Land Release in Action: a field study of practices in use in six countries

This paper discusses the results of a three-month in-field survey that was conducted in mined areas of Angola, Croatia, Bosnia Herzegovina, Northern Iraq, Tajikistan and Cambodia from the 2nd of April to the 8th of July 2012.

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Introduction

This study was conceived, prepared and carried out by the author as part of TIRAMISU research into system and end-user's requirements in Humanitarian Demining. Recognising a lack of published information about how Land Release is implemented in the field, the author set out to record, compare and assess Land Release practices currently in use in a wide range of countries. The results provide a detailed update of current practice as a foundation for research within the European funded TIRAMASU[1] project. The database that is one of the outputs can be used for further analysis and research within the demining community. It is hoped that this will ultimately lead to improvements in Land Release methodology. The complete study report is available on the project website (http://fp7-tiramisu.eu/).

The study gathered detailed data on Non Technical Survey (NTS) and Technical Survey (TS) practices that are in use with fourteen different organizations in six different countries. The majority of those interviewed welcomed the study, acknowledging a widespread need to compare practices between organisations and countries. While recognising a need for further research, the author has drawn the preliminary conclusions presented here.

Study background and aims

The TIRAMISU project aims to conduct the necessary Research and Development to provide the foundations for a global toolbox of assets and equipment for mine action activities ranging from the survey of large areas to the actual disposal of explosive hazards and including mine risk education. The TIRAMASU toolbox will provide mine action actors with a large set of tools, grouped into thematic modules, to help them do to work effectively and efficiently. The content of

[1] The European funded TIRAMASU project: Toolbox Implementation for Removal of Anti-Personnel Mines, Submunitions and UXO.

the toolbox must be designed with the help of end-users and then validated by them in mine affected countries[1].

Acknowledging the fact that the Geneva International Centre for Humanitarian Demining (GICHD) has recently undertaken comprehensive work on Land Release and published two guides[2], this assessment of the state of the art draws extensively from their conclusions and aims at complementing information presented in their guides. GICHD also released an update to the Land Release IMAS in March this year, so making a study of how Land Release is actually implemented extremely timely.

A meeting at GICHD was held in February 2012 prior to deciding the structure of the study and arranging the trips to selected mine affected countries.

During the preparation for the study, other important documents have informed the definition of the baseline by which study results are compared. The baseline is defined as “theoretical” Land Release and embeds concepts and definitions taken from the guides published by GICHD cited above along with the following documents: IMAS 09.50[3], IMAS 03.40[4], Cen Workshop Agreement CWA: 15044:2009[5], CWA: 15832[6], April 2008, Humanitarian Mine Action – follow-on processes after the use of demining machines; IMAS 08.20[7], IMAS 08.21[8] and IMAS 08.22[9].

Although currently employed with some success, the processes and procedures used in the Land Release process lack the full transparency that would allow them to be assessed and implemented on a wider scale when appropriate. A comparative analysis of methods in use in different countries helps to identify and share good practice. By documenting different uses of similar assets in different conditions and with varying follow-ups, the study also raises questions about how to evaluate success. We need to understand under which conditions the varied assets perform as required. Knowing their limitations allows us to make choices over where, when and how to deploy them with confidence in the outcomes.

So the ultimate aims of the study are twofold: to share best practice among mine action operators and to identify strengths and weaknesses in the varied Land Release processes studied. To achieve this, the study has involved collecting as much detailed information as possible about how the two core components of Land Release, are conducted in six different countries. The two core components are Non Technical Survey and Technical Survey. Moreover, relevant stakeholders’ opinion about critical aspects of the Land Release process have been collected.

Methodology and tools

Whenever possible, arrangements were made to visit and interview Mine Action organisations before the field study started. Taking advantage of being in the same country, other Mine Action entities involved in Land Release, either mine action centres (MACs) or local or international Non Governmental Organizations (NGOs), were also visited for data collection.

Within each organization, different types of interviews and questionnaires were used with different types of stakeholders. Table 1 lists the planned schedule of visits and which tool was chosen to collect which data from which stakeholder.

A detailed description of the tools used (including all questions asked) is included in the complete study report. A short description is included in Figure 1 and Figure 2 below.

When planning the field studies, the traditional four steps data gathering approach used in participatory processes (involving ‘engagement’, ‘information’, ‘involvement’ and ‘plan’) was adopted. A participatory tool-game designed to increase interviewer involvement in the process and so encourage interaction was designed but not used because, in all but a few cases, stakeholders interviewed showed great interest in the questions and actively participated in the study without the need for the tool-game. The participation of stakeholders allowed the author to acquire a good understanding of the end-users point of view on Land Release practices and this was augmented by data gathered during long informal discussions that took place outside working hours.

Plan of visits: data to collect from each organization					
Day	**activity**	**tool to use**	**short tool name**	**stakeholder**	**estimated duration**
1					
	introduction to TIRAMISU aims and to the in-field survey	TIRAMISU presentation	TIRpres	PM/director	10min.
	quick insight on relavant country information	country table	countryTable	PM/director	10 min.
	interview and opinions on other tools for data collection to be used; organization of visit	Director/Program Manager interview matrix	PMInterview	PM/director	30 min.
	overview of land release practices, opinion on machine technologies	Planning Officer interview matrix	POInterview	Planning officer/other appointed by PM	45 min.
2					
1°half	field visit			team leader	half a day
2°half	questionnaire on Non Technical Survey	NTS questionnaire	NTSquest	team leader	45 min.
3					
1°half	field visit			team leader	half a day
2°half	questionnaire on Technical Survey	TS questionnaire	TSquest	team leader	45 min.

Table1. Planned schedule of visits to organizations and data collection

Flexibility was anticipated and required because the planned schedule of visits could not always be respected and in different organizations it was not always possible to use the same tool with the same stakeholder.

The majority of data was collected through semi-structured interviews and questionnaires from the Director of Operations and planning, or an equivalent figure.

Other key figures interviewed were field specialists or decision making persons identified by the Director of Operations and, when possible, those in charge of quality assurance.

Visits to field operations were used to enrich understanding of the information collected.

Interviews were used to collect data on a more general level. Questions allowed open answers and sometimes included suggestions about the type of answer expected.

	STRUCTURE	AIM	RELEVANT SECTIONS
Country table	notes and comments on information from literature	quick insight of relevant information on development and mine problems in the country	- country geography, resources, natural hazards, main economic activities - recent history, mine contamination, mine victims and areas mostly affected, current clearing and cancelling rate, estimation of time to accomplish article 5 obligations, post clearance land use,..
PM interview	open answers questions (sometimes embedding suggestions on the type of answer desired)	overview of landmine problem as perceived by stakeholder interviewed	overview of landmine problem
PO interview	open answers questions (sometimes embedding suggestions on the type of answer desired)	overview of land release practices from a general point of view	- scheme drawing of steps taken in land release (LIS, NTS, TS) - overview of NTS practices - overview of TS practices - opinion on machine technology used in TS

Figure 1. Data collecting tools: interviews

Questionnaires were used to collect detailed information in a way that allowed ready comparison between different organizations.

As far as Non Technical Survey was concerned, the study focused on collecting the indicators of mine absence and mine presence that were used to evaluate the probability that a Suspected Hazardous Area (SHA) was contaminated by mines or ERW. Particular attention was given to the criteria for Cancellation based on agricultural use of the land. Possible relationships between these criteria and new technical survey techniques have been suggested[10].

Direct connections between indicators and land threat classification were looked for, especially when quantitative values of indicators (i.e. number of years of land use without evidence of threat) were used to make decisions affecting planning about Technical Survey requirements.

The credibility assigned to informants who provided information about the presence of hazards was recorded, together with the different possible outputs of NTS in terms of threat levels assigned to the SHA/CHA, the possibility of mine/ERW risk, or confidence in the decision that a specific area was contaminated. The constraints affecting the possible application of Technical Survey assets, such as vegetation, estimated mine depth, the type of threat and the type of contamination (pattern minefield, spot mines, etc) were also gathered.

For Technical Survey (TS), the study focused on the critical process of assigning a level of confidence to different demining assets that would be used in TS. This involved examining the procedure used to allocate each asset a certain percentage of ground that the asset must be used over to give confidence that, when no evidence of mines are found, the whole area could be released.

For each asset in use in Technical Survey, the study recorded its application in relation to the type of threat and the other constraints indentified during Non Technical Survey (such as vegetation, soil type, perceived level of threat, etc).

The application of each asset was recorded according to its use as either a first stage investigation tool, a second stage follow up tool, or a third stage additional inspection tool. For each one, the depth of work was recorded together with observations and comments.

Recommendations about the requirements for Technical Survey assets were collected, with the aim of suggesting a new standard for the test and evaluation of mechanical assets that are used during Technical Survey, and of ensuring that those suggestions are based on field experience.

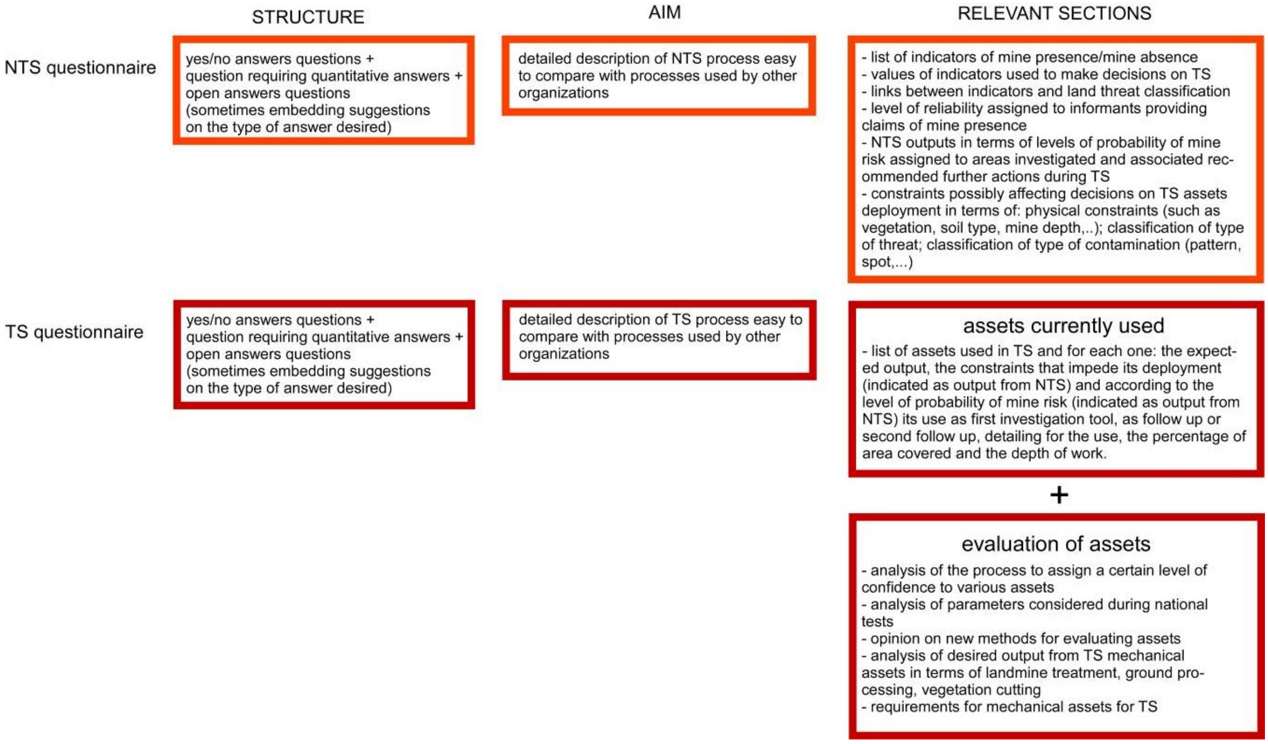

Figure 2. Data collecting tools: questionnaires

Choice of countries and data collected

Non Technical and Technical Survey is being conducted in many countries but some were considered inaccessible as a result of political instability and a high level of insecurity. The time constraints of the research also imposed restrictions. Despite these constraints, a fair cross-section of mine affected countries was selected, all of which had been previously surveyed and were conducting Land Release procedures. The countries visited were Angola, Croatia, Bosnia Herzegovina, Northern Iraq, Tajikistan and Cambodia. Reasons for favouring one country over another included the length of time for which Land Release had been implemented, the local construction of demining machines, and other particular facts indicated in Table 2.

Other countries could have been substituted but practical reasons for making this choice included the possibility or travelling from one country to another without long flights (for environmental reasons), the need to minimise risk for the researcher who travelled alone in the country, and the ease of access to a VISA.

Country	particular facts	VISA
Bosnia	definition of ground processing in quantitative terms, use of AI DSS (based on airborne and space born remote sensing). Local construction of demining machines	no
Croatia	use of airborne and space born remote sensing; Local construction of demining machines	no
Angola	local construction of demining machines; training site for mechanical demining in Cunene	yes, at the embassy in Italy
Northern Iraq	local construction of demining machines	yes, on arrival
Tajikistan	at the beginning of the process; just starting accreditation of machines	yes, on arrival
Cambodia	long history in land release	yes, on arrival

Table 2. Countries chosen for data collection and reasons behind their choice.

Overall, fourteen Mine Action organizations in six countries were visited.

Not all organizations visited were performing NTS and TS. As a result, the amount of data collected is not the same for each organization and varies as shown in Table 3. Moreover, when time was restricted and no more than one stakeholder was available, the questions included in PO Interview and TS Questionnaire were only asked during the TS Questionnaire, where they were more detailed. When the time available did not allow in-depth research, more general questions such as those contained in the PM Interview were put to a single organization. This allowed enough time to document each organization's Land Release practices in as much detail as possible.

Data collected by type								
country	organization	PMInterview	POInterview	NTSquestionnaire	TSquestionnaire	SHA field visit*	cost table	other discussions
Angola	Ang_org1	1						
	Ang_org2	1	1	1	1	3	1	
	Ang_org3	1	1	1		3	1	1
Croatia	Cro_org1	1	1					
Bosnia and Herzegovina	BH_org1	1		1				1
	BH_org2		1		1	2	1	
Iraqi Kurdistan	IraqiKur_1	1	1	1	1	1		2
Tajikistan	Taj_org1	1	1					
	Taj_org2			1	1	2		
	Taj_org3							1
	Taj_org4							1
Cambodia	Cam_org1	1	1	1	1	2		1
	Cam_org2							1
	Cam_org3					2		1
overall tot		8	7	6	5	15	3	9

*one per each SHA visited

Table 3. Data collected from each organization.

Data analysis

The results of the study are presented by country and by topic.

In the country section, data from all available country tables and PM interviews are merged into two separate tables presenting general relevant facts about the country and a general overview of the landmine problem as perceived by those stakeholders interviewed.

Other data collected through interviews is presented in raw format by organization. Because the study aim was not to compare and evaluate the efficiency of different organizations in achieving Land Release but rather to analyse the processes used and to share good practices while highlighting weaknesses, organizations are not named but are referred to by a number. To preserve anonymity, the same number does not always correspond to the same organization.

Information in the country section that was acquired through questionnaires and field visits is used to contribute to the sub-section "Major facts about Land Release practices" that is elaborated for each organisation by the author. This section includes a summary of inputs and outputs, procedures followed and the technologies that the organisation uses in the traditional steps of Land Release (General and/or Impact Survey, NTS and TS). To allow a level of comparison, Land Release practices are described following the same points for each organization. It was possible to gather, analyse and elaborate on data from seven organisation in the section “Major facts about Land Release practices” (see figure. 3).

In the Topic section, two large tables have been prepared merging the results from the NTS Questionnaire and from the TS Questionnaire (see figure 3). Answers to key questions in the TS questionnaire relating to the TS asset requirements are grouped and shown in charts.

The number of organizations for which it was possible to insert data in the NTS table is six. The number of organizations for which it was possible to insert data in the TS table is five.

Particular attention has been given to presenting data in a way that allows easy comparison of answers to the same questions given by different organizations.

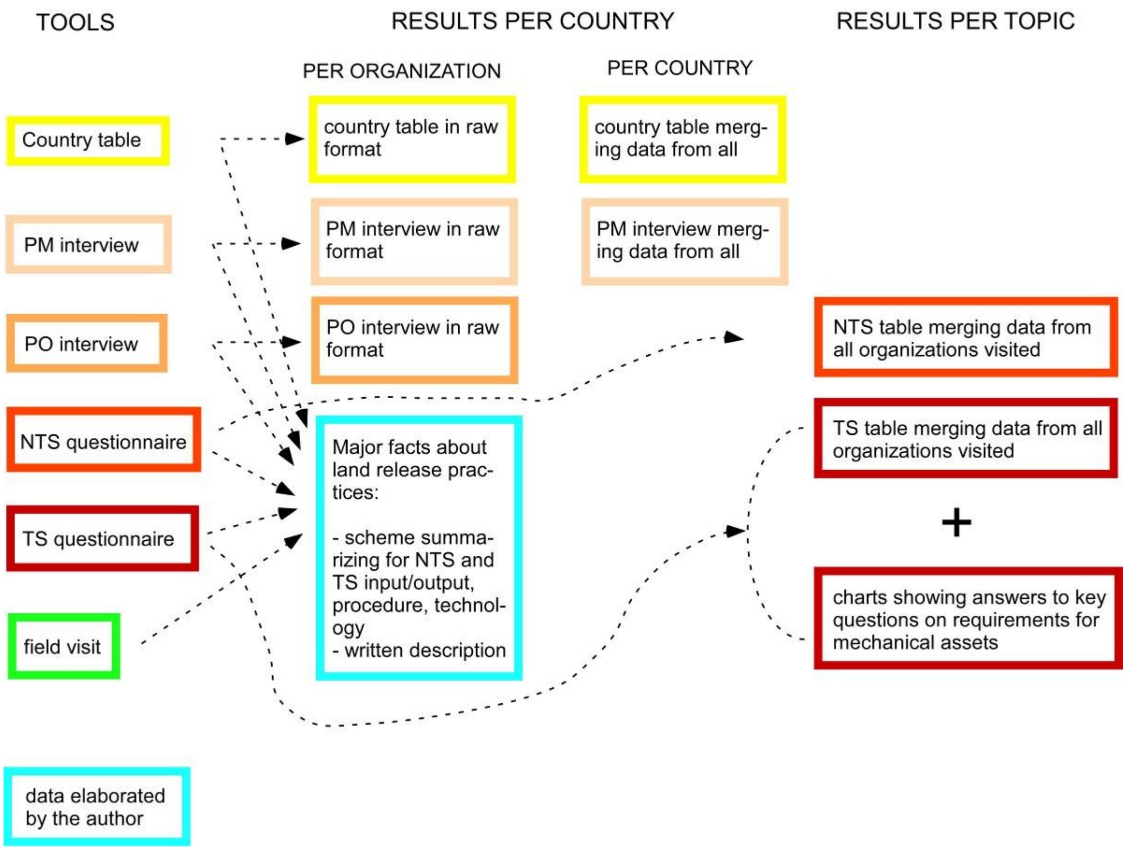

Fig. 3 Presentation of data

Preliminary conclusions

The major conclusion of this study is that it highlights a large gap between the theory and practice of Land Release. This is first suggested by the fact that every country used different terminology, rarely in accordance with its use in IMAS. The borders between General Survey, Impact Survey, NTS and TS concepts shift from one organization to the other. As a result, the range of activities embedded in the phases of survey varies according to the organization and country.

This makes it difficult to compare the practices used by different organizations, which also vary greatly.

Generally, the NTS efforts studied were aimed at:

1. identifying Confirmed Hazardous Areas (CHA) while assigning a certain level of confidence to the statement that the area contains mines or ERW;
2. re-examining the evidence for the status of Suspected Hazardous Areas (SHA) while assigning a certain level of threat or level of suspicion;
3. classifying SHA/CHAs according to the socio-economic impact that the hazards have on communities, so informing the prioritisation of TS and clearance work.

That generalisation conceals the fact that one organisation’s NTS was only aimed at defining the socio-economic impact of the SHA on local communities while three other organizations did not assess socio-economic impact during NTS at all. Some organizations used more than one NTS form, so adding confusion to the process of comparing their outputs.

Two organizations used unconventional technology in the form of airborne survey systems during NTS. All others employed traditional equipment such as Global Positioning Systems (GPS), sometimes Differential Global Positioning Systems (DGPS), range finder, compass and binoculars. One of the organizations using airborne systems deployed it as an interim step between NTS and TS, gathering further evidence intended to reduce the need for TS. The other organisation using an airborne system had only just started to use it so could not provide information about its benefits. In one organization, the NTS teams were also equipped with metal detectors because they performed limited TS while doing NTS.

All organizations applied a confidence rating system to data gathered from informants. All agreed that the most reliable informants about the presence or absence of mines were soldiers or combatants involved in mine laying. Only when these people were not in the area or when a long time had passed between mine laying and mine action were other key informants considered most reliable. Other key informants included shepherds, land owners and mine victims.

When land was being used, the fact of its use was involved in the evaluation of the land’s hazardous status in a way that varied greatly from one organization to the other. Of the seven organizations asked about NTS, all except one made the length of time that the land had been in use a parameter in their definition of the level of land use. Of these, only three organizations also considered the depth of soil disturbance during land use and only one took note of whether the land had been cultivated manually or mechanically.

The biggest difference between the NTS practices used by the organizations visited was in the way that the NTS outputs affected the conduct of subsequent Technical Survey (TS). Only two organizations changed their approach to Technical Survey as a result of the output of NTS. In one organisation, the size of the area that must be investigated during Technical Survey was reduced as the level of risk assigned to the area after NTS decreased. In the other organisation, the size of the area investigated was reduced as their level of confidence in the asset used to conduct Technical Survey increased.

It is significant that none of the organizations visited had established a system for evaluating the varied performance of the assets they used to conduct Technical Survey. Although one reduced the area searched according to their confidence in that asset, no system for assessing and comparing the level of confidence/accuracy/reliability of the assets and the procedures in which they were used was in place. Despite one organisation using an SOP that allowed the search of a smaller area when a “reliable asset” was used, no system was in place for defining what was “reliable” or of deciding what level of follow up behind the varied Technical Survey assets would constitute having made “all reasonable effort” to determine where or not hazards were present.

One organisation appeared to prefer using a mechanical asset over the entire SHA/CHA during Technical Survey. For that organization, Technical Survey only differed from clearance because it allowed the use of a less efficient asset over the entire area. All other organisations generally used Technical Survey assets over a proportion of the SHA. When it did not depend on the level of threat assigned to the area during Non Technical Survey, the criteria for determining the size of the area processed during Technical Survey varied according to the organization. In one case it depended on the number of assets used to process the area. In another case, it depended on the ability to perform visual inspection after the asset had been used. In another case, it depended on the residual threat when all hazards expected to be present had not been found.

As for the type of assets used during Technical Survey, all organizations used manual deminers. Six of the seven also used machines. Four used a combination of manual deminers, machines and dogs (see pict.1). Among the six organizations using machines, one used four different types, two used three types, one used two types and two only had access to one type of machine. Among the different types of machine used, small flails were used by two organizations (the organizations that only had access to one type of machine). Medium tillers were used by two organizations, and a medium flail by one (see pict.2). Large flails, large tillers and large excavator based flails were used by a single organization. Two organizations used Mine Protected Vehicles (MPV) (see pict. 3) and two used armoured front loaders. One used sifters and one used brush cutters. Two organizations also used large-loop detectors during Technical Survey.

Pict. 1. Dogs used during Technical Survey in Bosnia Herzegovina.

Pict. 2. Medium flail used for vegetation cutting, ground preparation and possibly mine detonation in Tajikistan.

Pict. 3. MPV used to drive remotely a medium tiller from close in Bosnia

It is significant that although traditional demining machines such as flails and tillers are the machines mostly used during Technical Survey, they may not be the most appropriate. As machines intended to detonate mines, they do not offer the type of output identified by stakeholders as being most appropriate during Technical Survey. Technical Survey is intended to collect information about contamination which is best done by using assets that detect and identify the devices and their precise location rather than detonating or destroying some of them in the ground.

Another aspect that might make flails and tillers inappropriate for Technical Survey is the fact that all the organisations used their machines with some kind of follow up. Machines that detonate, deflagrate or disperse hazards may make this more difficult. The follow up that was used covered a very broad range. Manual deminers were used to conduct full clearance over all or part of the area. Dogs were used in single or double search mode. Manual deminers made a rapid metal detector search while standing. Manual deminers made a simple visual search and only checked possible skip zones where the machine might not have processed the ground appropriately. The only machine behind which there was no follow-up was the sifter but the use of that machine involved the use of manual deminers to check the sifted residue inside the bucket so the mechanical procedure included manual demining.

Stakeholders were asked what was the best condition in which to find mines after a machine had been used to process an area over which there would be manual follow up. They answered that it was better if mines were left intact. When mines were touched, it was better if they had not been crushed or initiated. One organization clearly stated that "machines are not deployed with the aim of detonating mines". They are used to cut vegetation and soften the soil (see pict.4).

Pict.4. This manual deminer found an AT mine booby trapped with a small AP mine during TS after the soil has been softened by a machine.

All organizations except one agreed that the use of ground processing tools similar to the ones used by farmers when cultivating land in Technical Survey was a possibility. This was suggested because areas that have been mechanically cultivated for a defined period of time without any indication of the presence of mines are frequently cancelled during Non Technical Survey. During the study, the organisations using machines had a high level of confidence about the kind of hazard that might be in the area being subjected to Technical Survey. All except one of the machines in use could not be deployed in areas where there might be Anti-Tank mines (mines containing more than 2kg TNT). This suggests that agricultural machines used in Technical Survey would only need to be modified to withstand Anti-Personnel mine detonations.

The study results provoke further reflections on the suitability of a large variety of machines for use in Technical Survey. Field visits suggested that, for Technical Survey, no machine was expected to detonate or crush all mines, in particular metal cased mines. During the visit to one organization out of the 46 AP mines found during operations, only six were destroyed or detonated by the machine that was used as the first asset deployed over the area. Even mine protected vehicles were used to increase confidence that an area was free of explosive hazards (see Pict.5).

Pict. 5. Mine Protected Vehicle being used with steel wheels for Technical Survey in Angola

The study also tried also to discover what soil processing output was expected by machines used in Technical Survey. The organisations reported a depth of processing between 10cm and 30cm. Only one organization defined the type of soil processing by defining the maximum size of soil particles that can be left behind the machine.

The study also found that life-cycle cost is an important aspect of the use of mechanical assets. As well as purchase cost (which may be donated), the running costs and frequency of maintenance are important considerations that must be balanced against its anticipated productivity when selecting a new machine (see fig. 4).

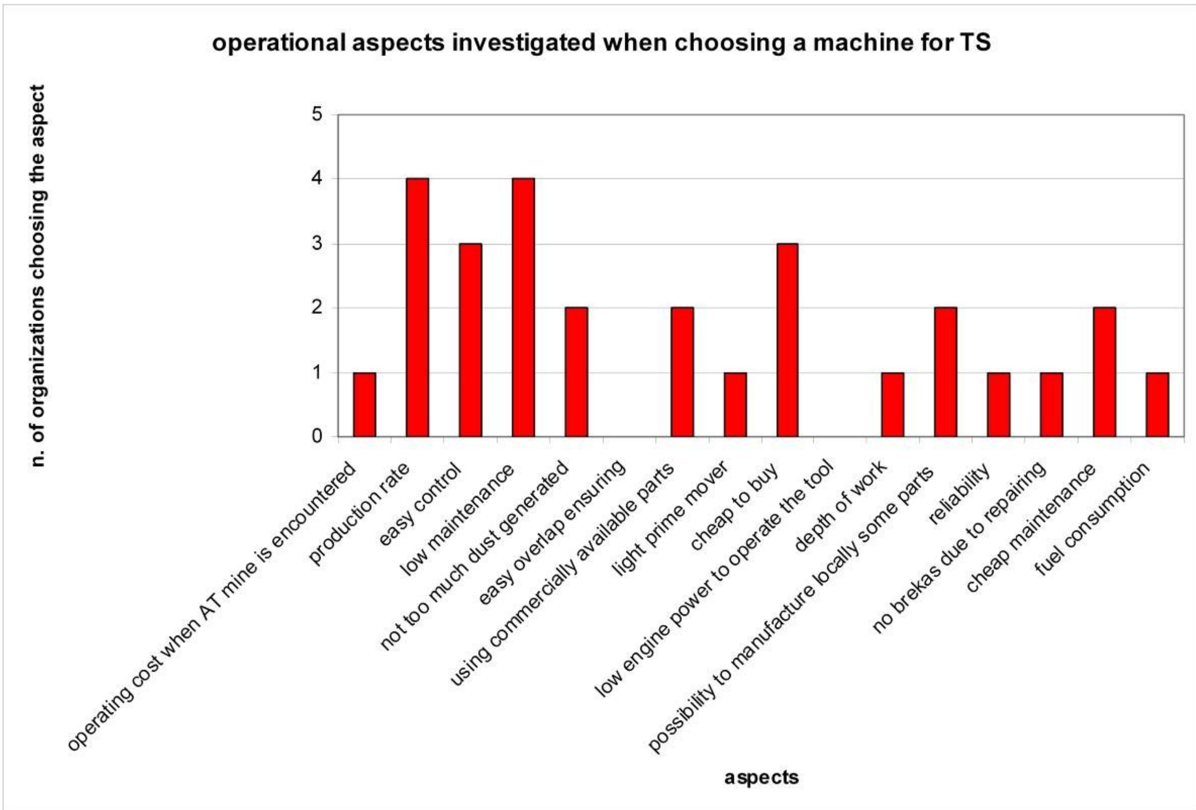

Fig.4 Operational aspects investigated when choosing a machine for TS. [Data from five questionnaires]

A general lack of technical knowledge of machines also became apparent because only three organizations chose their mechanical assets themselves. Those are also the only ones that expressed a desire for existing machines that they currently do not have (see pict.5). This implies that investing in the technical knowledge of management staff might help when selecting cost-efficient technologies for Technical Survey that are suitable to the local context.

The study allowed the collection of a large amount of data that has been presented in the report in a raw format, as it was collected from those stakeholders interviewed. The idea behind making raw data public was to provide a database suitable for further analyses and investigation. The author recognises that findings other than those discussed here can be made by analysing the data in different ways.

The author believes that one of the most important outcomes of this study is the revelation that there is no common standard for the use of machines during Technical Survey. There is no agreed way to determine the level of confidence that results from their use, and opinion about this varies considerably. Machines used during Technical Survey need not be designed to detonate mines, so the existing mechanical CEN agreement for evaluating machines is not applicable to them. There is an immediate need for a well defined systematic definition of what is expected from the machines that are used during Technical Survey. Confidence in their performance should not only be a matter of personal opinion, but should be subject to agreed limitations and parameters that are defined with a degree of objectivity that can be hard to achieve in the field. This new system should be specifically designed to be applied to machines that are or may be used during Technical Survey. The types of machine used for Technical Survey vary almost as widely as the context in which they are used, so a standard method of determining a machine's reliability as a Technical Survey asset that could be conducted by the field-users in the area of use would be post practical.

Pict. 6. Technical Survey being conducted on a steep slope in Iraqi Kurdistan, where no machine currently available to the organization can work.

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It's an incredible privilege to be able to visit mine affected countries with the precious support of experienced people who work there which has allowed a deeper understanding of their country's history and problems.

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About the author

Emanuela Elisa Cepolina, PhD is a mechanical engineer who has been conducting research into sustainable and appropriate technologies for humanitarian demining over the past ten years. During her research work she has visited many mine action activities in twelve countries and has acquired a deep understanding of mine action environment and challenges. She has recently worked on the design, development and in-field test of Locostra a versatile and low-cost demining machine based on a small agricultural tractor. She has been working at the University of Genova and recently at Snail Aid – Technology for Development, a not-for-profit social enterprise of which she is president. Since January 2012, she has been working full-time on the E.U. funded TIRAMISU project.

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