Innovation for Change

Young Talents | Real Challenges | New Tech

Demetra

The greener way of performing
Challenge: Nitrogen cycle (air 3)
Proposed by: Barilla

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- **Problem statement and solution proposed**

The world faces a major climate change catastrophe unless a way is found of reducing the amount of pollution in the atmosphere. At the same time, agriculture needs to provide and regulate the nutrients, such as water and fertilizers, used in farming. Yet, currently too much unregulated nitrogen is entering the environment through the excess of fertilizers applied to crops and fields, while water is often a limited resource which needs careful management.

We propose Demetra as a smart and green way of responding to our challenge posed by Barilla of how to fix nitrogen from the atmosphere directly into the field by a self-regulated system, as well as a number of other challenges facing the world.

Demetra is a precision farming solution aimed to address current global issues such as population growth, environmental pollution, water scarcity and increasing food demand, through a more efficient water and nutrient management. It achieves this by analyzing the complexities of any single crop to enable farmers to make the right decisions at the right time. Sensors will measure key variables, such as the amount of soil humidity, over time. Knowing the exact quantity of water present in the soil allows the farmer to identify the precise moment at which to intervene. Other sensors will monitor soil, air, below ground temperature, irradiation, pH, soil properties and nutrients level over time. The heart of the project is a digital platform that processes data from the sensor networks to ensure optimal requirements management. The solution is linked to actuators able to distribute what is needed when it is needed. Farmers will thus be able to manage the flow of water or fertilized solution directed to any single plant, simply by using a device connected to the internet. Precision farming today can be considered as an architectural change of existing agriculture processes and the revolution consists of introducing equipment and technologies widely used in other industries, markets, segments, which is what Demetra does.

- **Main to do before June 20th**

To provide the proof of the concept of the final product, we will complete the Demetra prototype and propose a pre-series business plan definition. Even if more hardware and software release is in the pipeline, the industrialized prototype represents a viable minimum product that can be already sold to the market and used by farmers to provide cost savings.

By June 20th our to do list is as follows:

- final day pitch preparation
- backend and database: planned activities are completed in partnership with Istituto Superiore Mario Boella
- data acquisition system: planned activities are completed
- actualization system (for automatized irrigation and fertilization): ongoing activities
- frontend: web app + android app + iOS app in development
- UV sensor sold by Libelium is essential to copy&paste competitor soft/hardware and close the loop (data collection, analysis, distribution, feedback)

- **Action plan for next 20 months**

Demetra's pre-series has the objective to provide a more reliable solution through the following aspects:

- robustness: new components are added to check if units and components are working
- independence: Demetra's solution needs to receive software release remotely

Pre-series units will be realized to be tested in lab and on-field to improve functional and technical final product capabilities. Total number of units has not yet been determined. More in general, they will be divided as follows:

- lab tests: some units will be internally monitored to gather data related to selected crops and during the test actuation phase
- farmers: some units will be placed in real farm greenhouses for data collection and analysis purposes. Farmer experience will fine tune the Demetra vehicle from prototype to final product

Demetra's target is to handle challenges coming from the architectural change mentioned above during the prototype phase in light of the team's know-how and capabilities. Elements of innovation for investors are:

- big data collection, machine learning, optimized crops model, closed loop system (competitive advantage)
- R&D on current hardware or new ones such as drones (new market segments: not drip irrigated and/or outdoor crops)

- **Vision for the future: 20 years ahead**

In twenty years time we envisage a smart and green agricultural system where farmers are able through satellite images and drones to pinpoint exactly the right amount of nutrients to provide the different sections of the fields and the different crops in the fields, thus maximizing yield potential and minimizing fertilizer cost and environmental risk. We hope that Demetra will be at the center of this new worldwide agricultural revolution!