

PROCEDURE FOR AUTOMATED GEOREFERENCED SOIL SAMPLING UNDER A PROJECT

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LIST OF DOCUMENTS TO PROCEDURE PR03:

PR0301-Order for agronomic service

Protocol of soil sampling

CHAPTER ONE GENERAL PROVISIONS

1 Subject

This procedure regulates the order and manner of performance of automated georeferenced soil sampling developed in accordance with The Methodology. This procedure (PR03) describes the actions that follow after placement of an assignment for automated soil sampling.

2. Purpose

The purpose of the procedure is:

- to provide a reasonable level of assurance through implementation of the rules regulated therein that system for management, control and reporting of the quantity

of sequestered carbon from crop species - perennial plants, annual crops and other agricultural crops is reliable;

- to determine the methodology for correct sampling and to guarantee the objectivity of the soil analyses and results.

3. Principles

(1) In the implementation of this procedure, the respective responsible officials are guided by the following principles:

1. Objectivity and impartiality;
2. Honesty and autonomy;
3. Legitimacy and loyalty;
4. Professionalism, responsibility and accountability;

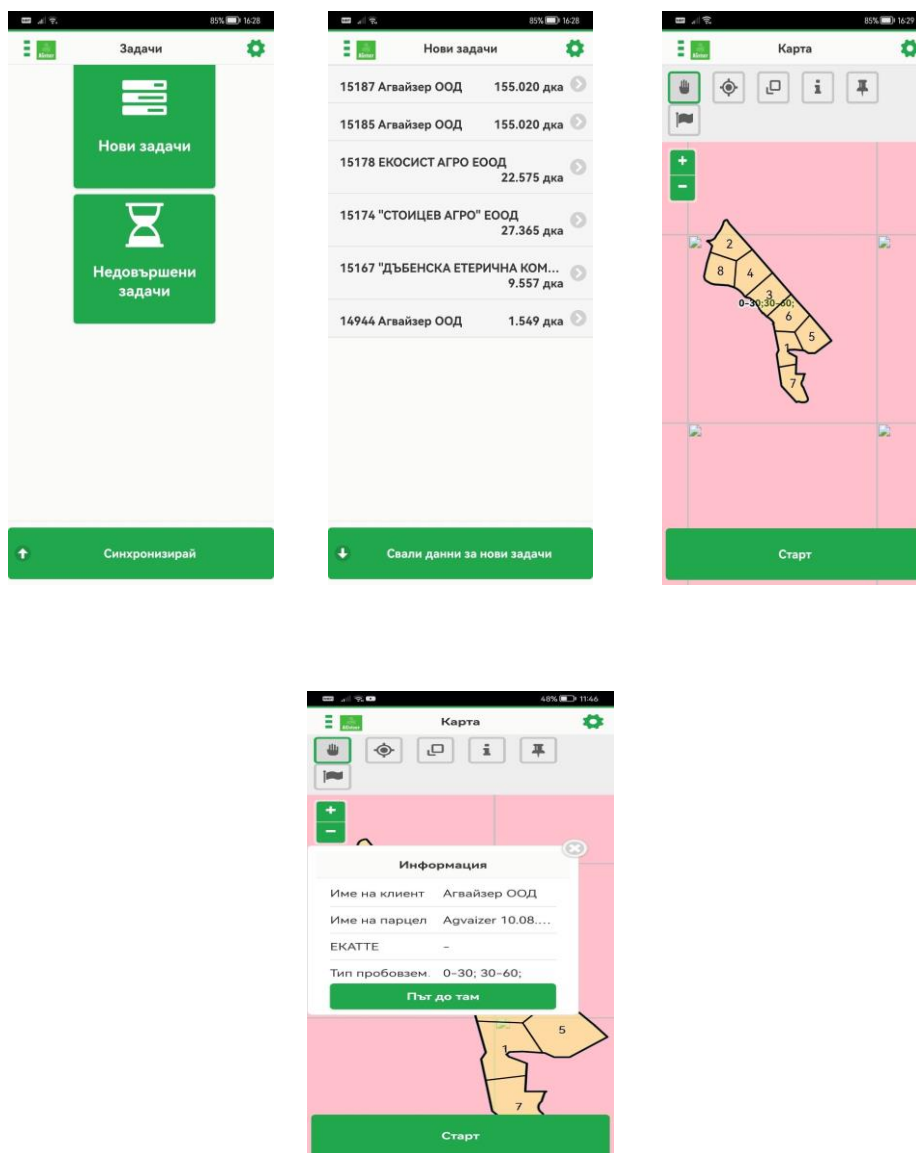
(2) For failure to observe the principles under paragraph 1 and/or the rules established under this procedure, the responsible employees shall bear the relevant liability.

CHAPTER TWO PROCEDURE FOR AUTOMATED GEOREFERENCED SOIL SAMPLING

The process starts with placement of an assignment (see PR02) for automated georeferenced soil sampling in ISACO2. After completing the steps of placement, the system automatically prepares and sends an assignment to the mobile application of ISACO2 where it is received in the form of a new task. The application is installed on a device (telephone/tablet/GPS), which is attached to an ATV, UTV, tractor, puck-up car or other type of equipment on which an apparatus for automated taking of homogenous soil samples from three layers with one operative step is mounted.

Sampling operator accesses the mobile application by entering their user name and password for login to the system.

He/She chooses the "New Tasks" panel and a screen is visualized with a list of uploaded new tasks from which the operator selects a task to perform. The sequence of task performance should be determined by the location of the farming blocks subject to sampling. On a subsequent screen, the graphed into cells blocks for sampling are visualized. By pressing the button "" and the following screen is visualized:



In this window, the system provides information about the name of the customer (participant in the programme), the name of the plot, EKATTE (The unified classifier of administrative-territorial and territorial units is a system of conditional designations of administrative-territorial and territorial units in Bulgaria, maintained by the National Statistical Institute), sampling type - the depths at which the block will be sampled. The "Way to there" button is pressed, the system automatically recognizes the GPS coordinates of the block and opens a map with navigation and a route to the place where the employee arrives with the necessary equipment and instrumentation.

Mandatory equipment: ATV with attached probe for automatic georeferenced sampling at three depths in one step; ziplock bags for storing soil samples; labels for sticking and barcode scanning; tablet with installed ISACO2 mobile application; fire extinguisher; shovel; specialized working clothing and protective equipment. Soil samples should be taken with specialized and calibrated technical equipment.

The drilling operator inspects the field /or fields/ and assesses whether the conditions allow it to be sampled.

Under unfavorable conditions, the task is not started, the operator is directed to the next task to be executed and returns to the previous one when conditions are available for its execution. Correct judgment is of utmost importance, since a cell started with samples already taken must be completed because the mobile application sends data to the system that the cell is being sampled and the laboratory expects to receive an exactly specified number of samples that should be taken from the field for this task. In the event a cell is started but cannot be completed, the sampling task is transferred to the "Unfinished Tasks" panel and sampling should be performed again.

With a positive assessment, the drilling operator enters the agricultural block, positions himself at the starting point for execution and presses the "Start" button, after which he proceeds to performing the task and taking a georeferenced soil sample.

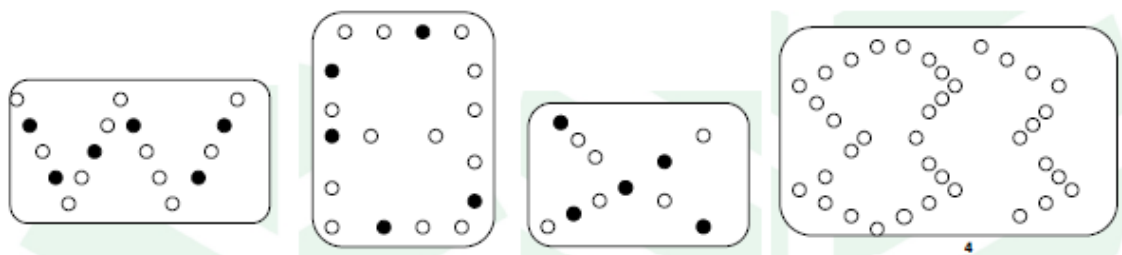
The operator himself determines, for each block/cell separately, the starting point and the path for taking samples from the corresponding points, according to the relief, the shape and the size of the plot. In the course of sampling, it is mandatory to avoid the boundaries of the plot, where it is possible to have a deviation from the normal values of the results due to various reasons, such as: over-fertilization, over-drying, waterlogging of the soil; overcrowding as a result of agricultural machinery; various impacts and specifics of the relief; independent and uncontrolled by the programme actions on adjacent areas performed by unspecified persons.

The operator estimates on the spot the distance between the individual sampling points, taking into account the requirement of not less than 25 individual drills in a cell. A sampling cell cannot exceed 25 ha. (3% tolerance is allowed), (PR02).

The amount of sample from each stitch varies and depends on the type of soil, as well as other characteristics - humidity, etc. For each layer 0-30 cm; 30-60 cm and 60-90 cm the amount of sample is between 0.5 kg.-1 kg. , which is a representative sample of all the points taken.

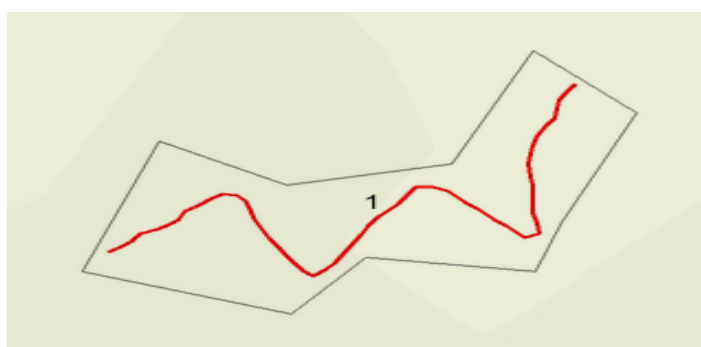
Method of taking soil samples: Soil samples are taken with the help of mechanized probes from three depths 0 - 30 cm, 30 - 60 cm and 60 - 90 cm. One average sample is taken from each elementary section, which is formed by 25 stitch. The points are made diagonally or zigzag (according to the attached example schemes) in the elementary section, avoiding places uncharacteristic of the field.

Each point samples the three soil layers, which are separated into separate vessels on the probe. On completion of sampling in the respective plot, increments from each layer are mixed and this constitutes a representative sample for each soil layer.



During the execution of the task on the screen of the mobile application, the trace of the progress/path of sampling is observed, and after completion the data automatically becomes part of the progress report sampling.

Example illustration:



The probe automatically separates the sample from each layer of the soil: 0-30 cm; 30-60 cm and 60-90 cm in separate containers and after completing the sampling in the cell, the operator is obliged to:

- seal the samples from each layer/each vessel in a separate ziplog bag, making sure that the zip is tightly closed;
- stick a pre-printed label with a unique barcode on each envelope;

At the end of the sampling in a given cell, the "End" button is pressed. Thus, it is proceeded to scanning the samples. A window appears for scanning the different depths. The operator carefully selects the desired depth and again very carefully scans the barcodes of the adjacent samples one by one, then presses the "OK" button. He/She repeats the scanning procedure for all remaining depths in this cell.

		КЛИЕНТ:	
		АДРЕС:	
ПОЧВЕНА ПРОБА НОМЕР:			
 2749955			
НАИМЕНОВАНИЕ:			
Състояние на полето	Сухо	Влажно	Преовлажнено
	Стърнище	Оран	Подравнено
КЛЕТКА #	ДЪЛБОЧИНА		
ПОДПИС			
ДОПЪЛНИТЕЛНА ИНФОРМАЦИЯ			
ДАТА:		ЛАБ #	

The system asks if the block is complete or if there are more cells to be sampled. Provided more cells are available for sampling, the task is automatically moved to "Unfinished Tasks", the driller moves to the next cell, positions himself at the starting point for sampling, starts the task, and repeats the described process for each subsequent cell until the block is complete.

Provided that the block is complete and all the cells in it have been sampled, the "Synchronize" button is pressed and the task is moved to the "Completed tasks" section.

Next is "Send protocol", with which the system automatically generates and sends to the customer a report and protocol for the performed sampling - PR0304. This completes the process, and the task disappears from the list of completed tasks. The data from the sampling is automatically uploaded to ISACO2 and the status of the sampled block is automatically changed to "sampled" in the system.

Physical samples from the field are sent for OC (Organic Carbon) analysis to an accredited laboratory, via courier with return receipt, or the sampling operator stores the samples and transports them to the laboratory. The valid time duration of the sample collected from the field to the laboratory has no limitations regarding its validity. The term for the delivery of the samples is 15 calendar days from sampling to receipt in the laboratory.

Bulk density analyses should be carried out by accredited laboratory.

Bulk density soil sampling is conducted under БДС EN ISO 11272:2017 standard.

CHAPTER THREE OBLIGATIONS AND RESPONSIBILITIES

The drilling operator is obliged to:

- Observe all rules and provisions pursuant to this procedure for work and the Methodology;

- Service and maintain the equipment and facilities entrusted to them by observing the rules he is familiar with concerning correct operation while working with specialized equipment.

When accepting actions for performance of a task, the drilling operator is obliged to:

- Get familiarized in advance with the tasks assigned to them and the location of the farming blocks for sampling;
- Take into account the weather conditions, which could eventually impede the task performance. Sampling is not conducted when there is snow, rain or mud.
- Make sure the equipment is in good order.
- Make sure they have a fully charged tablet/phone and bring a spare charger.
- Wear specialized working clothing and safety devices.
- Strictly adhere to the method of sampling;
- Store and transport the samples taken up to their acceptance in the accredited laboratory.

The drilling operator is responsible for:

- The equipment they are entrusted with.
- Prompt removal of any problem occurred with the equipment
- The drawing up of protocols for repairs conducted
- Performance of the assigned tasks.
- Correct storage and transportation of the samples up to their handover to an accredited laboratory.