

APOPO – PARADIS trial report

16-20 October 2006

Background:

APOPO is a Mozambique-based NGO that has developed a technique of explosive vapor detection using African rats. This technique is applied to Humanitarian Demining (HD) to carry out the detection of landmines in suspected areas, and has proved to be very accurate and faster than other techniques that use human-made sensors. The IND (National Institute for Demining in Mozambique) in collaboration with the GICHD (Geneva International Center for Humanitarian Demining) conducted licensing tests based on the IMAS standards on the sniffer rats and their trainers, and since October 2004 a first detection capacity has been operationally deployed. APOPO currently works in partnership with Handicap International; the latter is responsible for the marking of the suspected zone, the clearance of safe lanes and the removal of explosive objects detected by the APOPO rats.

PARADIS is a project funded by the Belgian Defense and aims at improving the planning of HD campaigns. The system is designed to follow the progress from global (country) to local (field) scale, and to provide geo-information to the different actors involved in the demining campaign. Two classes of users have been identified – planner and field operator – hence the system consists of two separate but complementary interfaces: the Planning Interface helps the manager in the process of making judicious decisions, while the Field Interface runs on a PDA and enables a safe and easy collection of the data on the field. The system is being developed for the SEDEE-DOVO (“Service d’Enlevement et de Destruction d’Engins Explosifs – Dienst voor Opruiming en Vernietiging van Ontploffingstuigen” - Belgian Bomb Unit) for their missions in developing countries.

Introduction:

After a first discussion in the beginning of 2005, it appeared that PARADIS could help APOPO in the planning of their activities and a first field trial was set up in October 2005. This first joint test clearly showed the huge potential of the PARADIS system for APOPO. Indeed, the system would add value to APOPO’s work at each step of the demining process, from field data collection to decision-making at the office (see:

http://www.itep.ws/pdf/PARADIS_APOPO_workplan.pdf).

However the test also showed that the functionalities in the system must be slightly modified in order to fit APOPO’s needs. Indeed, APOPO and the SEDEE-DOVO have their own specific methods of work and PARADIS tightly fits the methods of the latter.

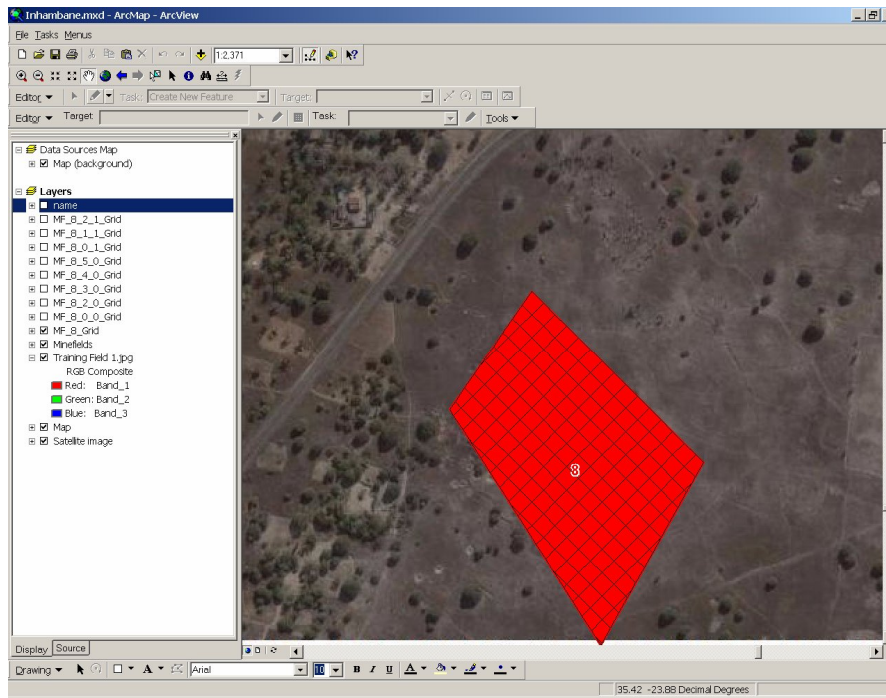
A second field trial was thus set up in October 2006 in order to get an accurate picture of the impact of the tailored system on APOPO's work. The joint team selected a bunch of tools that would be adapted and tested on the field. These tools enable the user to:

- create a minefield in the database;
- draw a grid of 'boxes' (10x10m) on the minefield;
- draw a grid of 'cells' (1x1m) on each of the boxes;
- for each cell in each box, enter the results of the rats and the deminer;
- for each cell in each box, compare the results of the rats and the deminer.

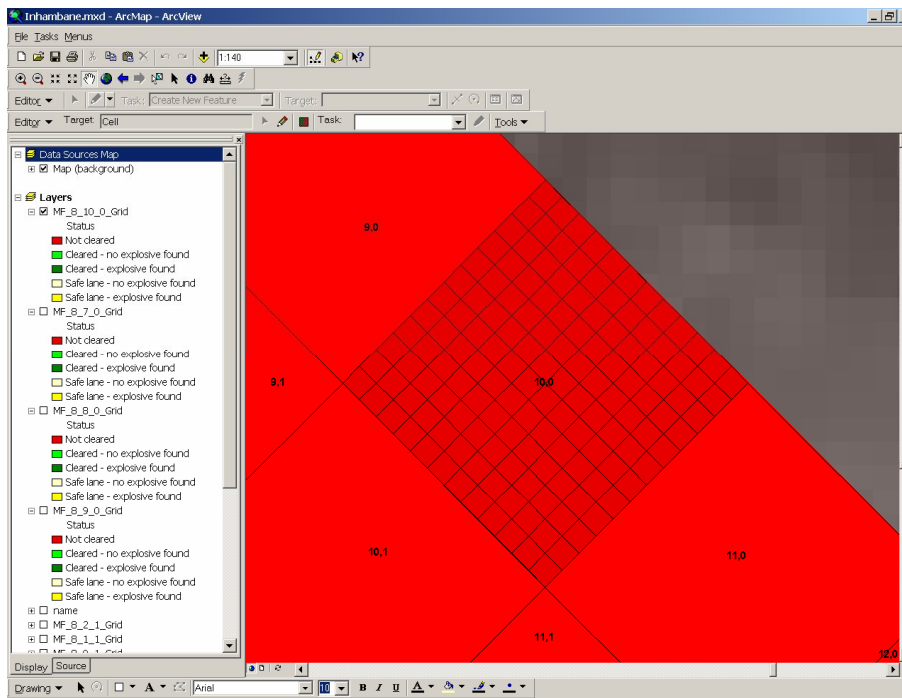
APOPO's clearance method

APOPO works in close collaboration with Handicap International. The latter delineates and fences the zone, and clears safe lanes in order to provide APOPO with a grid of 10x10m boxes to clear. The practical method APOPO currently uses for clearance operations consists of:

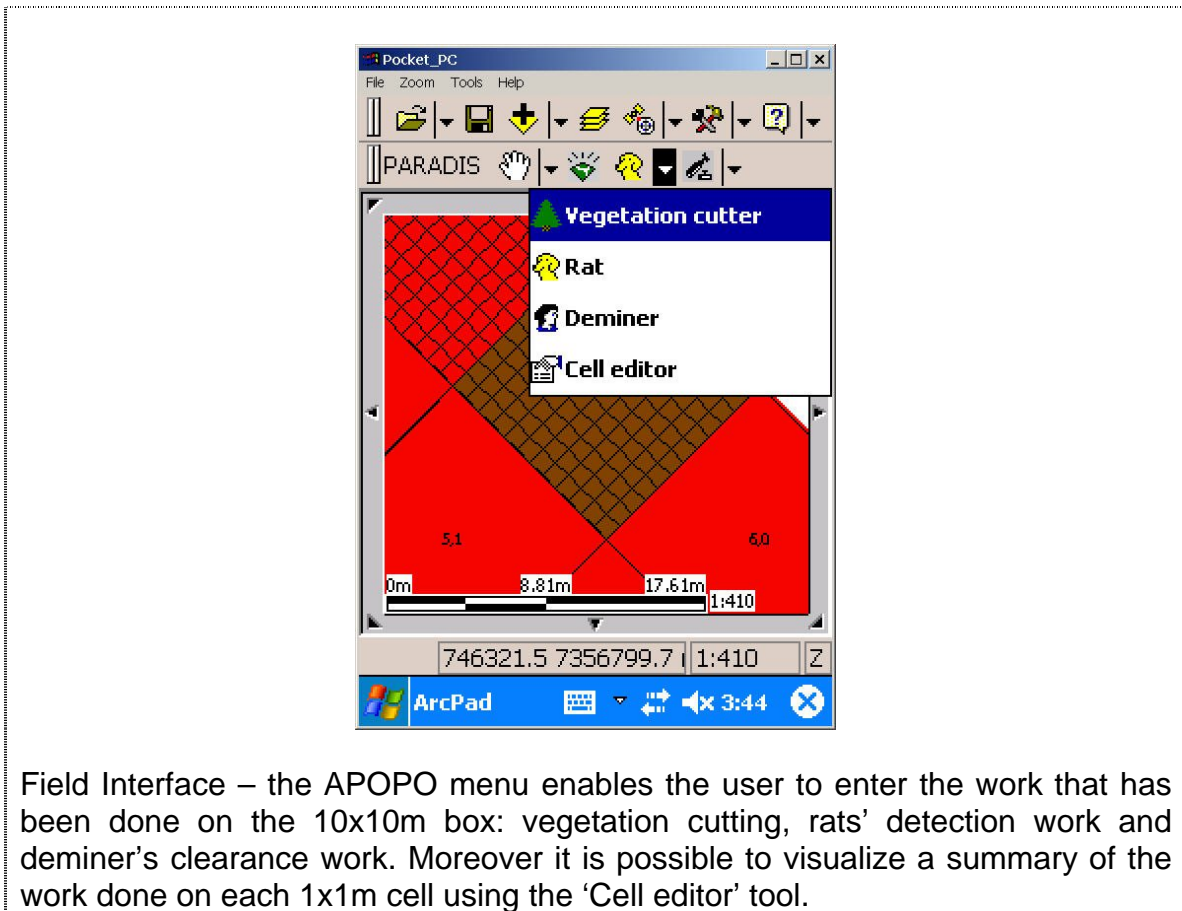
- 1) removing the vegetation from the 10x10m box with a vegetation-cutter;
- 2) sampling the box with the 1st rat; if it finds explosive then a deminer clears the whole box and the work is done for this particular box;
- 3) idem with the 2nd and 3rd rats;
- 4) if no rat has found explosive in the box then the latter is considered as cleared.

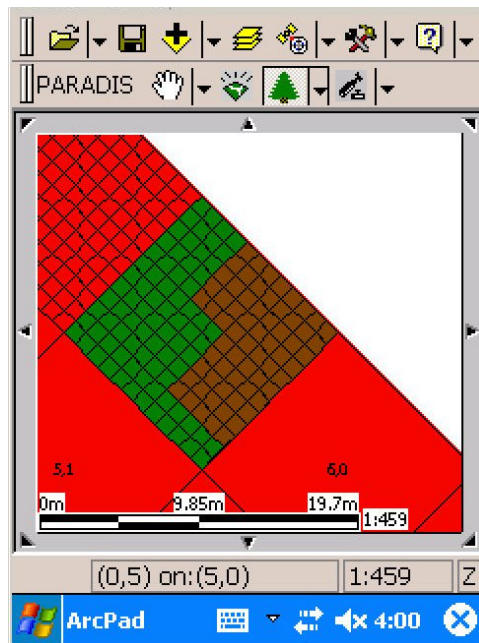


Planning Interface - After the minefield perimeter has been created in the system, the user draws a grid of 10x10m boxes on top of the minefield

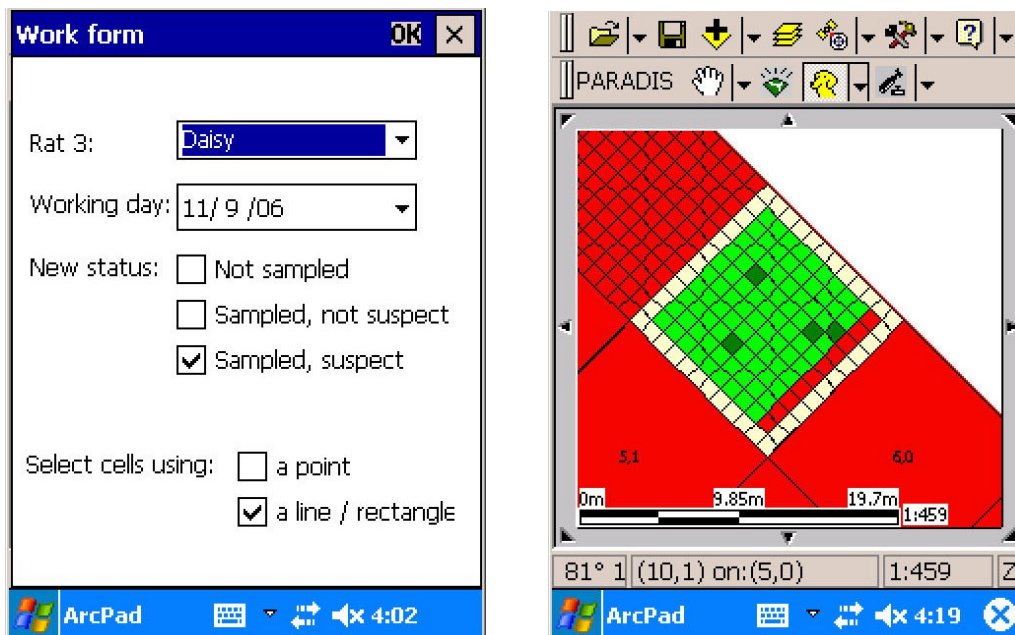


Planning Interface - Then, on each box the user draws a grid of 1x1m cells





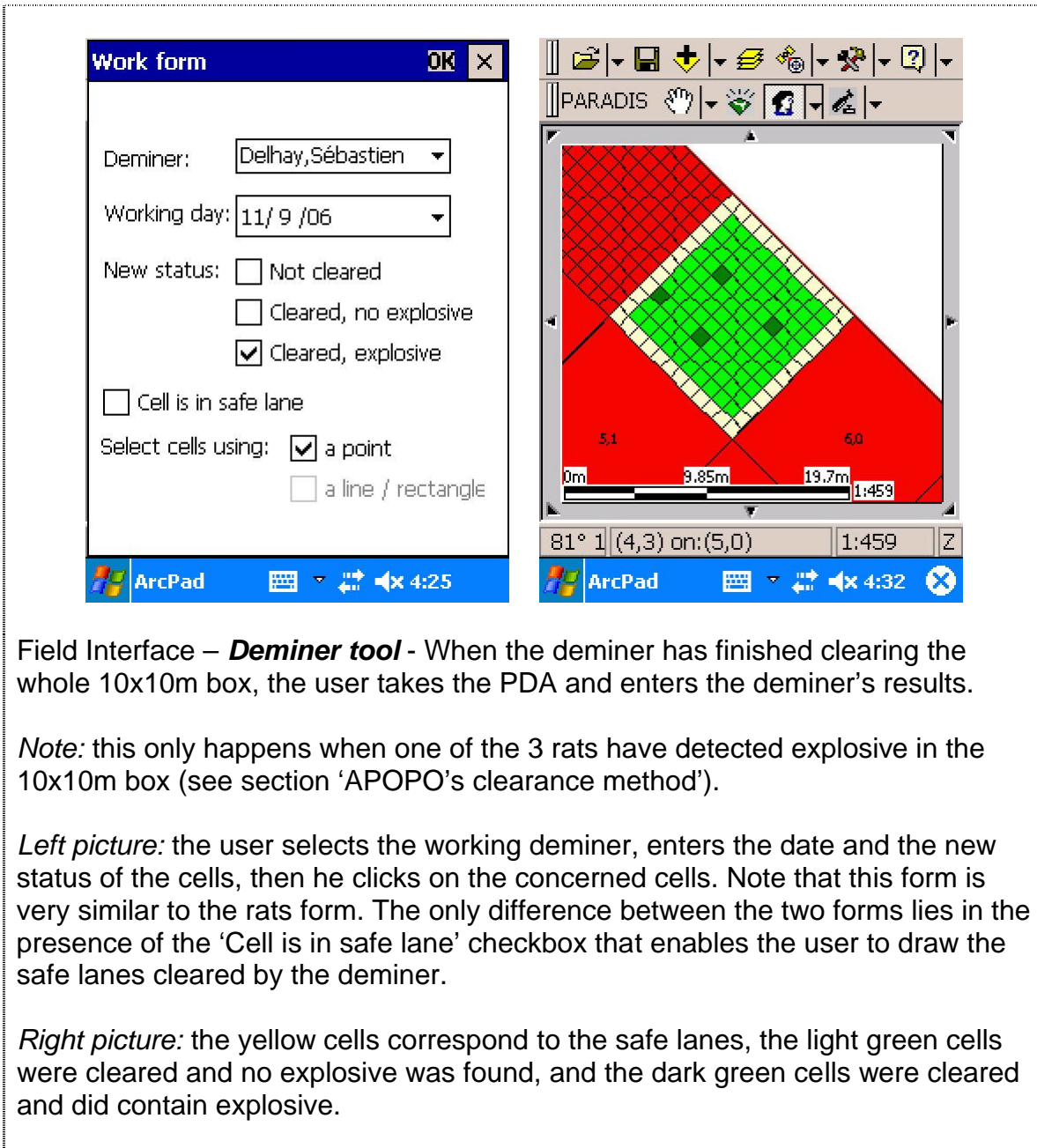
Field Interface – **Vegetation cutter tool** - the user can easily mark the cells where the vegetation cutter was used (green)

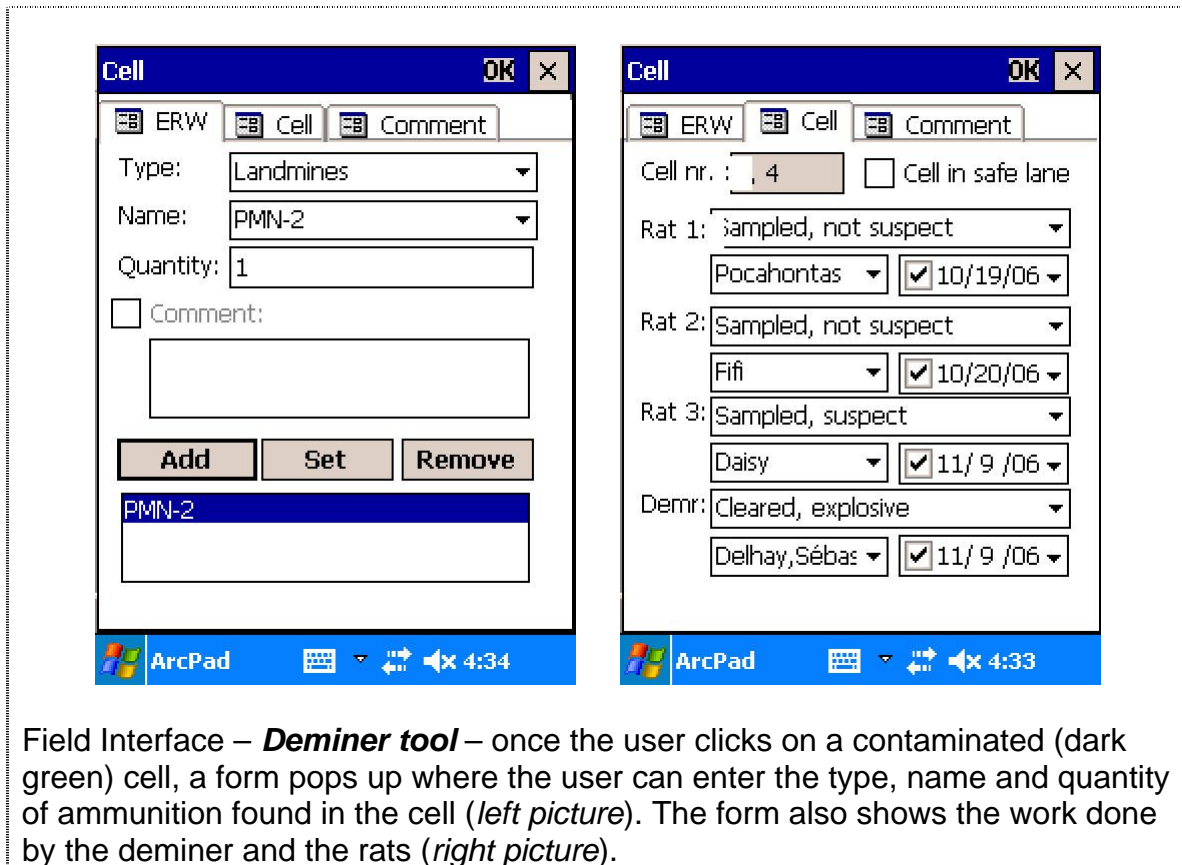


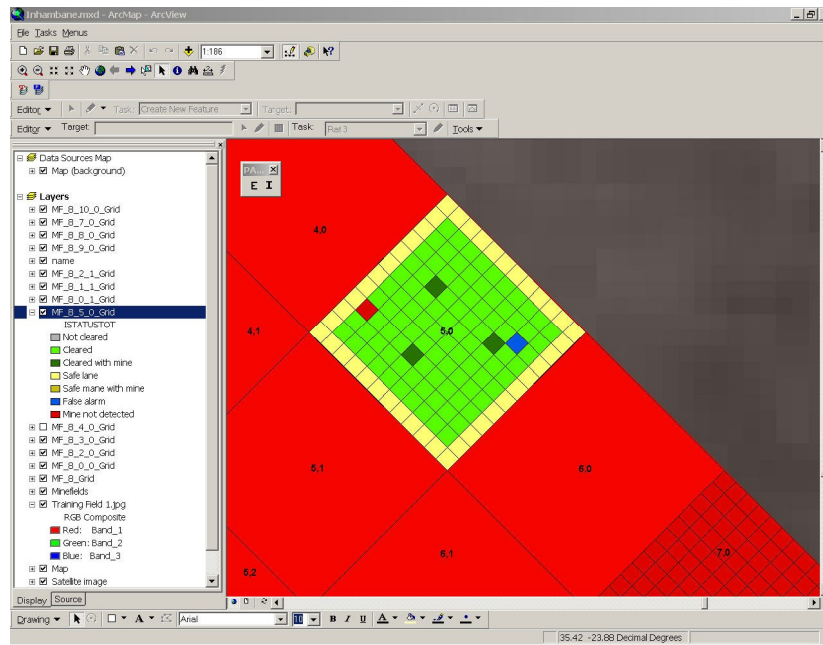
Field Interface – **Rat tool** - When the rat has finished sniffing the whole 10x10m box, the user takes the PDA and enters the rat's results.

Left picture: the user selects the working rat, enters the date and the new status of the cells, then he clicks on the concerned cells;

Right picture: The figure shows a grid as it is being filled: the yellow cells correspond to the safe lanes around the 10x10m box, the red cells have not been sampled yet, the light green cells have been sampled but are not suspect, and the dark green cells are considered as suspect by the rat.







Planning Interface – after the data have been imported into the Planning Interface it is possible to combine the rats’ and the deminer’s results into one single grid for each 10x10m box.

This figure shows the compared results shown above for rats and deminer. One can see two alarms on the grid: a false positive or ‘false alarm’ (blue cell) and a false negative (red cell). This grid could be very useful for the manager to appreciate the efficiency of the rats that were working on the zone.

Table of data needs:

The tools that we expose here are only dedicated to the collection of clearance data. Other data collection and analysis tools need to be developed to fulfill APOPO’s needs, as is shown in the following table.

Note: A= available; TBA= to be adapted; TBD= to be developed

Topic	Data needs	Needed adaptations	Remarks
Minefield	Perimeter and size	A	
	Location of access point, control point, parking, resting room	TBD	
	Estimation of vegetation density	TBD	
10x10m box 1x1m cell	Rats and deminer results for box/cell (which rat/deminer, which day, which result)	A	Developed for the second test
	Ammunition found in box/cell	A	
	Detection and false alarm rates for box	TBD	
	"Result grid": rats' results compared to ground truth (GT)	TBD	On a test minefield the GT is known a priori; on a real minefield the GT is known from the deminer's work, only if the deminer has cleared the box
Rat work	Detection and false alarms rates for rat	TBD	
	Performances comparison	TBD	compute rats comparison based on detection/false alarms rate (temperature, humidity, type of soil could be taken into account)
Road clearance	Road path, seasons of practicability, state, width, etc	TBA	PARADIS already proposes a road reconnaissance tool
	Cleared zone along the road	TBA	APOPO plans to use rats attached to "fishing lines" to clear roads borders. The zone would be considered as a minefield (→ use same tools)
Mine Risk Education	Villages where MRE activities have been done; polygon representing the zone around the village where MRE was done and representing the zone where all those people come from	TBD	The goal is to know which are the populations that have received MRE
Surveying	Global and Technical Surveys	A/TBA	These features are proposed in the core PARADIS system but would need to be adapted
Daily work	Temperature, humidity Resources spent (fuel, explosive material, etc)	TBA	PARADIS already stores data about the working day
Monthly / yearly work	Resources spent, productivity indicator per zone	TBA	

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