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GEOLOGIE APPLIQUEE - MINES et CARRIERES - ENVIRONNEMENT

TOWARDS SUSTAINABILITY IN ARID LANDS

THE PLAN.T.E PROJECT – From concept to operations

__ ABSTRACT and TEXT __



Irrigated crops on the Pout Forest edge– Senegal - February 2017

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Pascal Bernasconi (Links Consultants), Emilio Neto & Patrick Pierron (GéO-CSP SAS)

__ ABSTRACT __

Facing desertification is a pregnant priority for humankind.

Since the early 30's its spreading mechanism has been unveiled by Pr. Henri Erhart¹.

When considering the Bio-Rhexistasy cycle, it is noticeable that a strong unbalance prevails between a slow colonisation rate of soil creating vegetation, and abrupt reversing conditions of soil erosion when the vegetation hold is lost.

As illustrated in Figure 1, Africa is perceived as the most vulnerable ground for desert expansion.

When seeking for remediation in reforesting and re-cultivating arid lands, the crucial question is how to restore the water retention capacity of surface formations, essential for plants to survive. In most desert landscapes very altered soil conditions prevail; in fact former elaborated soils have generally been washed away by scarce torrential rains, leaving lateritic cuirass or barren rock grounds.

The basics of the PLAN.T.E project is to remediate the consequent lack of water retention capacity by creating local systems of small reservoirs able to collect a significant part of the impluvium and retain shallow depth water out of reach of intense evaporation, but still available for plants.

PLAN.T.E is an imperative that can be read as “**PLANT** Trees with **Explosives**”.

The method is known as “cratering” and allows to produce from appropriate blasting in 4-6 m deep drilled holes a series of cones of crushed rock with a high fracture porosity. When applied to impervious rocks like claystone, marl or shale, individual reservoirs with up to 10 m³ capacity are made available. Success in planting trees of selected resilient stocks in these locations is then to be achieved through appropriate fertilisation with organic compost and adapted watering till self-sufficiency, when roots gain access to the eventual water reserve .

The method is thought to provide to most of the fragile ecosystems, that currently vanish in arid regions due to the double penalty of adverse climatic drift and increasing human pressure, the necessary impulse for a medium term recovery and long term prosperity.

Besides the technical presentation of the method, our contribution mostly focuses on the framing conditions of the project PLAN.T.E, through specific studies and partnerships that back the first projected developments and illustrate our collaborative strategy to rally expertise and funding.



Figure 1 : Africa within 1 000 years (or less ?) An illustration of probable desertification progress

Source : Data from UN, GRID-Arendal, PreventionWeb, UN Convention to Combat Desertification



THE PLAN.T.E PROJECT

A STEP TOWARDS A BETTER RESILIENCE OF SAHELIAN POPULATIONS

FACING THE DESERTIFICATION PROCESS

Pascal Bernasconi (Links Consultants), Emilio Neto & Patrick Pierron (Géo-CSP SAS)

Introduction

The PLAN.T.E project is currently supported by Géo-CSP, an independent consultancy in Applied Geology with significant experience in the mining sector as well as in cement and construction material industries. Géo-CSP provides customized services to match its institutional and private client's needs in project framing and development, through a very proactive network of small to medium sized engineering and consulting partners, focused on sustainable solutions and industrial integration. The activity includes site rehabilitation and waste management in order to meet the highest criteria of environmental compliance in a realistic approach of project integration and sustainability.

So, the PLAN.T.E project appears as a natural extension of our field experience based on the realization of mining and environmental audits carried out in the Sahelian region. These actions were accompanied by a reflexion on the process of desertification.

The PLAN.T.E project presented here is the result of our commitment to contribute to the emergence of efficient processes and techniques in line with a logic of sustainable development.

Context and objectives

The "post-Rio" Convention to Combat Desertification (CCD) refers to desertification as "land degradation in arid, semi-arid and dry sub-humid areas as a result of various factors, including climatic variations and human activities ". This serious phenomenon affects nearly 40% of the land area and affects one-third of humankind; inaction against this plague would cause 10 million hectares of agricultural land to vanish every year, equivalent to 1/5th of the area of Spain.

The objective of the PLAN.TE project is to impulse a new dynamic of land rehabilitation in the regions affected by desertification through the reforestation of pilot zones, now firstly located in southern Tunisia (Tataouine) and Morocco (Merzouga), using methods inspired by the mining industry.

Concretely, it means creating locally a system of small reservoirs capable of collecting a large part of the impluvium and of retaining water at depth, protected from evaporation. This step is essential for restoring a significant soil cover ratio through planting suitable ligneous species and then facilitate the regeneration of ecosystems favouring agricultural development and reinforcing the resilience of local populations to environmental changes.

Finally, the specificity of the project lies in the use of explosives, as in the case of mining, which requires the implementation of special safety and security measures.

THE PLAN.TE PROJECT: from concept to operations

An innovative planting method

The most practical and effective way to reach the aforementioned objectives is to use the so-called cratering technique, as illustrated in the following diagram:

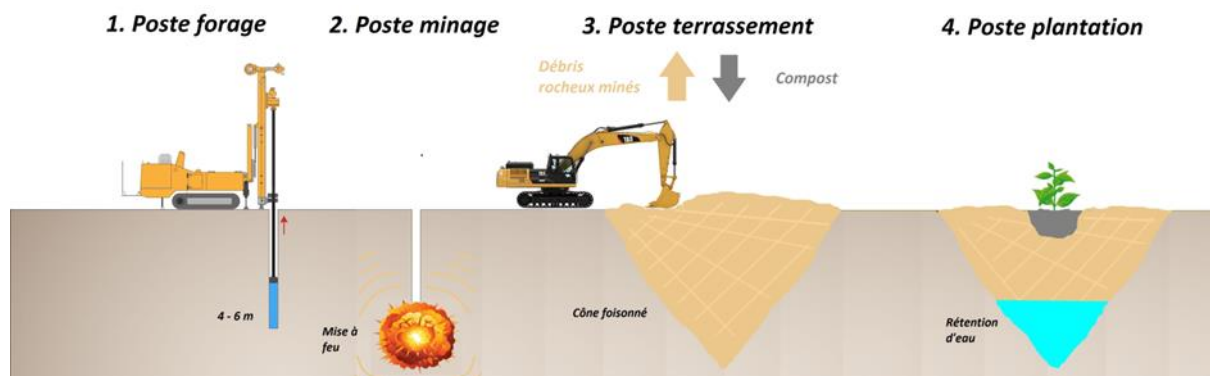


Figure 2 : Illustrative diagram of the "cratering" method.

1- Use of a hammer drill for the realisation of short drillings from 4 to 6 m deep

2- Use of ANFO explosives (ammonium nitrate-Fuel). Under ideal conditions (94.7% NH_4NO_3 and 5.3% diesel) the reaction essentially releases water (H_2O), Nitrogen (N_2) and minor Carbon Dioxide (CO_2):

This excludes any danger of soil contamination.

3 – Minor excavation works to host compost and tree to be planted. Excavated rock can be used as dykes for run off collection. A composting station for organic waste will provide the fertilizer needed to start planting.

4 - The final planting operation of adapted trees will be accompanied by planting of non-invasive and non-toxic protective plants. Planting will require limited watering until the first significant rains. So coupling with a temporary irrigation system is required.

The application of the PLAN.TE method is relatively easy, however it requires a precise approach in terms of choice of target areas, mobilization of specific teams and equipment, safety and security in the use of explosives, also acceptance and participation of the communities concerned. The financing of such works, followed by the necessary monitoring and maintenance of the plantations, is also a sensitive issue, in particular because of the scarce economic resources of the potential beneficiaries.

A threefold strategy

1 / Carry out two pilot projects in two target areas of which we already have a good knowledge, particularly through local contacts favourable to a partnership. These are the aforementioned regions of Merzouga-Hassilabied and Tataouine-Douiret.

2 / Create, in synergy with these pilots actions, a cross-cultural component, further presented as "DESERT FESTIVAL" which will potentiate and support our approach, and also promotes our action by expanding awareness through media coverage and also mobilise local support.

3 / Form local teams to spread over targets more difficult to access, especially in Algeria, then expand operations in the countries of the Sahel belt, Senegal first, then Burkina Faso, Mali, Mauritania, Niger and Chad if possible.

Our scope for project development

In accordance with the common concept of industrial greenfield project development the following steps are observed :

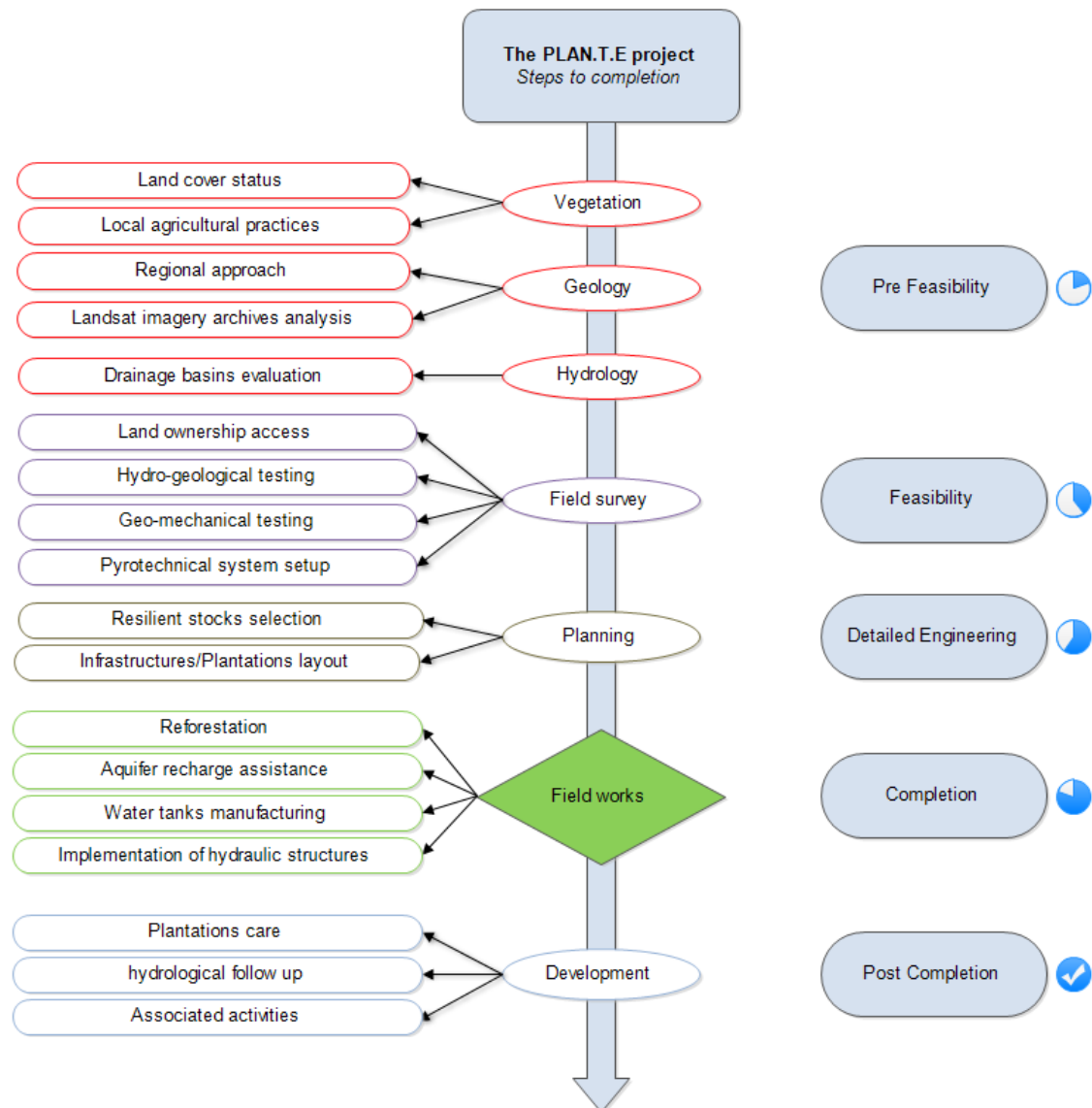


Figure 3 : Logigram of the PLAN.T.E Project development

The initial implementation of the PLAN.T.E method is now being planned in Tunisia, where the MARHP (Ministry of Agriculture, Hydraulic Resources and Fisheries) and IRA (The Arid Regions Institute) are incorporating it to their current projects with three main targets :

- the assistance to surface aquifers recharge, through blasting enhanced permeability of flooding racks,
- the creation of ponds and cisterns in impervious rock sites, in gypsum as an instance,
- the simple reforestation in rocky areas with combined simple water capture systems.

For each of these targets, a sheet describing the project draft, the means to be implemented, and the corresponding preliminary budget calculation will be presented at CONSOWA.

Our perspectives and communication plan

The PLAN.T.E Project is conceived as collaborative and therefore open to all scientific and practical contribution in form of either expertise or grants. It is developed using the collaborative project management platform **Atikteam** sponsored by Demotera ².

This approach ensures rapid access to the bulk of information and enables better tracking of project progress by partners and stakeholders; it is a guarantee of a transparent and effective collaboration. Thus any new entrant can very quickly access the main part of the project and put himself in situation to be able to collaborate effectively in his field.

Usage makes Atikteam the instrument of a remarkable increase in collective effectiveness .

Operation wise, the pacing to be considered for the PLAN.T.E Project is dictated by the drilling capacities. Our target is 60 000 m/year for a standard drilling equipment, meaning 200 holes per week at 6.0m depth, or potentially 100 hectares per year, planted along a 10 m x 10 m grid.

The PLAN.T.E project may naturally be part of the Green Wall Project that should ultimately cover a 15 km wide strip over 7 600 km of east-west extent in Sahel, meaning more than 10 million hectares.

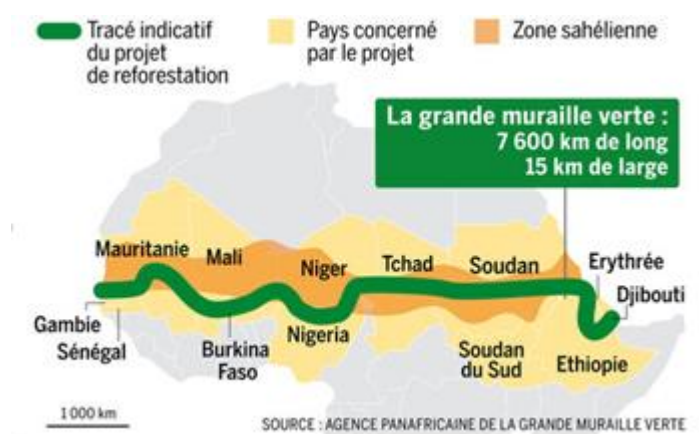


Figure 4 : The Great Green Wall Project

Assuming that the PLAN.T.E method is applied to 10% of this surface, which would have the effect of an initiator of certain beneficial character, it would be necessary to mobilize 1000 workshop units to achieve this goal in 10 years. This would create about 50 000 direct jobs and would require some 3Mt of explosives. These figures are important, but remain low compared to the estimated cost of the impacts of desertification (over \$ 40 billion / year in the World).

To eventually plant 100 million trees, the yearly PLAN.T.E budget would be less than \$ 1 billion.

Our communication plan, detailing the “DESERT FESTIVAL” issues will also briefly be presented at CONSOWA.

References :

¹ Erhart, Henry 1951. *La genèse des sols en tant que phénomène géologique. Esquisse d'une théorie géologique et géochimique. Biostasie et rhéxistase*

² <http://www.atikteam.com/en/demotera>