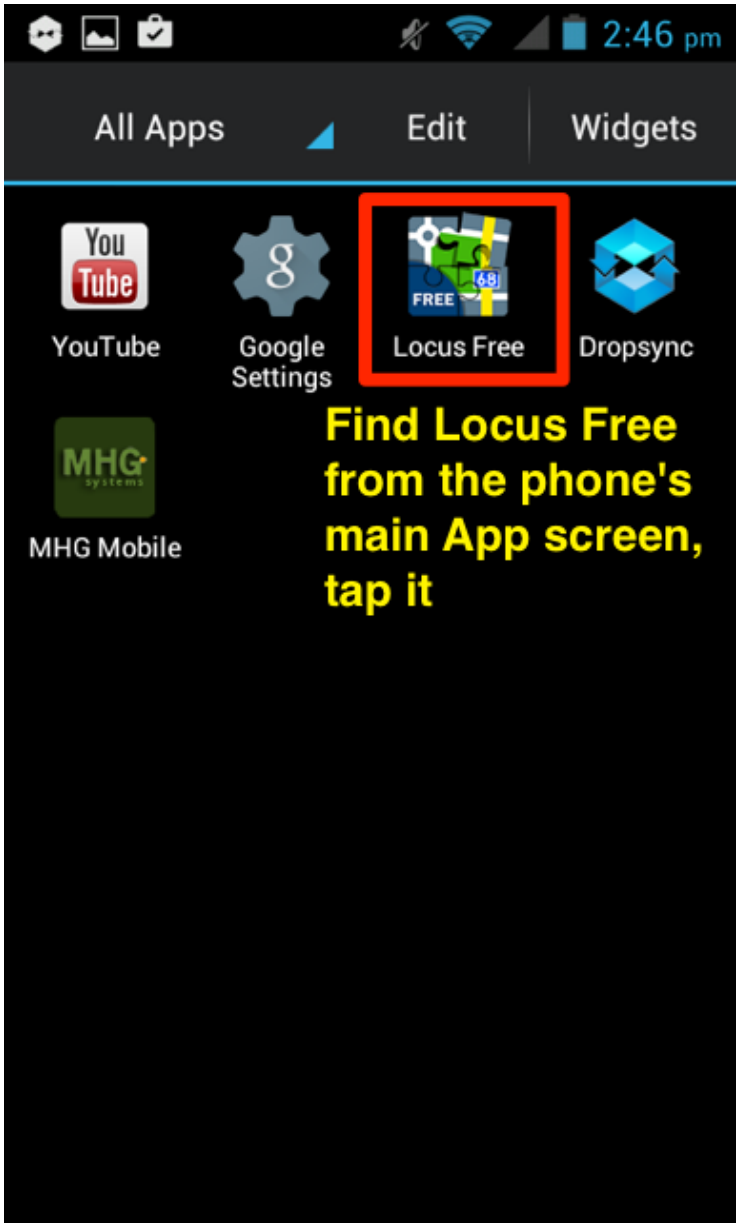

48% 18:41
Data collection
Uploading...
Create observation
Crop residue survey
Saved: 1
After filling the missing info and tapping the save icon again, you'll be taken to the screen where you can start the next interview. The result will be uploaded immediately to the MHG server if you have a network connection. If not, it'll be uploaded when you next are within the network reach.
Updated

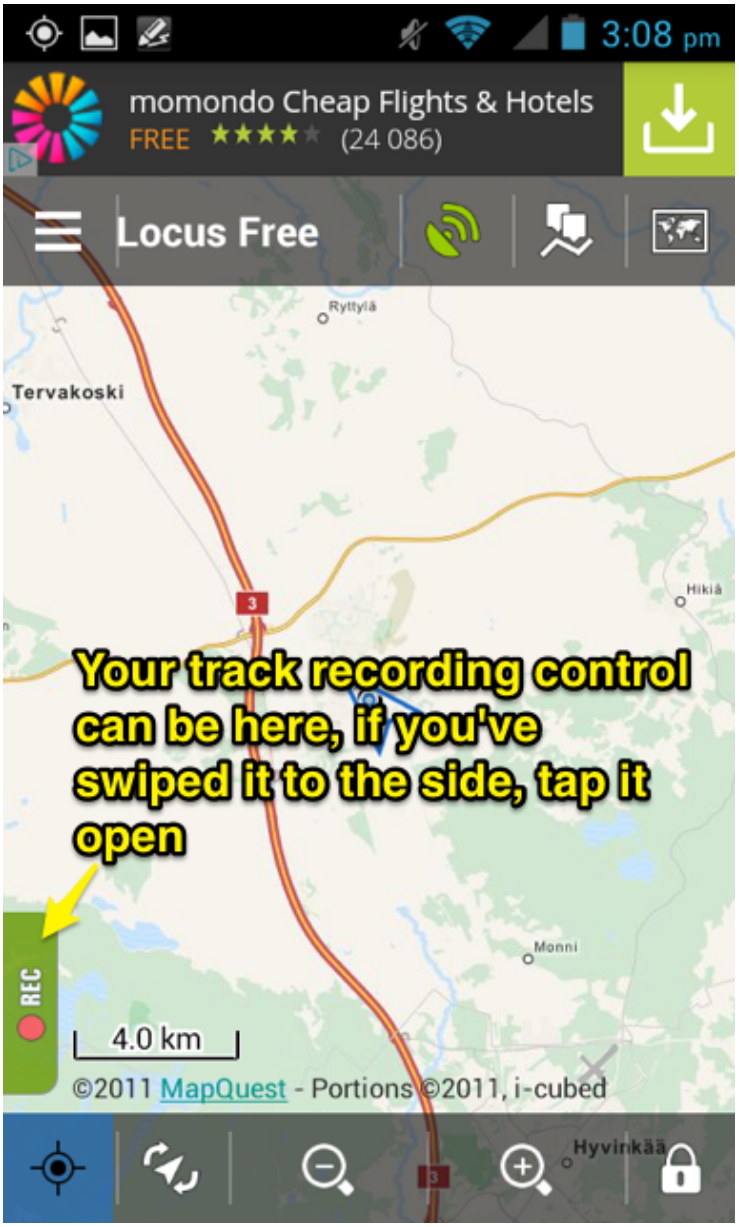

89% 09:43
Data collection
Create observation
Crop residue survey
Saved: 2
If you don't have a network connection, the upload will fail. Don't worry, the upload will happen automatically once you get a network connection again, and you navigate to this screen in the app.
You're now ready for your next interview, just tap here
Send data failed

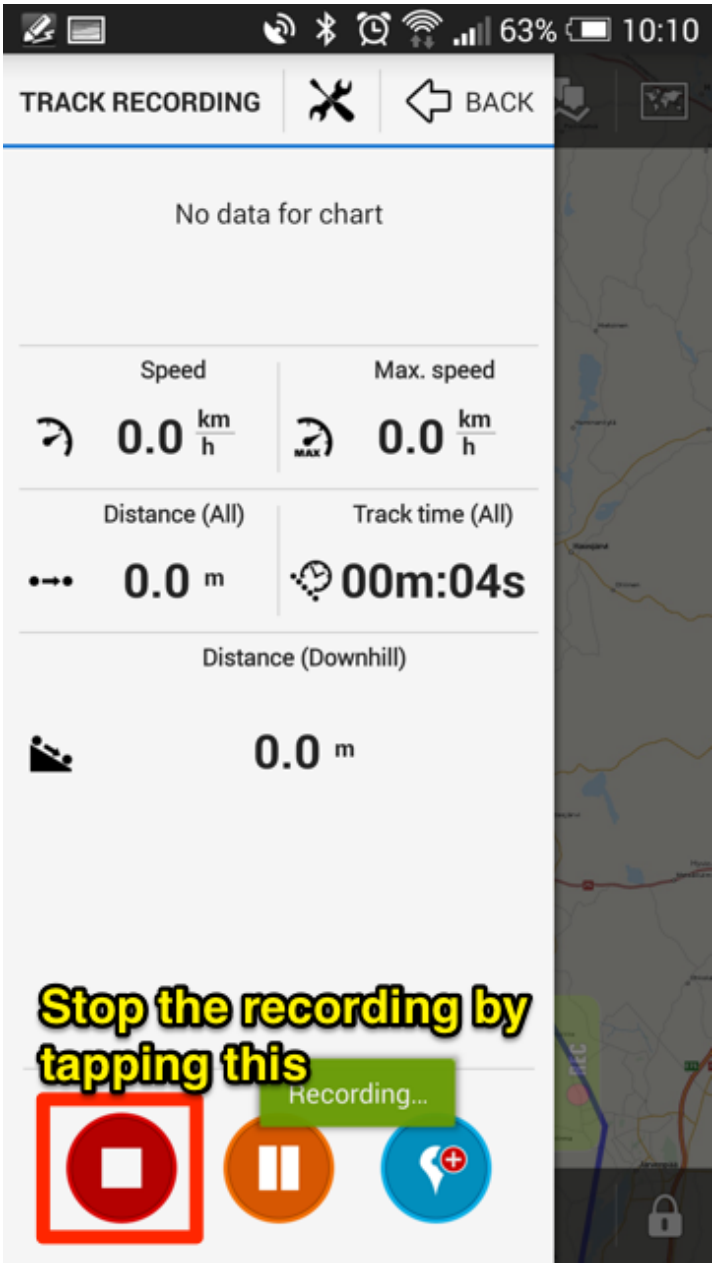

46% 18:58
Work orders
At the end of the day you can stop MHG Mobile by tapping the "back" control of your phone
Exit
Shutting down?
No
Yes

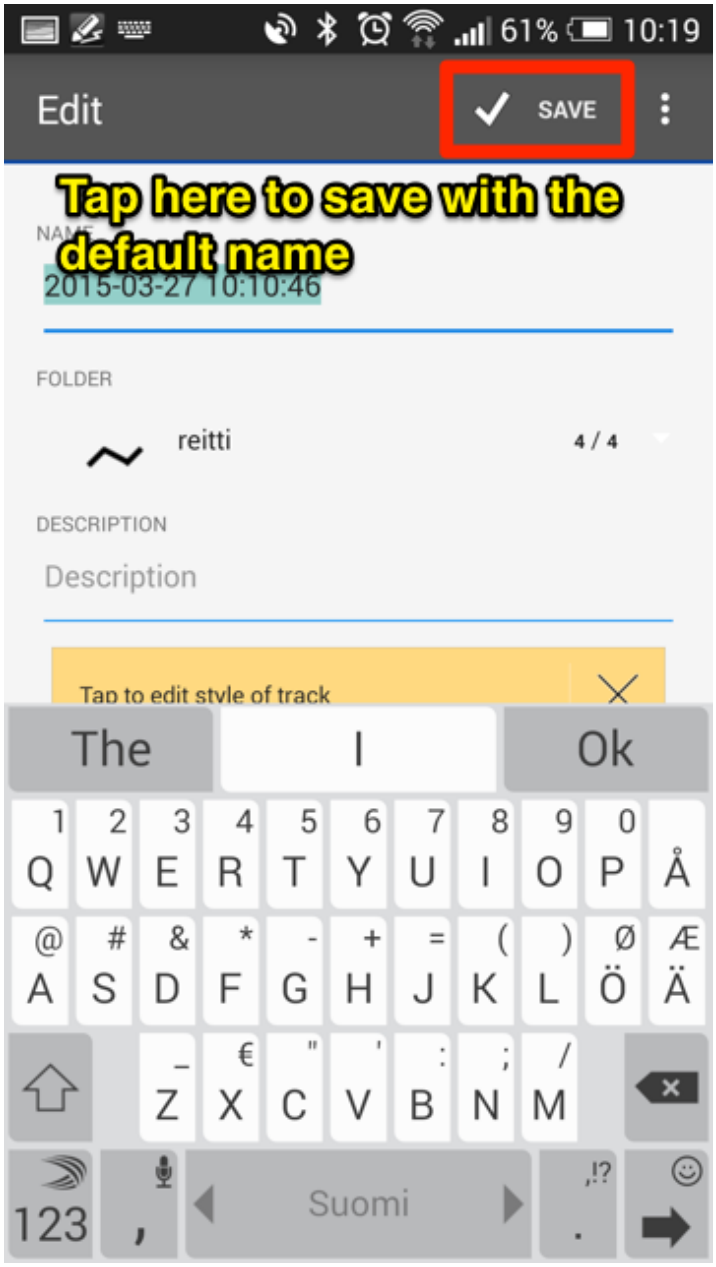
Step 5: End of the day – stop track recording

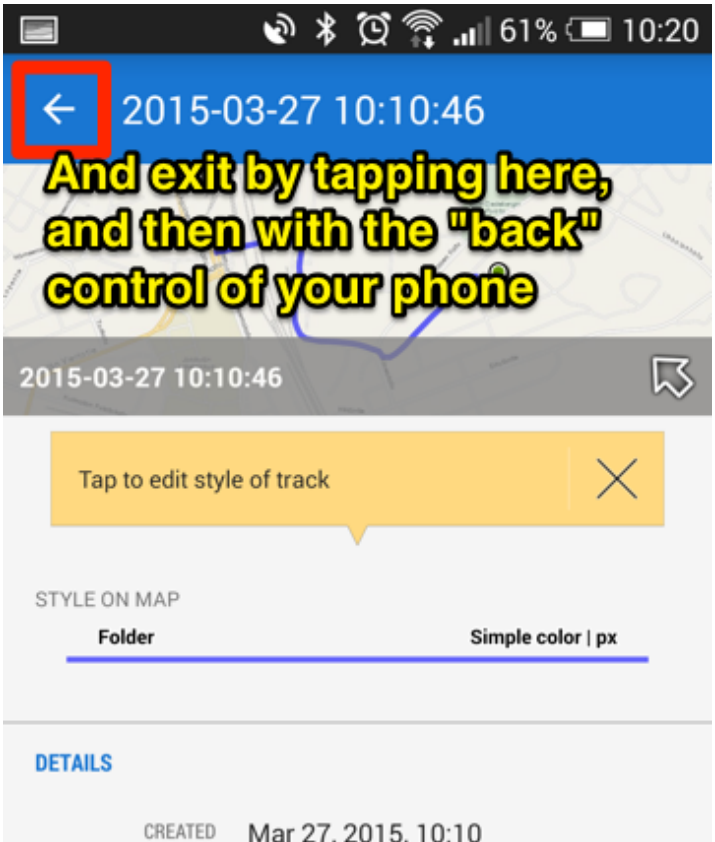
When back at the home base in the evening, remember to stop the track recording. Or even earlier, if you know that you'll be taking the same route back as in the morning.






63% 10:10
TRACK RECORDING
BACK
No data for chart
Speed
0.0 km/h
Max. speed
0.0 km/h
Distance (All)
0.0 m
Track time (All)
00m:04s
Distance (Downhill)
0.0 m
Stop the recording by tapping this
Recording...


61% 10:19
Edit
SAVE
Tap here to save with the default name
2015-03-27 10:10:46
FOLDER
reitti
4 / 4
DESCRIPTION
Description
Tap to edit style of track


61% 10:20
2015-03-27 10:10:46
And exit by tapping here, and then with the "back" control of your phone
2015-03-27 10:10:46
Tap to edit style of track
STYLE ON MAP
Folder
Simple color | px
DETAILS
CREATED
Mar 27, 2015, 10:10

Annex V

Selected Photos of the Workshop

Annex V: Selected Photos of the Workshop

Group photo of the participants of the training workshop.

Digital billboard at the entrance of NLU welcomes the participants of the training workshop.

Dr. Tuan of NLU welcomes all participants of the training workshop.

Mr. Phuc of Enerteam introduces himself as part of self – introduction of participants while Dr. Ludovic listens intently.

Mr. Bien, Project Coordinator of FA introduces himself.

Dr. Ludovic gives his presentation on the progress updates and revised work schedule of the project.

Mr. Qazi presents the Industrial Biomass Survey methodology and questionnaires.

Dr. Jussi explains the benefit of the project during his presentation on the Crop Biomass survey.

Jussi explains to the NLU participant how to set up the smartphone.

Participants discusses the different applications to be installed.

Mr. Phuc of Enerteam explains to one participant while Dr. Cu and Ms. Phuong is setting up the smartphone.

Participants are busy setting up their smartphones as Dr. Jussi is giving instructions at the background.

Dr. Tuan points to one of the instructions in the presentation.

Dr. Jussi clarified some instructions in the presentation.

The Consortium is waiting at the meeting place at Kai Lay Ward at Kai Lay town, Tien Giang province. Dr. Cuong of Institute of Energy is talking to Dr. Thuc of MOIT. Other Consortium members include Dr. Jussi, Dr. Cu, Dr. Ludovic, Mr. Qazi and Ms. Phuong.

Participants are busy reviewing the questionnaire for the industrial biomass survey while receiving some last minute instruction.

Dr. Thuc gives an inspirational talk to the participants.

An enumerator from Team 1 conducts the industrial biomass survey interview with Trần Văn Quân of DNTN Xay xát Phước Vinh (Phuoc Vinh Rice Milling Private Company).

The owner responds to the inquiry while Dr. Cuong listens intently.

Team 2 surrounds the manager of DNTN Năm Nga (Nam Nga Private Company), a rice mill, during the interview while Dr. Thuc (MOIT), Dr. Ludovic and Dr. Jussi observes the conduct of the interview.

Interaction between the manager with interviewer and the International Consultants.

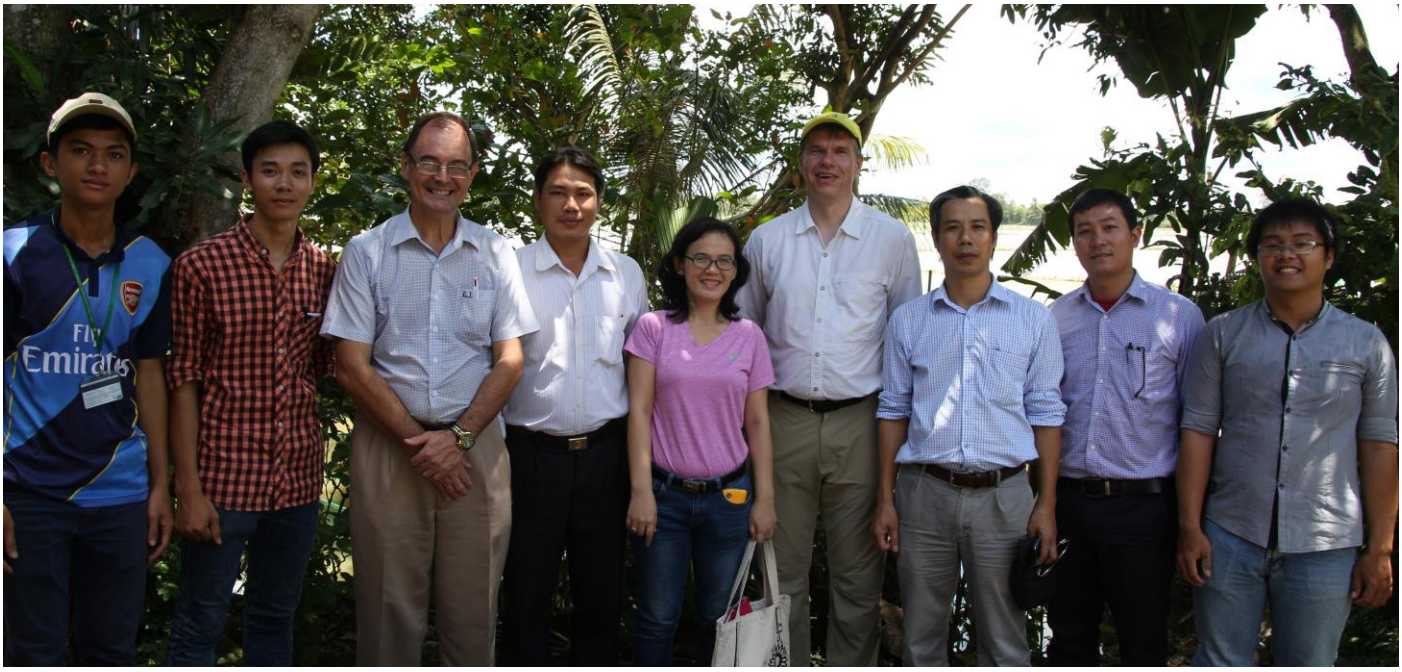
Team 2 of the Industrial survey walking towards the site for the crop biomass survey led by Mr. Trần Hoàng Minh, vice manager of division, Tiền Giang DONRE.

Team 1 of industrial survey on their way to the meeting place with Team 2.

All participants converge into the village to conduct crop biomass survey.

The team of Dr. Jussi and Dr. Ludovic conducts the interview of the farmer inside their house.

A participant from the Team of Dr. Jussi takes photo in the middle of the flooded rice field.



Team of Dr. Jussi poses together with the interviewed farmer beside Dr. Ludovic.

The team of Dr Cuong talks to the farm owner while the enumerators are inputting data in their smartphones.

One of the enumerators prepares to take the photo and coordinates in the middle of a flooded rice field. Mr. Minh of DONRE enjoys the view while the owner points to the boundaries of her field.

A member of the team of Dr. Cuong takes picture in the middle of the flooded rice field.

The participants enjoy lunch after the field survey with the Consortium, local consultants and Mr. Minh from DONRE. The Vietnamese text at the foreground welcomes the participants of the WB Biomass Mapping project.

Mr. Phuc and Dr. Ludovic shares each other's experience of the exercise with the other participants.

Dr. Jussi and Dr. Cu hosts the debriefing of the field exercise.

Interaction between Dr. Cu and one of the participants in Vietnamese while Dr. Jussi is discussing some issues with the other consultants.

Dr. Cu interprets the comments made by the local coordinator to Dr. Jussi.

A group picture of the participants of the field survey and after the de-briefing session.