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WATER: PROPOSAL FOR VIABILITY FOR AGRICULTURE IN BRAZILIAN SEMI-ARID REGION

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Brazil is a country of contrasts. Embrapa and the National Water Agency published in March 2015, a study of irrigation in the country. This work called survey of irrigated agriculture by central pivots in Brazil, the first on a national scale, 17,900 pivots were identified in activity. Evaluating satellite images, between 2006 and 2013, detected an increase of 32.1% in the growth of the area occupied by pivots, in Brazil, totaling 1.18 million hectares. The water used for irrigation in Brazil corresponds to 72% of the offer. This volume of water is thus distributed, Minas Gerais (31%), Goiás (18%) and Bahia (16%t), Sao Paulo (14%) and other States 21%. The neediest region of Brazil, water still awaiting an eternal wait that never comes.

The polygon of the semi-arid Northeast, the region occupied by the Caatinga, extends over a large part of the States of Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte, Ceará. Piauí and smaller part of the States of Minas Gerais and Maranhão. According to data from the Brazilian Institute of Geography and Statistics (IBGE, acronym in Portuguese), this biome covers about 844,453 km² of extension, something equivalent to the territory of Chile or twice the territory of Germany.

One of the obstacles to agricultural development of the region is its water balance. With a deficit of available water for the crops, for most of the year or throughout the year, driven by major cyclical droughts, is poisoned and planned production on a large scale. However, in the 21st century this problem can be solved

by technology, since societies organize, press the public authorities and that it undertakes to solve it.

Cite as an example the political will of the State of Israel. With only 22,072 square miles (smaller than the State of Sergipe and still having 60% of the total occupied by desert) and 8.1 million citizens. Despite limited natural resources managed a development of intensive agriculture in those 65 years of existence. Has become largely self-sufficient in food production; It is the only country that accounted for the end of the 20th century with more trees than it began. Is recognized worldwide for its cutting edge technology in reuse, desalination and water loss control.

Israel had deflation of 0.2% in 2014, the economy grew 3.2% on average for the preceding three years; the country has an enviable *per capita i*ncome of almost $ 35,000 and quality-of-life index of 0.888 – one of the highest in the world. Is the country that invests in research and development (P&D), almost 4.4% of its GDP. This represents almost double the application of 34 developed countries that make up the Organization for Economic Cooperation and Development (OECD).

The Brazilian semi-arid region fights against drought, through public policies since the 19th century, still in time of Brazil Empire. And these policies have focused on building dams. In recent decades, policies directed to the construction of tanks and in the transposition of the São Francisco River. However, with few exceptions of polygons of irrigation, the development of their agriculture continues to be small or non-existent, not contributing to the economic sustainability of most of its municipalities.

The society of the semi-arid, to organize and demand public policies, have to look at the costs on the uptake and use of water for agriculture, not as an expense, more as investments. Starting from this premise, the planning and the search, at first, by technologies that provide the distribution with less potential loss of water stored, and should add new ways to increase the availability of water for agriculture. Among these new forms, two can fit in this context: the reuse of treated water, sewage and desalination of sea water. This article deals with the first option.

The use of treated domestic sewage for irrigation, also called water reuse features like benefits three aspects. The reuse of water available, environmental gains (this water can no longer be thrown into rivers and other water sources), she's carrying mineral nutrients that decrease the cost of fertilizer for the crops to be exploited.

The treatment is established in three stages. The first takes place in anaerobic reactors (closed tanks with bacteria), later with macrophytes aquatic plants that have

large root systems that filter the sewage. Finally, the liquid goes through sand filters. After wastewater is transported to the crop through pumps and pipelines. Then she is distributed on the plantation by drip tubes buried at depth of 20 cm to 40 cm, technique known by subsurface or underground irrigation. Is the safest way to make irrigation because it avoids possible contamination, if it occurs in the water, and also because there is no evaporative loss.

The strengths of sewage reuse for agriculture beyond the economic gains. Among the environmental benefits, one of which is the conservation of lakes, rivers and other reservoirs, and of groundwater, because the water used in irrigation ceases to be released in these watersheds. That means using these sources for more noble uses, such as human and animal consumption. This is because these waters are getting scarcer, especially in the semi-arid. Another benefit, this time of agronomic and economic base, is that the water acts as irrigation and fertilization to meet the needs of growing water irrigating it and, at the same time, applying the waste with high rate of micro and macronutrientres.

Despite these positive points and the perspectives they open up, there are still some obstacles to the large-scale use of treated domestic sewage for irrigation, but none of them insurmountable.

Specifying these risks has that effluents may contain heavy metals in its composition, pathogenic organisms, high amount of sodium and nitrogen. In the case of domestic sewage, heavy metals, however, not prevent its use in irrigation, because the levels, when present, are under restrictive values imposed by legislation and by the World Health Organization (WHO).

In relation to the risks with pathogenic organisms can be minimized if chosen crops whose production is processed industrially. For other crops there is possibility to disinfect the sewage treated before their use in irrigation with chlorine. As for sodium, its high concentration may cause negative effects on the physical properties of the soil. In this case, reversals occurs after periods of rain and, if necessary, also choose to correct soil management with application of agricultural gypsum. With respect to nitrogen is important to suit the irrigation blades, i.e., provide the exact amount of water required for cultivation, avoiding, especially, leaching of nitrate to groundwater.

A more serious obstacle is the absence of a specific law governing the matter. What exists today is only the resolution No. 375, of August 29, 2006, the National Environmental Council (Conama, acronym in Portuguese), which deals with domestic

sewage sludge, which is solid part, by-product treatment, in addition to Resolution 121/2010 of the National Council of Water Resources (CNRH, acronym in Portuguese), which establishes the guidelines and criteria for the practice of direct non-potable water reuse for agricultural and forestry methods. The Brazil has little experience with wastewater use in irrigation, so the legislation is not specific, as well as for the installation of prototypes in test cities.

The prototype was tested in sewage treatment plants of small and medium-sized cities, with up to approximately 500 thousand inhabitants, preventing the flow of water to the springs, which would be very good for the semi-arid region. Second search result accordingly held by team agronomist Edson Eiji Matsura, professor at the Faculty of Agricultural Engineering (Feagri) at the University of Campinas (Unicamp), in a city of about 80 thousand inhabitants, as Jaboticabal, in São Paulo State, the volume of effluents generated would irrigate 240 to 320 hectares, while the nearby Ribeirão Preto, about 600 thousand inhabitants the irrigated area would be of the 2,400 1,800 hectares.

So it is a valuable investment, whose benefits appear simultaneously in the economy generating production, wealth and income and on the environment by giving quality of life for urban populations. This is a matter that the Brazilian semi-arid region society must engage politically for that to happen.