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Promotion of manual drilling in Guinea

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In the last decade UNICEF has supported manual drilling in several countries as a possible low cost and sustainable strategy to increase adequate water supply for the population. In partnership with local authorities and other stakeholders, UNICEF has implemented different activities to ensure high professional level in manual drilling: mapping of suitable zones, capacity building in construction of drilling tools and application of different drilling techniques, good practice in manual drilling, organization management. In Guinea manual drilling was unknown before 2011; at that time the joint program of SNAPE (National Water Authority) and UNICEF aiming to create an efficient manual drilling sector started, and after 3 years Guinea can be considered one of the most positive example of implementation of this program.

Background

In the framework of the program for the achievement of MDG (Millennium Development Goals) for water supply, UNICEF is promoting manual drilling throughout Africa through different activities: advocacy, mapping of suitable zones, technical training and institutional support.

Manual drilling refers to those techniques of drilling boreholes for groundwater exploitation using human or animal power (not mechanized equipment). These techniques are well known in countries with large alluvial deposits (India, Nepal, Bangladesh, etc). They are cheaper than mechanized boreholes, easy to implement as the equipment is locally manufactured, able to provide clean water if correctly applied.

The introduction of manual drilling in Guinea

Although manual drilling was already present in other West African countries (like Chad, Senegal), in Guinea there was no previous knowledge. The first experience of manual drilling was carried out in 2011, with 15 hand drilled wells in the coastal region. In this zone, geological conditions are difficult for mechanized boreholes (lack of fractured water bearing rocks and increasing salinity of water at higher depth) and several villages have strong problems related to water supply.

Here manual drilling turned out to be an effective alternative solution, and 9 positive wells were completed combining different techniques, with yield higher than 1 m³/h.

After these promising results in the coastal region, the interest for manual drilling increased and both SNAPE (Service Nationale Aménagement de Points d'Eau, Guinea) and UNICEF decided to increase their efforts for the promotion of these techniques and the professionalization of drillers

The identification of suitable zones for manual drilling

Manual drilling can be successfully implemented only in those hydrogeological contexts where subsurface geological layers are soft and water level is not very deep (it is assumed a maximum depth of 25 m). For this reason, it is important to identify those zones where manual drilling is feasible, before moving forward with the next steps of the program.



Photograph 1. Drilling tools



Photograph 2. Manual drilling

Mapping of suitable zones for manual drilling at national level was carried out with the same criteria and general approach already applied for similar studies in other 12 African countries between 2008 and 2010, in the framework of a large UNICEF program to promote manual drilling. But in Guinea results of the study are considered much better than other countries for several reasons: a) lessons learnt from previous research in other countries: b) much larger effort in terms of time, human and logistic resources (In Guinea, the study was conducted in a period of approximately 6 months, with a field mission of two international consultants and two Guinean geologist for two weeks, and remote collaboration for 4 months focused in collection and organization of ancillary data, analysis and interpretation, production of the final maps and reports)

The main sources of information for the identification of suitable zones at national level are the following:

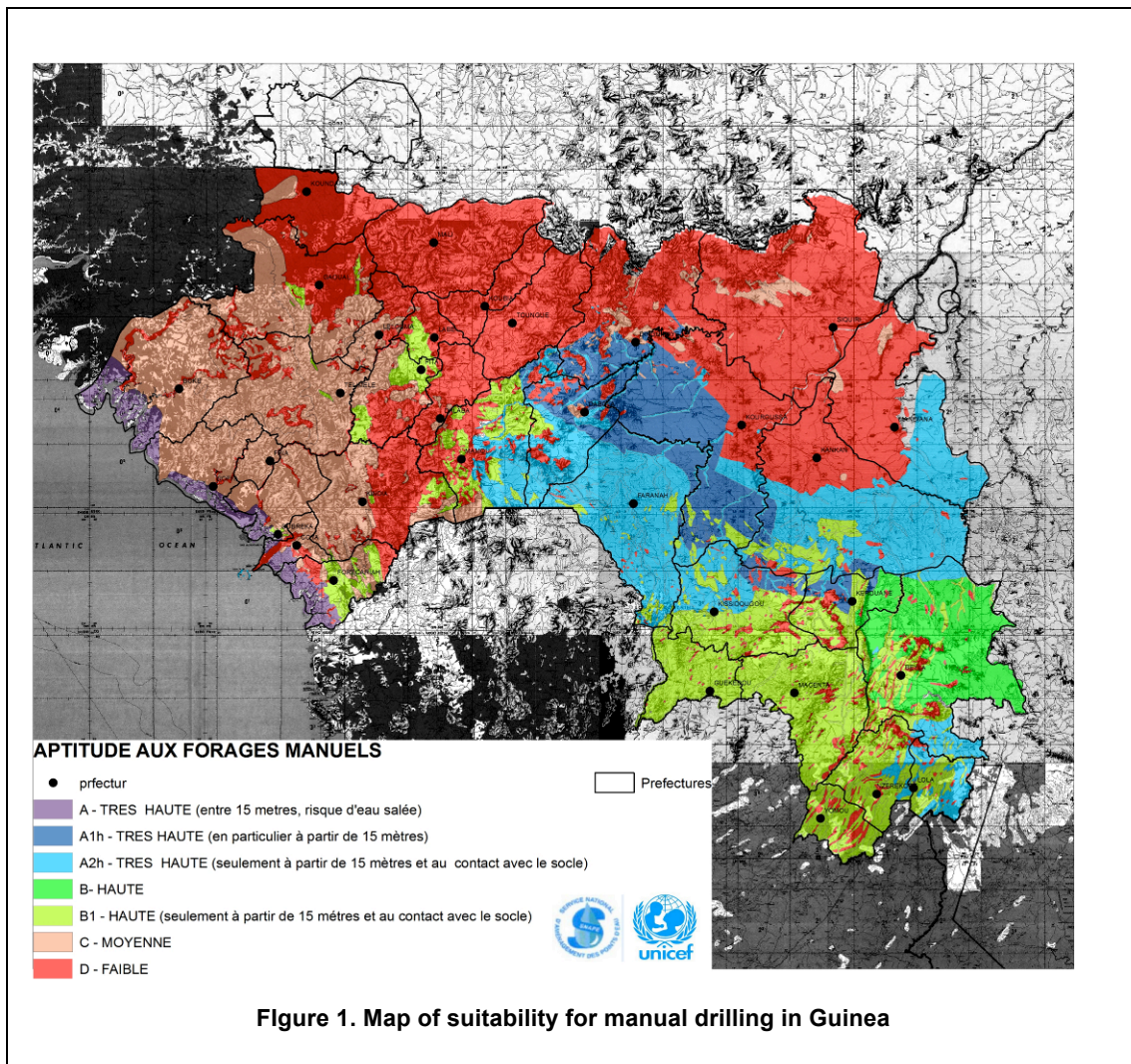
- The Geological map of Guinea, scale 1:1.000.000
- The Morphopedological map of Guinea, scale 1:200.000
- The borehole database organized in SNAPE archive with a specifically designed structure and DBMS tools for data manipulation (software PROGRES)
- The archive of stratigraphic logs of boreholes kept as hard copy in SNAPE central office in Conakry and in the 8 regional offices.
- The direct experience from hydrogeologist and water technicians from SNAPE or other organizations involved in rural water supply programs

Results of mapping of suitable zones for manual drilling show that there is a good potential for this technique in Guinea at national level, but large areas do not have suitable conditions; it means that in these zones manual drilling is not considered a valid alternative to increase access to water for the rural population.

The next step of the project was based on the comparison of the map of suitable zones for manual drilling with the map of present situation of water access and required water points.

With this process it was possible to define the target zone for the following activities, aiming to create the capacity for high quality manual drilling through training and equipment to local groups (drilling enterprises and tooling workshops), followed by the implementation of manual drilling programs.

Two main zones have been identified as main targets for a 4 years manual drilling project: the Coastal area (especially the southern sector) and the South-Eastern Guinea. These activities are included in a larger program financed by the Dutch Cooperation (DGIS), which focused not only on manual drilling but also on other aspects of water, including sanitation and hygiene. However, the identification of suitable zones proved to be extremely important to define where to implement manual drilling, inside the large area of DGIS program.



Strengthening local capacity for manual drilling and implementing drilling program

Between 2012 and 2013 different actions have been carried out to increase the capacity of developing manual drilling programs in Guinea:

- A series of kits of equipment and tools for the application of two techniques of manual drilling (rota sludge and jetting) have been constructed in Conakry by a local organization (ENAM). Furthermore, ENAM and 3 other organizations (in different regions) have been trained in construction and maintenance of tools for manual drilling. Up to March 2014, 15 kits were completed;
- A quality control system has been set-up to follow and document manually drilled boreholes. Guinea is one of the few countries where the whole manual drilled wells' main specificities (localization, depth, static level, screen length, yield...) are saved within a database;
- 8 local small enterprises have been trained in manual drilling and equipped with the required tools and materials.

International research to improve the methodology for the identification of suitable zones with integration of remote sensing and terrain modelling

A research program with partners from Guinea (SNAPE and UNICEF), Senegal (University Cheik Anta Diop Dakar and UNICEF) and Italy (University of Milano Bicocca) has started. This project, which is financed by NERC (National Environmental Research Council, UK), has as its main objective of improving the methodology for the identification of suitable zones for manual drilling, integrating other sources of information, in particular remote sensing data and terrain modelling. The results of this project will make it possible to produce more reliable and detailed maps of suitable zones, increasing their effectiveness as

decision support tools for the implementation in the field of manual drilling activities. The two study areas are located in Eastern Guinea and North-Western Senegal, but the new method can be replicated in other regions and improve already existing maps of suitable zones.

Results achieved and future steps

At the moment of the mid-term evaluation of the manual drilling program (January 2014), the results achieved were the following:

- 116 manual drilled wells have been completed in 3 regions (Coastal zone, Nzerekore, Kankan-Faranah), with an overall rate of positive wells of 61%; if we divide this overall indicator by region, we can obtain 77% positive results in Kankan - Faranah (10 out of 13), 60% in Nzerekore' (27 out of 45) and 58% in the Coastal region (34 out of 58). In general, the results obtained confirm the interpretation of the map of suitable zones, although there is some uncertainty, especially in zones with complex geology and limited boreholes data available. With the direct information about subsurface geology obtained through the manual drilled wells and the research program, the interpretation is constantly improved and this can lead to a higher rate of success in the next years
- At this time there are 8 teams trained in high quality manual drilling and properly equipped, with a total capacity between 120 to 140 boreholes per year. It is expected that more teams will be trained, in order to ensure that the number of 500 manual drilled boreholes already included in the program of UNICEF and SNAPE (with external financial support already available) till 2017 can be achieved, and eventually cover other requests for manual drilling
- A more detailed map of the region of Faranah - Kankan is expected at the end of 2014 as an output of the research program financed by NERC (National Environmental Research Council, UK) with participation of Guinea, Senegal and Italy: this map will give a more detailed interpretation of this region, which is considered one of the most promising for manual drilling and selected as a priority area for manual drilling program in the next years.

Lessons learnt and conclusion

Guinea is considered one of the countries where the different phases of the program to support the diffusion and improvement of manual drilling have been efficiently put in place; they have been carried out according to a logical sequence, based on a good planning, with good coordination of the different stakeholders involved and continuous collaboration.

Although they were not yet part of a long-term program, the first pilot experiences in 2011 obtained the important goal of raising interest. After that, an improved strategy of action and a good coordination among institutions allowed more effective in the activities that were implemented, but also helped to convince external donors of the importance of supporting this program. The evidence of preliminary promising results and the existence of a long-term vision concerning the contribution of manual drilling for the water sector in Guinea: these points contributed to convince different institutions to ensure financial support to the program for the next years.

The efficient integration and exchange of information between mapping suitable zones and implementing field activities in selected areas has produced good results; however it seems clear that there are zones where a more detailed field observation and data collection (for example with geophysical survey or field survey of open wells) are required to increase the rate of success during manual drilling.

At the project design stage, it appears that it would be better to carry out mapping works and data analysis before planning implementation areas for manual drilling. Feasibility and needs can be crosschecked then to ensure optimal benefits from the capacity building works.

The following recommendations can be formulated for the future activities of the program.

An efficient monitoring system must be set-up prior to any implementation, and training must be provided to drillers in order to record the relevant information. Field data are needed to conduct in-depth analysis of manual drilling achievements, to prioritize the most suitable ones and identify where it is more important to develop local entrepreneurial skills and develop appropriate quality guidelines.

The collaboration and open sharing of information between the different activities (increasing local capacity, drilling boreholes in selected area and researching for an improved methodology to identify suitable zones at more detailed scale) is crucial to improve the results achieved by each group.

It would be advisable that the positive experience that Guinea is making in setting up a high professional sector for manual drilling could contribute to increase the capacity to meet the target of accessing drinking water for the rural population, and could be replicated in other countries in the future.

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