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Land Release in Action

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As part of the EU-funded TIRAMISU project, the author conducted a comprehensive survey of land release procedures in six countries during 2012. The results show that expectations of technical survey machines should be defined and standardized through tests and evaluations.

by Emanuela Elisa Cepolina [Snail Aid – Technology for Development]
with editorial support from Andy Smith [Mine Action Specialist]

From 2 April to 8 July 2012, Snail Aid – Technology for Development carried out a three-month survey of relevant mine action stakeholders in Angola, Bosnia and Herzegovina, Cambodia, Croatia, Northern Iraq and Tajikistan to assess best practices on land release. Recognizing a lack of published information about how land release is implemented in the field, this study records, compares and assesses land release practices in use by 14 different organizations in six countries. The results provide a detailed snapshot of current practice that serves as a foundation for further research within the EU-funded TIRAMISU project, an integrative project to develop a comprehensive toolbox for humanitarian demining.[1] It is hoped that the study will lead to improvements in land release methodology. The complete study report is available on the project website: http://www.fp7-tiramisu.eu/.

The land release study's aim was twofold: to identify and share best practices among mine action operators and to identify strengths and weaknesses in land release processes. To achieve this, the study gathered as much detailed data as possible on the two core land release components: Non-technical Survey (NTS) and Technical Survey (TS). The majority of those interviewed welcomed the study, acknowledging the need to compare practices between organizations and countries. The complete study report presents the large amount of data in a raw format as it was collected from interviewed stakeholders. The idea behind making raw data public is to provide a database suitable for further analysis and investigation. Findings other than those discussed here may be made by analyzing the data in different ways.

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	10 min.
	Quick insight on relevant 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	PM Interview	PM/director	30 min.
	Overview of land release practices, opinion on machine technologies	Planning Officer (PO) interview matrix	PO Interview	Planning officer/other appointed by PM	45 min.
2					
	Field visit			Team leader	Half a day
	Questionnaire on Non-technical Survey	NTS questionnaire	NTS quest	Team leader	45 min.
3					
	Field visit			Team leader	Half a day
	Questionnaire on Technical Survey	TS questionnaire	TS quest	Team leader	45 min.

Table 1. Planned schedule of visits to organizations and data collection.
All graphics courtesy of the author.

Country	Particular facts	Visa
Bosnia and Herzegovina	Definition of ground processing in quantitative terms, use of Advanced Intelligence Decision Support System (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 the reasons behind their selection.

Methodology

The mine-affected countries visited—Angola, Bosnia and Herzegovina, Cambodia, Croatia, Northern Iraq and Tajikistan—had been previously surveyed and were conducting land release procedures. Reasons for selecting one country over another included the length of time that land release was implemented and the local construction of some demining machines used in TS.

Of the 14 mine action organizations in the six countries participating in the study, not all performed both NTS and TS. As a result, the amount of data collected varied for each organization.

The study was not designed to compare efficiency in achieving land release so the organizations are not named in the study report. Particular attention is given to presenting data in a way that allows comparison between answers provided by anonymous organizations. While the full analysis regarding the tools used and questions asked during the survey are in the complete study report, Figures 1 and 2 (page 46) provide short descriptions of each.[2]

Whenever possible, arrangements were made to visit and interview mine action organizations before the field study started. Carefully designed, structured interview and data-gathering techniques were used. The author visited multiple organizations involved in land release in each country and collected data on an *ad hoc* basis. The flexible data-collection methods are described in the full study report.[2]

Non-technical Survey and Technical Survey

For NTS, the study focused on collecting indicators of mine or explosive remnants of war (ERW) absence or presence used to evaluate the probability that an area was contaminated. Particular attention was given to the criteria for (threat) cancellation based on agricultural use of the land. The author looked for direct connections between indicators and land threat classification, especially when quantitative values of indicators (such as the number of years land had been used without finding evidence of hazards) were used to make decisions affecting TS requirements. The study also documented the credibility assigned to informants, providing information about the presence of mines, the different possible outputs of NTS in terms of threat levels, and the constraints on the application of TS assets (such as vegetation and the type, depth and anticipated pattern of mine and ERW hazards).

	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 most affected, current clearance and cancellation rate, estimation of time to accomplish Article 5 obligations, post clearance land, etc.
PM interview	Open-answer 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.

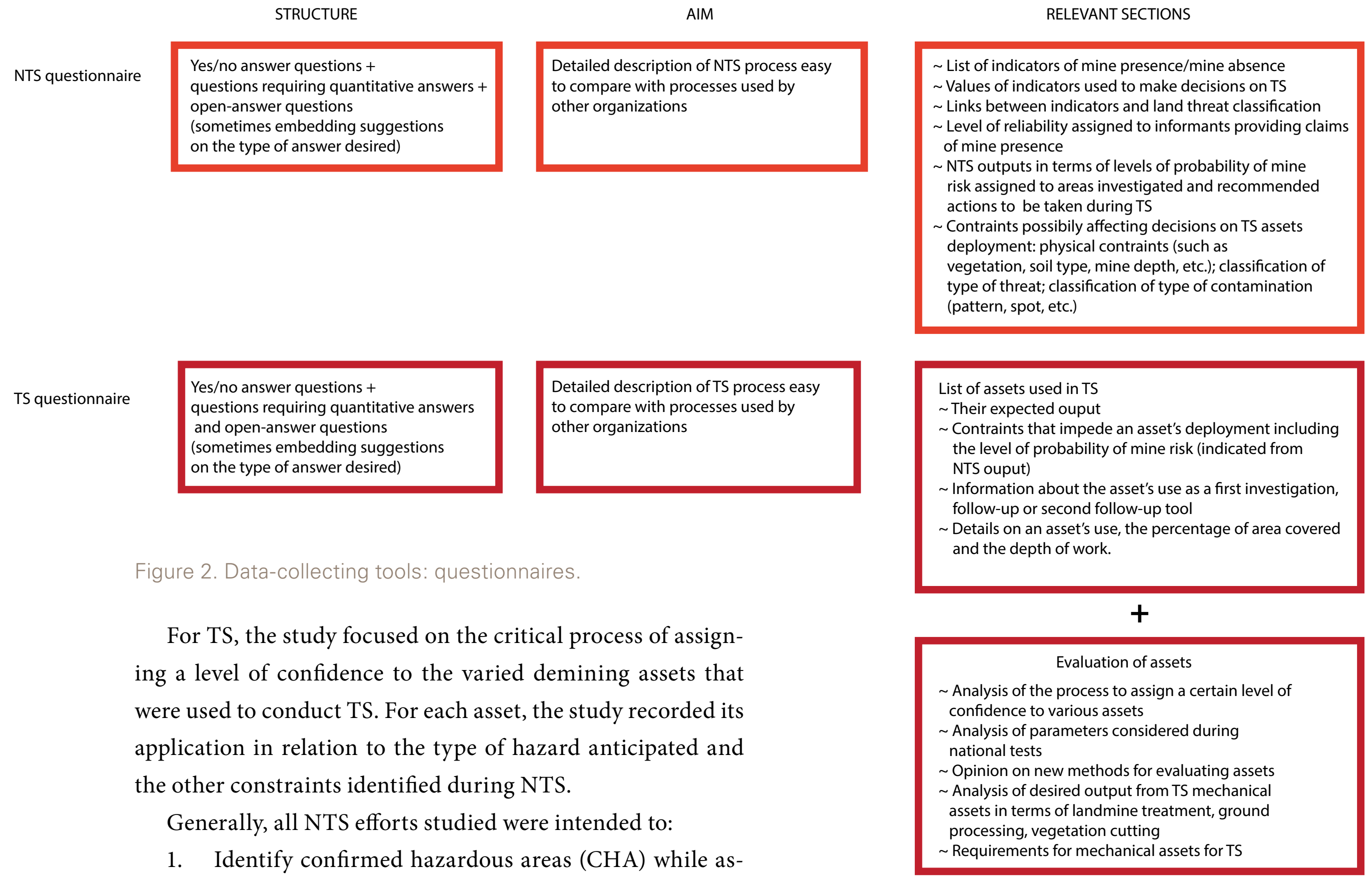

Figure 2. Data-collecting tools: questionnaires.

For TS, the study focused on the critical process of assigning a level of confidence to the varied demining assets that were used to conduct TS. For each asset, the study recorded its application in relation to the type of hazard anticipated and the other constraints identified during NTS.

Generally, all NTS efforts studied were intended to:

1. Identify confirmed hazardous areas (CHA) while assigning a certain level of confidence to the statement that the area contained mines or ERW
2. Re-examine the evidence for the status of suspected hazardous areas (SHA) while assigning a level of threat or level of suspicion to the area
3. Classify SHA/CHA according to the socioeconomic impact that the hazards had on communities, thereby informing the prioritization of subsequent TS and clearance work

These generalizations conceal the fact that one organization's NTS was only aimed at defining the socioeconomic impact of the SHA on local communities while three other organizations did not assess socioeconomic impact during NTS at all. Some organizations used more than one NTS report form, which added confusion to the process of comparing their outputs.

Findings

This study found a large gap between the theory of land release and its actual implementation. In every country, terminology varied or was used to mean different things that were rarely in accordance with the definitions used in the International Mine Action Standards. The division between general survey, impact survey, NTS and TS concepts varied from one organization to another, and the range of activities involved in the phases of survey varied according to the organization and the country of operation.

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 TS. Only two organizations changed their approach to TS as a result of the output of NTS. In one organization, the size of the area that must be investigated during TS was reduced as the level of risk assigned to the area after NTS decreased. In the other organization, the size of the area investigated was reduced as their level of confidence in the asset used to conduct TS 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 TS. Although one reduced the area searched according to their confidence in that asset, no system for assessing and comparing the level of confidence or reliability of the assets and the procedures in which they were used was in place. Despite one organization using a written standard operating procedure 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 deciding what level of follow up behind the varied TS assets would constitute having made "all reasonable effort" to determine whether or not hazards were present.

One organization appeared to prefer using a mechanical asset over the entire SHA/CHA during TS. For that organization, TS only differed from clearance because it allowed the use of a less efficient asset over the entire area. All other organizations generally used TS assets over a proportion of the area. When it did not depend on the level of threat assigned to the area during NTS, the criteria for determining the size of the area processed during TS 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 yet another case, it depended on the residual threat when all hazards expected to be present had not been found.

The use of land was recorded in the evaluation of the land's hazardous status in a way that varied greatly from one organization to another. 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 significance 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 assets used during TS also varied. All organizations used manual deminers. Six of the seven also used machines. Four used a combination of manual deminers, machines and dogs. 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 machines used, small flails were used by two organizations, medi-

Medium flail used for vegetation cutting, ground preparation and possibly mine detonation.

Mine-protected vehicle used with steel wheels in TS.

This manual deminer found an AT mine booby-trapped with a small AP mine during TS after the soil was softened by a machine.

um tillers by two organizations, and a medium flail by one. Large flails, large tillers and large excavator-based flails were used by a single organization. Two organizations used mine protected vehicles and two used armored front loaders. One used sifters and one used brush cutters. Although traditional demining machines such as flails and tillers are most used during TS, they may not be the most appropriate because they are intended to detonate mines. TS is intended to collect information about contamination and this is best done by using assets that detect and identify the devices and their precise locations rather than detonating some of them in the ground. All organizations studied used their machines with some kind of follow-up, so the use of flails or tillers that detonate, deflagrate or disperse hazards was less than ideal. When 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, stakeholders confirmed 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 were not deployed with the aim of detonating mines but were only used to cut vegetation and loosen the soil.

All organizations except one agreed that it was possible to use ground-processing tools similar to those used by farmers in TS. This was suggested because areas that have been mechanically cultivated using farm implements for a defined period of time without any indication of the presence of mines are frequently released during NTS.

During the study, the organizations using machines had a high level of confidence about the kind of hazard in the area subjected to TS. Field evidence showed that, for TS, no machine was expected to detonate or crush all mines or ERW. All except one of the machines in use could not be deployed in areas where there might be mines containing more than 2 kg (4.4 lb) of TNT. This suggests that agricultural machines used in TS would only need to be modified to withstand the detonation of small mines.

The study also examined what soil-processing output was expected of machines used in TS. The organizations reported a depth of processing between 10 cm (3.94 in) and 30 cm (5.12 in). Only one organization defined the type of soil processing with reference to the maximum size of soil particles that could be left behind the machine.

Conclusions

One of the study's most important findings is that no common standard is in place for the use of machines during TS. There is no agreed way to determine the level of confidence that results from the use of machines, and opinion about this varies considerably. Machines used during TS need not be designed to detonate mines, so the existing mechanical CEN Workshop Agreement for evaluating machines is not applicable.[3]

An immediate need exists for a well-defined, systematic definition of what is expected from TS machines. Confi-

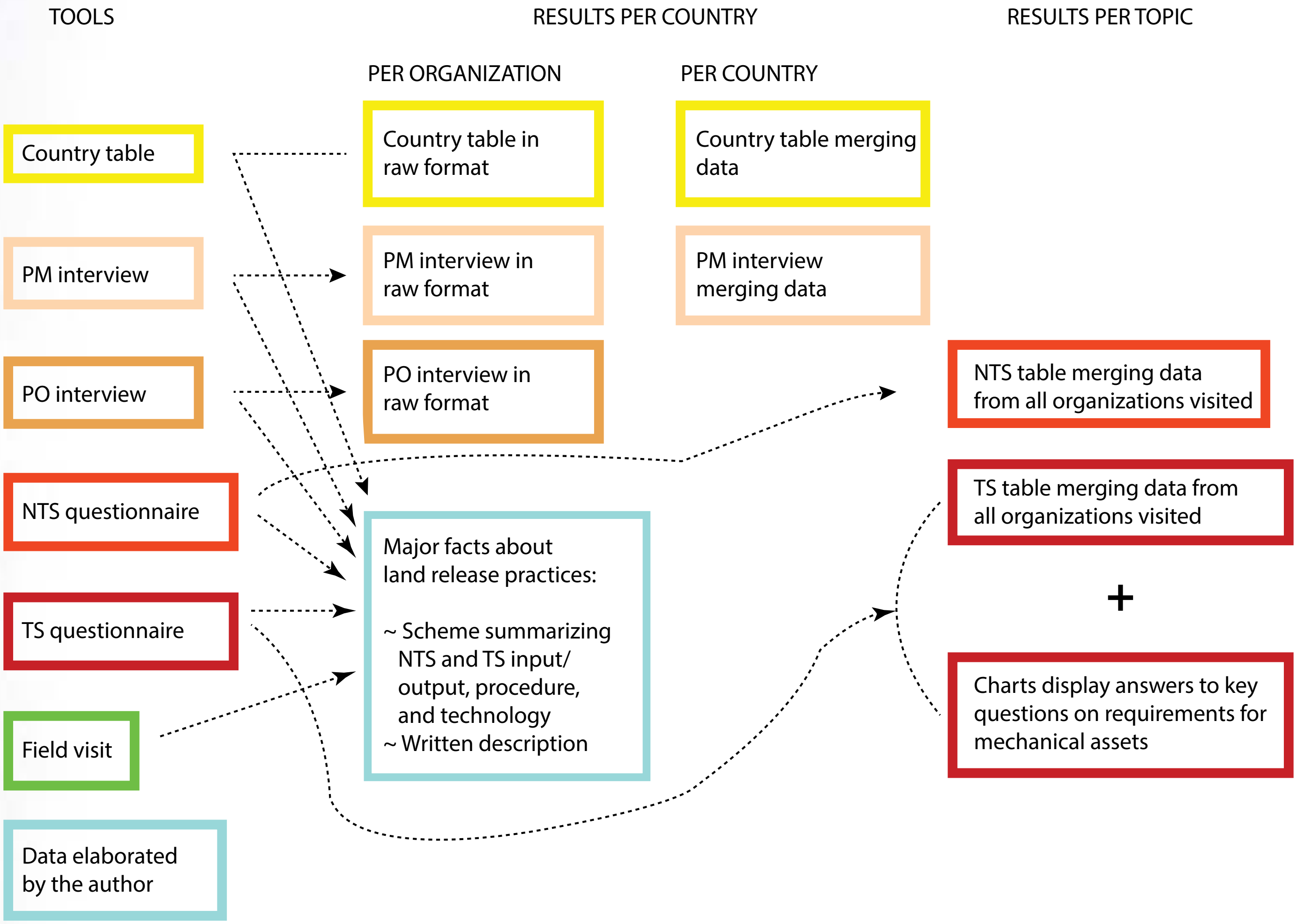

Figure 3. Presentation of data.

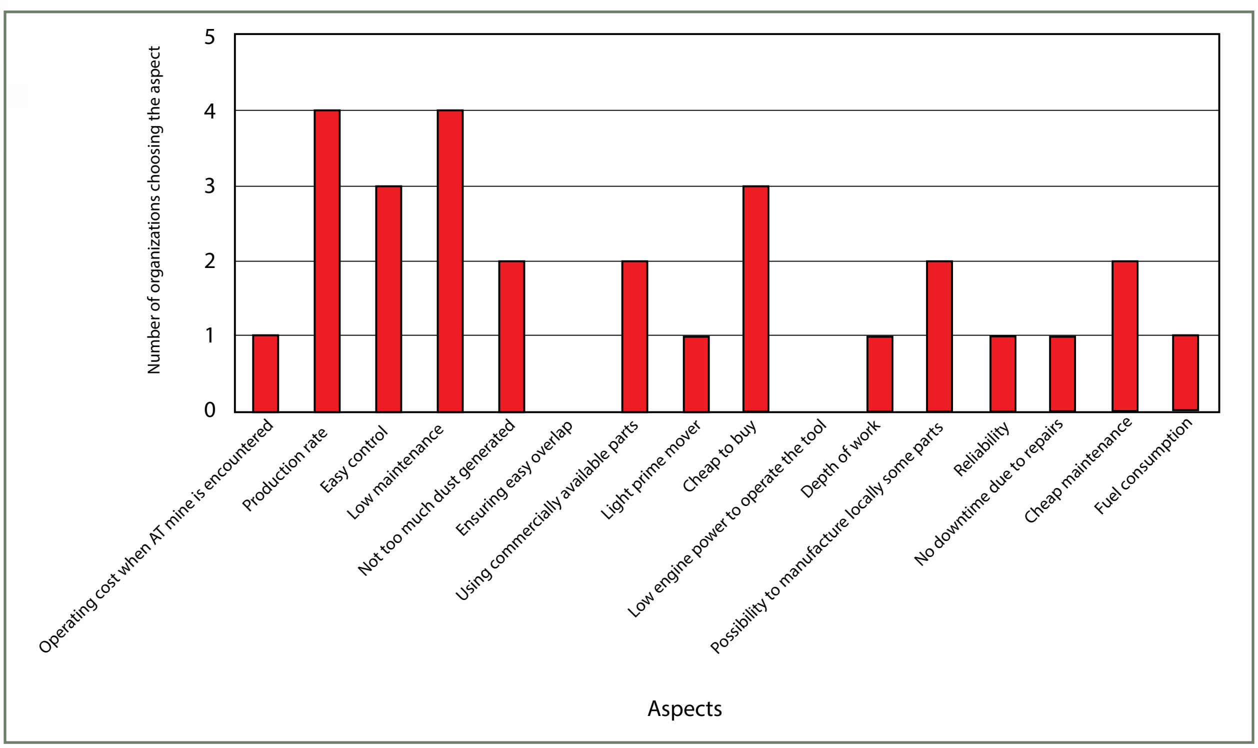

Figure 4. Operational aspects investigated when choosing a machine for TS. Data from five questionnaires. For two categories, the response was 0.

dence in their performance should not be a matter of personal opinion; the level of confidence should be subject to agreed limitations and parameters that are defined with a degree of objectivity that is difficult to achieve in the field.

A new standard for the evaluation and deployment of mechanical assets should be specifically designed and applied to machines that are (or may be) used during TS. The types of machines already used for TS vary almost as widely as the context in which they are used, and the potential for adapting others from the agricultural sector is real. To achieve cost effectiveness and a consistent quality in TS, a standard method for determining a machine's effectiveness and reliability that could be conducted in the area of use would be most practical.

A longer and more detailed version of this paper (18 pages) can be accessed online at http://bit.ly/1a76OCD. The full research data (133 pages) can be accessed online at http://bit.ly/16eJyOK.

See endnotes page 66

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TS being conducted on a steep slope in Iraqi Kurdistan, where demining machinery able operate on such terrain is currently unavailable to the organization.

Emanuela Elisa Cepolina, Ph.D., is a mechanical engineer with 10 years of experience researching sustainable and appropriate technologies for humanitarian demining. During her research work she visited many mine action activities in 12 countries and acquired a deep understanding of the mine action environment and challenges. She recently worked on the design, development and in-field test of Locostra, a low-cost machine built around a small agricultural tractor. She has worked at the University of Genova (Italy) and is the president of Snail Aid – Technology for Development, a not-for-profit social enterprise. Since January 2012, she has worked on the EU-funded TIRAMISU project.

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ENDNOTES

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2. "Land Release in Action: In-field study of practices in use in six countries." *TIRAMISU*. http://www.fp7-tiramisu.eu/publications. Accessed 12 June 2013.
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