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Sustainable reuse in agriculture: **Subsurface Drip Irrigation System**

ULPGC Universidad de Las Palmas de Gran Canaria | Fundación Parque Científico Tecnológico
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TYPE OF RESULT

New technology
New product
[New service]
[New knowledge or skill]

COMMERCIAL MATURITY LEVEL

Conceptual idea
Proof of concept (design)
Validated in a controlled environment
Validated in a real environment
[Successfully implanted]

PROTECTION LEVEL

[Non- applicable]
Patent
Software
Know - how
Utility model

Description of the solution. Problem solved

Climate change is one of the biggest challenges of 21st Century. For this reason, as we adapt to a changing climate, actions such as reuse of water reclamation, efficient irrigation and prevention and pollution reduction play an important role in this process.

Water reclamation, particularly in Canary Islands, and promotion of the efficient use of water would contribute significantly to mitigate water deficits, as well as to contribute to environmental preservation. To do so, urban treated waste water should have a proper physicochemical and sanitary quality, becoming a suitable resource for agricultural irrigation, but that also for irrigation of golf courses, parks and gardens and other non-potable water.

In order to provide a tool for sustainable reuse in agriculture of water, this solution offers the installation of a pilot project for a subsurface drip irrigation system; additional treatments in waste water treatments (WWTP) and/or determination of best agriculture practices for a sustainable reuse. Thanks to this proposal a service for adapting the quality of waste water for agroecological conditions is done, allowing a safe reuse and obtaining more food using less amount of water.

Water quality control is vital since, for example, boron content implies a risk of phytotoxicity in sensitive crops. However, its bioavailability depends on both the soil conditions and water management in field crops. Therefore, if its bioavailability is higher than the level that generates phytotoxicity in sensitive crops, continued irrigation would cause nutrient imbalance in the crops. In this sense, it is necessary to determine the bioavailability, phytotoxicity risk, water and soil management in a way that avoid problems or designing additional treatments that decrease the boron amount.

As a consequence, it should be taken into account the type of soil where the irrigation system is going to be implemented, as well as specific assessments and laboratory testing. In Canary Islands the price fluctuation of groundwater (0.3 to € 1/m3) has increased the number of crop abandonment, which poses a risk of soil degradation. Availability of cheaper alternative resources would contribute to the design of optimal infrastructures that make possible the return of investment.

This way, this irrigation system allows to determine the supplementary treatments and the maintenance techniques that are necessary to guarantee its sustainability in certain agroecological conditions. Also, cultural practices best adapted to each situation are determined, allowing to minimise the impact of climate change as well as the use of reused water in the environment (including the underlying aquifer).

In this sense, “good practices” for managing the farming system are determined, optimising the resources used by tools for sustainable intensification and intelligent agriculture. Thus, safety and sustainability of the agricultural reuse in rural municipalities, as well as the presence of low cost and low-energy wastewater plants are guaranteed.

Fields of commercial application

- Public administrations, and particularly rural municipalities that have a wastewater treatment plant (WWTP) or a sewage treatment plant of low-cost technology.
- Wastewater treatment companies.
- Companies of farming and agriculture industries.
- Sector-specific groupings such as Spanish Association of Companies Managing Urban Water Services (AGA), the Spanish Association of Water Supply and Sanitation (AEAS) and the Spanish Association of Public Water Operators (AEOPAS).

Market opportunity

Nowadays, agricultural sector must compete for water use with other sectors that make largest contributions to GDP of the Canary Islands (for example, tourism sector). Aquifer overexploitation has led to a decline in water quality. Also, shortage of water produces a fluctuation in the price of conventional resources that hinders the recovery of agricultural investments.

In this regard, availability of non-conventional water resources (reclaimed water, reclaimed water and subsequently desalinated and desalinated sea water) at a reasonable cost would enable designing optimal infrastructures adapted to the needs of farmers, decreasing risk in the estimation of return of investments.

Within this framework, primary beneficiaries of this solution will be isolated rural municipalities that have limited capacity to invest. This is due to that municipalities located in the middle mountain region of Canary Islands usually lead their primary effluents to wastewater treatment plants located on the coast. Once reclaimed water is obtained, it is pumped uphill for later reuse. This situation implies a high cost of pumping, which increases water price above the prices paid in coastal municipalities.

In view of the above, it can be stated that in situ reuse of reclaimed water, produced by “low technology” wastewater treatment plants in agricultural areas of middle mountain regions may provide a valuable resource for these areas, as well as eliminate the need of transportation from the coast areas, reducing thus the energy consumption.

Also, this solution has also room for global market, since water shortage is a problem affecting more than 40 % of world population and at least 1 out of 4 people will be affected by water shortage by 2050. In this regard, this solution can grade to global level, providing an alternative to problems of water shortage in other places by treatment and management of water quality.

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Competitive advantage

This solution allows the reuse of water, which turns into significantly benefits for both farmers and society in general. Compared to other options such as usual drip irrigation where water quality is not taken into account, this solution pays specific attention to the availability of different qualities of water for irrigation, which represents a chance for combine them and correct negative effects of some properties, such as salinity. Also, this assessment complements the use of other strategies such as irrigation management and types of crops.

In relation to the latter, among the features of this system stand out the possibilities for adapting or selecting the type of crops that better adapt to the means available taking into account the water quality, soil management and alternative water resources that are not exploited enough. In Canary Islands, it may be possible to cultivate many abandoned crop fields using reclaimed water, which same time would allow to obtain enough fodder for livestock production and to make the installation of the irrigation system profitable, benefiting both livestock and agriculture industries.

Finally, this solution means implementing irrigation technologies from health, environmental, economic and social from a point of view that better adapt to agroecological conditions of irrigated areas and that increase the effectiveness of the use of this solution. This proposal is linked to obtaining high performance in crops (more food with less water.)

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