Water Desalination For Agriculture And Free Market Economics In San Quintin, Baja California, Mexico

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Abstract: In the absence of policies aimed at small agricultural producers, the adoption of market-oriented desalination technologies tends to favor medium and large producers. Small producers lack economic capacity to invest in cutting-edge technologies and are forced to leave the market. In San Quintin overinvestment and excess of installed water treatment capacity resulted in the overexploitation of the aquifer. Large private seawater desalination plants serving the agricultural sector are believed to be the key to the future expansion of the agriculture sector. This would provide a reliable source of water without the individual capital investments required nowadays. To prevent the concentration of capital and allow medium and small producers to remain in the market it is required that a national policy directed specifically to that sector, provides economic aid to those who have the least. This would allow exploitation of the water resource to be more equitable and efficient, resulting in a better distribution of wealth and better conditions of work for rural agricultural workers.

Keywords: desalination, Mexico, groundwater, agriculture, free market economy

1. Introduction

Agricultural production in the State of Baja California is in second place nationwide in edible products such as tomato, onion, and strawberry. With the information obtained from the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA, 2014) and the Under secretariat of Food and Competitiveness during 2012, and with data published in the 2013 Agri-Food Atlas, Mexico ranks first among exporters of Red Tomatoes worldwide, with a production of 2,838,370 tons. The states that lead the exports of red tomato are Sinaloa with 1,039,378 tons. Followed by Baja California with 189,636 tons., where the San Quintín Valley contributes 99.4% of the entity's production (SEFOA, 2015). Additionally, the national onion production in 2012 reached 1,238,602 tons. Heading the list of main exporting states is Chihuahua with 206,044 tons. Followed by Baja California with 166,894 tons. The municipality of Ensenada Zona Costa, where the San Quintín Valley is located produces 55% of the state production. In the production of Strawberry, Mexico occupies the fifth place in exports, production has increased in recent years, reaching a total of 360,426 tons in 2012, the states that head the national list are Michoacán with 203,314 tons, and Baja California in the municipality Ensenada Zona Costa, from where the San Quintín Valley contributes 100% of the production of 111,708 tons. (SEFOA, 2015). Additionally, the area is among the major leaders in the yield of wheat and cotton (Corrales, 2010). This high agricultural production is almost paradoxical because the predominant climates, according to the Köppen classification, are of the arid and semi-arid type. To achieve such high yields in tomato and strawberry crops, irrigated agriculture is essential since rainwater is insufficient for the growth and development of crops.

In the State of Baja California, two agricultural regions are clearly defined, the area of the Valley of Mexicali that obtains its water for irrigation from the Colorado River whose volumes are regulated by the International Treaty of Boundaries and Waters between Mexico and the United States of America, which was signed on February 3, 1944, and gives Mexico the right to a total of 1,850,234 Hm^3 per year (Escoboza, 2009); and the coastal areas where there are seasonal crops but mainly irrigation is carried out using water extracted from aquifers that they are recharged by collecting the little rainfall that the region receives in large recharge areas. According to (CNA, 2002) data, the state of Baja California has 48 aquifers that together contribute a volume of 1,265 million cubic meters.

The agricultural area of the Coast is part of the Rural Development District 001, which includes the areas of Valle de Guadalupe, Maneadero, Ojos Negros, San Quintín, and El Rosario and has 234,435 hectares subject to cultivation, of which 108,451 are irrigated and 125,984 are from seasonal agriculture. The main crops are: tomato, onion, grape, strawberry, olive, and vegetables.

In seasonal agriculture, rainfall is the exclusive source of water for crops. In irrigated agriculture systems, rainwater supplies the rivers, basins and aquifers, which will later supply the irrigation channels and / or wells of the different irrigation districts. Unlike the agricultural area of the Mexicali Valley, in which traditional or open-pit agriculture predominates, in the coastal area, a transformation of agriculture has been taking place since approximately the 1990s, replacing open-air crops with protected agriculture. These structures vary in their technological level and range from the lowest technological level in which environmental control is minimal, to structures with a high technological level, where it is possible to control 100% of the main environmental parameters (solar radiation and temperature) that influence agricultural production.

Desalination for agricultural use is a practice that is spreading in different regions of the world. Among the countries that surround the Mediterranean Sea, perhaps the most developed examples are in Spain and Israel where highly technical agriculture allows high-value crops to be obtained in international markets. In both cases, the development of desalination for agricultural use was due to state policies, with large investments in infrastructure and adequate credit lines (Marcha, Saurib, & Rico-Amorósc, 2014); (Avirama, Katzb, & Shmueli, 2014); (Arahuetes & Villar, 2017). The introduction of water treatment technologies for agricultural use began in both Spain and Israel with the use of treated urban sewage in large-capacity plants and with strict effluent controls. This practice was gradually replaced by desalination of seawater as contamination of irrigated soils was discovered, as well as limitations by the markets of developed nations to the introduction of products irrigated with treated wastewater (Marcha, Saurib, & Rico-Amorósc, 2014); (Avirama, Katzb, & Shmueli, 2014).

In Spain, although seawater desalination was an important factor in the growth of tourism in the Mediterranean coastal zone, as well as in the Canary Islands and Majorca (Arahuetes & Villar, 2017), the great development of desalination occurred from the program WATER (Actions for the Management and Use of Water) from 2005 that promoted the desalination of sea water for the development of the Spanish Mediterranean coastal area and is mainly oriented towards tourism and real estate development. Within this program, several large-capacity desalination plants were built whose high operating costs would have little impact on the development of the real estate and tourism sectors. The European economic crisis of 2001 meant a brake on real estate investments, so the desalination plants were left without the market for which they had been designed, so agriculture became its main user. However, the high costs of desalinated water volumes oblige the use of technologies that minimize their consumption, forcing users to develop an entire agricultural system of greenhouses and high-value crops in the market supplied by desalinated sea. Both Israel and Spain are examples of state planning, with large investments in technology, as well as the parallel development of a financial system capable of promoting the development of the agricultural sector through the acquisition of new technologies.

The case of the San Quintin Valley in Mexico is different Spain or Israel. The state has been totally absent in the development of technological systems. Technologies emerged and were adopted by trial and error and the decisions were strictly individual, based on the laws of the market resulting in a particular model that deserves to be analyzed in depth. The first difference between Spain and Israel and the San Quintin Valley is that the home drainage system is of low quality, non-existent in many places and with a very low level of treatment, consequently waste black water never constituted a source of water. Therefore, the region began to be technified directly with the desalination of the aquifer that the agricultural activity itself overexploited and which was salinized by an intrusion of sea water. This article explores the consequences of organic development, without planning or control mechanisms to enhance its benefits or mitigate its negative consequences, in a situation analogous to that described by Garrett Hardin in The Tragedy of the Commons (1968), emphasizing the social and economic consequences of technological development.

In general, the introduction of advanced water management techniques only occurs when the available water does not allow the development of commercial operations to continue as before. In other words, when water is the limiting factor for development, only when the limit of the carrying capacity of a system is reached or exceeded does the adoptions of technologies that maximize the productivity of water volumes begin. Each technological step requires considerable investments by the producers, who will resist making the investments unless it is strictly necessary, that is, when it is not possible to continue with economic activity due to the extreme scarcity of the resource.

In regions where economic development occurs, be it agricultural, real estate, or hotel, as progress is made towards the limit of water exploitation, conflicts begin to occur between different users, especially between urban and commercial users. The increasing exploitation of a limited resource brings it near the carrying capacity of the system developing what is commonly known as the Tragedy of the Commons (Hardin, 1968)

The efficiency in the use of water is directly related to the availability of the resource, as demonstrated by the example of agriculture in Baja California. In much of the Mexicali Valley, in the irrigation by flooding of the furrows, approximately half of the water evaporates, if we add to this the losses due to conduction in the irrigation channels, it turns out that a large part of the water ends up being wasted. This great waste of water could be reduced utilizing some technologies that allow a more efficient use such as sprinkler irrigation or the drip system with controlled fertilization also known as fertigation. However, because the availability of water in the Mexicali Valley is still abundant enough, allowing the current system to continue with the traditional cultivation techniques, practically no substantial investments have been made in advanced irrigation systems that allow a better use of the resource, nor have there been significant changes in the quality of crops that save water and obtain better yields per hectare.

Even when the user conflict manifests Even as conflicts among different users starts to manifest as the exploitation of the supply source progresses, the introduction of technology that allows saving water in crops or general commercial operations (hotels, real estate developments, etc.) occurs only when the availability of the resource becomes critical for all users, as evidenced by the cases of Cabo San Lucas in Baja California Sur (Pombo, 2007), (Pombo, Breceda, & Valdez, 2008) and the agricultural Valley of San Quintin in Baja California in Mexico (Pombo, 2015) In both cases, it was observed that the adoption of technology that allows economic activity to continue brings about changes in the productive structure of the entity, which in turn affects the social relations of the affected communities.

In the San Quintin Valley in 2015 there were 31 companies located in the study region, with 52 desalination plants installed for agricultural production. Local agricultural producers invested heavily in technologies to make the most of water resources. The desalination plants identified have a general average water production capacity of 25.73 liters / second, the production capacities were grouped as detailed in Table 1:

Table 1. Desalination plants classification according to water production capacity.

0-20 L/sec	21-40 L /sec	41-60 L/sec	61-80 L/sec	117 L/sec
25	16	8	1	2

Source: Own, elaborated with results obtained

Table 1 shows the classification of the 52 desalination plants identified in the instrument applied to companies in the San Quintín Valley, with water production capacities ranging from 1 L / sec to 117 liters/sec. In this study, 25 desalination plants with a capacity of up to 20 liters/sec, 16

desalination plants with capacities between 21 and 40 liters/sec were identified, desalination plants with capacities from 41 to 60 liters/sec were 8, 1 desalination plant with a capacity of 76 liters/sec and 2 desalination plants with a capacity of 117 liters/sec were found.

Table 2. Companies that own desalting plants by water production capacity.

Plants per Company	Companies	0-20 L/sec	21-40 L/sec	41-60 L/sec	61-80 L/sec	117 L/sec	
1	22	15	5	1		1	
2	5	4	4	1		1	
3	1			2	1		
4	2	4	3	1			
9	1	2	4	3			
	31	**25**	**16**	**8**	**1**	**2**	
Average L/sec		10	30	50	70	117	
Total L/sec		250	480	400	70	234	**1434**

Source: Own based on field work

Table 2 shows the number of desalination plants owned by the companies and the water production capacity in liters per second. Twenty-two companies represent 71% of the companies that have a desalination plant for their production process, 15 (68%) of these companies have desalination plants with a capacity of up to 20 liters/sec, 5 (23%) companies with desalination plants with a capacity of between 21 and 40 liters/sec, 1 (4.5%) company has a desalination plant with a capacity of between 41 and 60 lt/ sec, and 1 (4.5%) company has a desalination plant with a capacity of 117 lt / sec. Five companies were identified as owners of two desalination plants for their production process, these companies represent 16% of the total number of companies that have a desalination plant, the capacities of the desalination plants were found, 4 with capacities of up to 20 liters/sec, 4 with capacities between 21 and 40 liters/sec, 1 with a capacity of between 41 and 60 liters/sec and 1 with a capacity of 117 liters/sec.

As can be seen in table 2 desalination plants of 0-20 liters per second predominate, that is, small desalination plants that serve medium and small producers. The largest operations (16%) have double desalination, that is, in the first stage they desalinate the water in the aquifer that has a salinity of between 10 and 14 ppm. The reject water from this first stage has approximately 30 ppm. This reject water is reprocessed to obtain more water. There is a market for reject water produced in plants that treat water directly from the aquifer, some producers sell their reject water to large producers with adequate equipment to desalinate more concentrated waters, the extent and importance of this mechanism is being studied by the authors at this time and will be the subject of a future publication.

The installed capacity for desalination is approximately 1,434 liters per second or 45,222,624 m3 / year, which is significantly higher than all the water extraction concessions for the agricultural region of San Quintin, which total 24,681,806 m3 / year. This apparent excess of installed capacity is partially explained by the fact that the plants operate mainly during the hours of reduced electricity rates. However, in informal conversations with producers, it is perceived that it is no longer profitable to invest in new desalination plants, it has been a while since new plants have been built and there are plans to move some of the existing ones to other places outside the basin, desalination seawater would be the only option to continue growing.

Currently, in Mexico, it is practically impossible for a private individual to desalinate seawater due to legal restrictions established in the National Water Law (LNA). In Mexico, there is no private property of water, but it is considered "original" property of the nation (Article 27 of the Constitution), and that its use and exploitation is authorized by the President of Mexico and more directly by the National Water Commission (CONAGUA, 2013) This also applies to the waters of the territorial sea, that is, to the marine waters comprised within the twelve nautical mile zone from the Mexican coasts. For this reason, the extraction of marine waters is regulated by the National Waters Law (LAN). This law establishes that the extraction of marine waters does not require a concession, "except when it comes to desalination" (LAN, Art. 17, reformed in 2014). Therefore, in Mexico, seawater desalination requires a concession title granted by the National Water Commission. This concession is for a minimum of five and a maximum of thirty years (Art. 24) (Pineda, 2015).

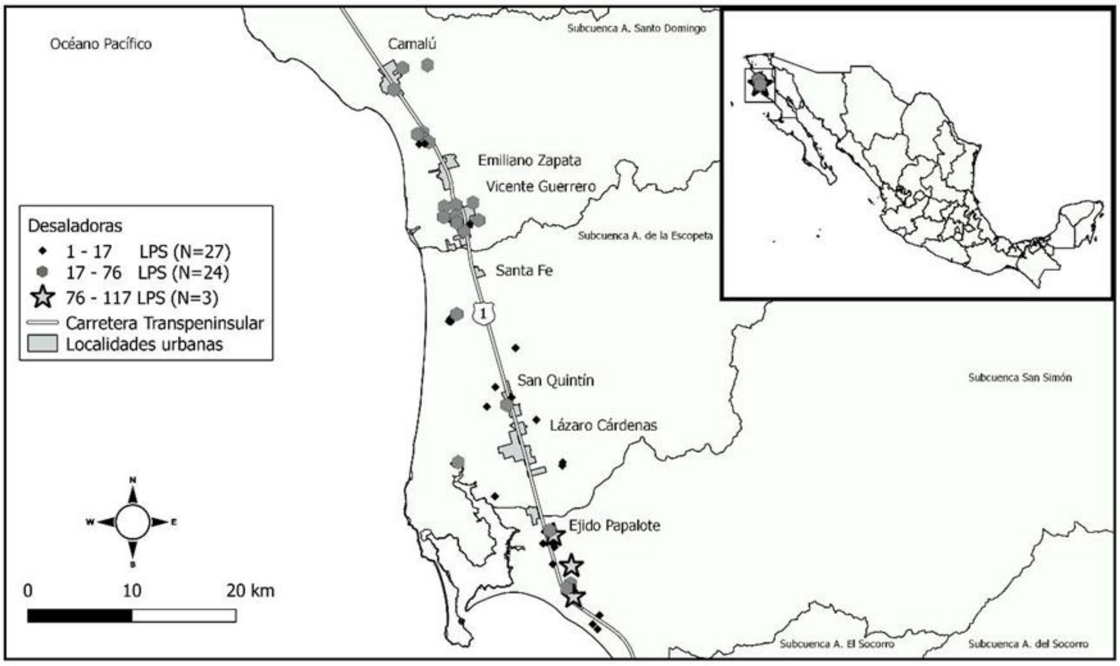
Table 3: Manufacturing and operational costs of desalination plants in San Quintin

	TDS (Salinity)	Cost of Desalination plant USD/GPM	Operational cost (USD) /m^3
1	1000	$ 890 USD/GPM	$ 0.16
2	5000	$ 1000 USD/GPM	$ 0.21
3	10000	$ 1100 USD/GPM	$ 0.22
4	25000	$ 1600 USD/GPM	$ 0.27
5	34000	$ 2308 USD/GPM	$ 0.29
6	39000	$ 2620 USD/GPM	$ 0.30

Source: Own based on information of Process Engineering (2014)

Using the information provided by Process Engineering of a construction cost of $ 100,000 per 100 gallons per minute (22.7 m3 / hour) for a salinity of 10,000 ppm, which is approximately the salinity of the San Quintín aquifer, and without taking into account that many plants when desalinating wastewater work with considerably higher salinities, the installed capacity of 1,434 liters per second or what is the same 5162.4 m3 / h represents an investment of (5162.4 m3 / hour * $ 100,000 / 22.7 m3 / hour) = $ 22,741,850, that is, approximately $ 23 million invested only in desalination equipment. Most of the plants are of small capacity, with 25 plants in this segment with an approximate production of 250 liters/sec or 900 m3 / hour (900 * 100,000 / 22.7), that represents an investment of approximately 12,775,330 dollars In other words, small and medium farmers invested approximately $ 13 million in desalination plants.

Figure 1: Location of desalination plants in the San Quintin Valley



Source: own based on field work

The availability of water suitable for human consumption and agriculture is the limiting factor for the development of two regions of the Baja California peninsula with high economic potential. In Cabo San Lucas, Baja California Sur, there was an isolated aquifer but on the verge of overexploitation and the closest alternative source of water is a long way from where it was needed for the hotel development that was taking place in the region. When extraction reached the limit of water availability, the response to continued economic growth came from the private sector itself, which began to invest in technologies for their private use, both for desalination of seawater and the reuse of wastewater for irrigating gardens and golf courses. Private investment in these technologies solved the problem of water supply to tourism enterprises without the need for state intervention, however, the state was forced to invest in seawater desalination plants to meet the demand for drinking water of workers who moved to the region as a result of the hotel and real estate developments that was possible thanks to the use of individual desalination plants that cover all the demands of that industry. This way the state provides an indirect subsidy to hotel activity without it directly participating contributing funds for the solution of the problem. (Pombo, 2007), (Pombo, 2008)

Water is the main limiting factor for the expansion of agriculture in the Baja California coastal zone. Since it is not possible to increase the extraction of the aquifers because they are balanced at best or overexploited with saline intrusion in most cases, the value of each drop of water increases considerably. Whether due to scarcity or the costs derived from producing it from low-quality water, water for agriculture is shaping the technological evolution of agriculture in the coastal zone. For some time, the desalination of brackish water from the local aquifer has been taking place in the agricultural area of the San Quintin Valley. Due to the high cost of producing water with adequate salinity for crops, parallel to desalination, there was an accelerated technification in the cultivation methods that include greenhouses, drip controlled fertilized irrigation also known as fertigation, cultivation in raised compost beds, and hydroponics, all these technologies allowed agricultural operations to maximize the efficiency in the use of water. Due to the economic characteristics as well as the availability of water in the region, this trend towards highly technical agriculture is a process that is not expected to be interrupted in the coastal zone of the state in the near future. Due to the scarcity of the water resource and due to the high costs associated with desalination, the tendency to artificially control the conditions in which crops are developed to increase production without using more water can only increase.

In the management of the aquifers of the San Quintin Valley (Baja California, Mexico) a situation similar to the one that occurred in Cabo San Lucas (Baja California Sur, Mexico), the local aquifer that allowed the settlement of large agricultural operations came to over-exploitation, causing an saline intrusion that further complicated the situation, the wells of the most important agricultural developments, located near the sea for strategic reasons of better infrastructure (rural electrification, communications, roads, etc.) were the first affected. Given the increased salinity of the aquifer and the practical impossibility of accessing other sources of water supply, producers were forced to invest in individual desalination plants to make brackish water in the aquifer suitable for cultivation. (Pombo, 2015); (Pombo & Santes-Alvarez, 2016). These investments were made privately by individual producers with little or no state intervention.

Both in Cabo San Lucas and San Quintin it was observed that the introduction of technology to improve water use brought about changes in the economic structure that in turn generated labor, social and cultural changes in the affected regions. In the Cabo San Lucas region, the introduction of seawater desalination plants to allow accelerated hotel development in the region brought about a considerable increase in jobs, which attracted large numbers of migrants from all over to meet the demand. There was a population explosion that brought with it all kinds of demand for services, such as water, education, housing, etc. which had to be covered with public funds constituting a veiled form of subsidy to the tourism industry.

The agricultural area of San Quintin includes the towns of Camalú, Campo San Simón de Arriba, Vicente Guerrero, San Quintin, El Rosario de Abajo, El Rosario de Arriba, El Bramadero (San Telmo) in the municipality of San Quintin Baja California, México. It is an agricultural area of great economic importance for the state of Baja California, since the beginning of agricultural development in the 1960s, companies specialized in high-value products settled in the area with a large part of their production destined for export to the North American market. These companies had great incentives for production such as: paying the minimum wage for labor, exploiting aquifers in the area in exchange for very low quotas, use pesticides and insecticides prohibited by US laws, enjoy extensive technological and credit assistance from the Mexican government, and after the entry into effect of the North American Free Trade Agreement (NAFTA) in 1994 it was possible to export to the United States with preferential tariffs and tax facilities. Under these operating conditions, during the 1970s and 1980s there was a boom in the state's agricultural economy, in which the San Quintín Valley played a leading role, since in 1980 it concentrated 70% of the production of state vegetables, especially tomato. Between 1988 and 1989 the state had a production of 151 thousand tons of fruit and vegetable products, which placed it in second place nationwide. In 1997, tomato production in the San Quintín Valley placed this region first in the national level for the yield per hectare. The increase in production during the last decade has been associated with technological innovations in cultivation, with climatic benefits, with state support and with the recruitment of available labor in times and quantities adequate to the needs of production (Velasco , 2000)

This original panorama allowed the entry of large capitals, some of them of foreign origin that coexisted with small and medium-sized producers of national capital. These large capitals brought with them greater productive technology and a greater capacity to adopt new technologies that would allow them to overcome environmental limitations.

At the beginning of the development of the agro-export industries of the San Quintín Agricultural Valley in the 1970s, the region was characterized by a high rate of population growth, mainly due to the settlement of migrant workers from the south of the country, for example between 1980 and 1990 the population settled in the San Quintín Valley grew from 4,694 to 23,354. In general, the INEGI censuses reflect high population growth throughout the decade of the 80s and 90s in all the populations of the San Quintín Agricultural Valley. The population stabilized around 2005, with relative stability since then. With some towns such as San Quintín itself, which suffered an accelerated reduction in its population growth rate, becoming negative in the period 2005-2010.

Population variations to a large extent can be explained in part by a change in farming technologies; from a seasonal extensive crop that required large numbers of workers, it evolved into large areas of crops under controlled greenhouse conditions with high technification and high production that require less seasonal labor and greater specialization by rural workers. While the use of abundant migrant labor was necessary in the early stages of economic development, especially for harvesting seasonal crops, today the most intensive crops produce crops throughout the year. Therefore, the dynamics of labor demand have also changed and workers are now local because they are needed in all seasons of the year. Recently, in 2015, a wave of protests by agricultural workers paralyzed the region's economy, the demands of the workers reflected this new productive condition, while the employers continued with the scheme of hiring temporary workers framed in the legal category of "casual day laborers" itself that delimits their labor rights and excludes them from a large part of the rights and benefits recognized for workers employed in the sectors of industry and services (Velasco & París, 2014). The characteristics of the New agricultural exploitation techniques make day laborers permanent workers and for what they demanded the corresponding benefits, the conflict began to unfold when the employers agreed to consider the workers as permanent and grant them the benefits that Mexican law guarantees them (Solano, 2017)

In the current banking system, loan payments must be made every month and a farmer only collects its money when the crop is sold, after few weeks or months, therefore a small farmer must have economic reserves to afford regular payments during those months without income. For a large corporation that is not a problem since their flows of capital are somewhat steady, but it is almost impossible for a small farmer who lives day to day. A system based on credits to small farmers with production insurance and with the interests and payments based on the production calendar would alleviate the pressure and make money available to them to capitalize their operations

The water shortage in the San Quintin Valley began to be seriously felt starting in the 1990s, and farmers had to adapt to the new conditions of scarcity to continue their activities. The adoption of salinity resistant crops such as onion was the immediate solution adopted mainly by small producers, the problem is that these products have low market value. Medium and large producers already had an established market for high-value products such as tomatoes or strawberries and they couldn't change crops. The result was the adoption of facilities that allowed desalting brackish water from the aquifer and cultivation techniques that maximize the efficiency of water use. In the beginning, the shade mesh was used to reduce evaporation, but this was soon replaced by greenhouses, since they achieve greater control of environmental conditions and consequently greater efficiency in the use of water. Intensive cultivation brought about other important changes, especially in the use of pesticides, since the controlled environment substantially reduces the need for their use.

In San Quintín the user conflict over access to water was also presented, in this case unlike Cabo San Lucas in that the conflict was urban-industrial in San Quintín there was an urban-rural conflict over the use of aquifer water that supplies the region. A very important part of the population receives drinking water at home through a network administered by CESPE (Ensenada State Commission for Public Services). As in almost all other regions of the state, due to the low quality and high content of salts, the general population only uses piped water for domestic uses such as cleaning, washing clothes and kitchen utensils, and personal hygiene, but never for drinking or cooking. People who are not connected to the network buy water from tank trucks (pipes), some are owned by CESPE and others are private, which charge from $ 8 to $ 15 (Mexican pesos) for the 200-liter barrel. On the other hand, there is a parallel market for drinking water purified by reverse osmosis that is sold in 5-gallon jugs whose use is universal. This differential market for water is common throughout the state of Baja California, which means that water for domestic-non-potable use can have a lower quality and still meet the expectations of users since it is never intended for drinking or cooking.

To solve this user conflict, and to release the volumes of water that the population uses today to be used for agriculture, the state followed the example of Cabo San Lucas in Baja California Sur and tendered the construction of a seawater desalination plant to meet the needs of the population This constitutes a veiled form of subsidy to the agricultural production of the region since, apart from releasing volumes of water that will be used by agriculture, it also solves with state funds the lack of drinking water for the workers of the agricultural companies that were the causes of the overexploitation of the aquifer.

At this time, due to the change in the Federal government, there is great tension in the region with large farmers, on the one hand, defending the installation of the marine desalination plant for urban use and the small and medium-sized producers who see the installation of the said plant as an element that will consolidate the power of large corporations since this plant will supply the communities where most of the workers of large corporations live, leaving aside marginal communities. On the other hand, the desalination plant is expected to sell part of its production to farmers, which would generate, on the one hand, a new source of water supply for crops but could generate social conflicts due to the high cost of water that would mainly affect the lower-income sectors of the population. At the same time, there is talk of at least two large seawater desalination plants financed by large producers for exclusively agricultural use, these plants would sell part of their production to the smallest farmers, which would bring about considerable changes in the system of agricultural exploitation when returning The small brackish water desalination plants that are used today, making them obsolete.

The technification of agriculture in San Quintin, and especially the use of brackish water desalination plants, has made possible a great economic development of a region after overexploiting its water resources. The current model of small brackish water desalination plants is already showing signs of depletion with overt overinvestment. However, the first signs of the approaching model are already being seen, large private desalination plants for agricultural use that probably converge in a model similar to that of Almería (Spain) although in the case of Baja California, without state intervention.

2. CONCLUSION

In the absence of specific policies aimed at small agricultural producers the adoption of market-oriented technologies tends to favor medium and large producers, while small producers, lacking the economic capacity to invest in cutting-edge technologies, are forced to leave the market.

In the Peninsula of Baja California, Mexico, unlike Cabo San Lucas, where the hotel industry started directly with the desalination of seawater without any legal limitations, in San Quintin the desalination was developed to take advantage of the brackish waters of the local aquifer in which a marine intrusion occurred due to overexploitation. However, an expansion limit has been reached in the provision of water for crops that is generating tensions in the region. On the one hand, there has been an overinvestment, and an excess of installed capacity to treat the waters of the local aquifer. The seawater desalination plant promoted by the state of Baja California to produce water for urban use is seen as a key pilot experience for the future development of the region since on the one hand it will release volumes for rural use that are currently used for urban use but, on the other hand, it will be able to sell excess production to farmers. The installation of large private seawater desalination plants that sell their products to the agricultural sector is being promoted by producers as the key to the future expansion of the sector since this would allow them to have a reliable source of water without having to make investments of capital as up to the present.

Due to the change in the production model seen when introducing large volumes of desalinated seawater to the production system, this is the ideal time to carry out a technification of agriculture that avoids the concentration of capital and allows small producers to remain in the market. A national policy directed specifically to that sector is required, which provides economic aid to those who have the least to allow exploitation of the water resource more equitably and efficiently, which will result in a better distribution of wealth and better conditions of work for thousands of rural workers.

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