

# XVI century Salt Production by Aborigines in Quíbor, Venezuela

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## Introduction

Salt is an essential substance for the human diet and for millennia world-wide has been subject to commercial exchange, so that many salt sources have been considered strategic places. In the case of Venezuela, the salt works of Araya in Sucre State, have been the most important with more production through time. In the colonial period salt works were active in Borburata, Coro and in the lake of Maracaibo. Cities near the sea had an easy supply of salt while it was a real problem for the inhabitants of the interior cities as Barquisimeto, El Tocuyo, Mérida, Barinas and others.

The indians of the interior of South American and especially those of the Andean highlands, had their own sources of salt and even had some with a natural iodine content (BOUSSINGAULT, 1825, 1833), but regrettably they fell in disuse after contact with the Europeans who preferred the iodine-free marine salt similar to the one used in Spain.

FIERRO (1994: 268) indicates that the empiric knowledge of the indians made them prefer their local salt for human consumption rather than the marine, since it helped to prevent and to cure the goiter. The writers of Colombia of the XVII century described the bad aspect of this local salt due to its yellowish color, but the gradual replacement with the iodine-free marine salt contributed in the XVIII century to make goiter a health problem of great magnitude.

In Venezuela besides the area of Quíbor object of this note, it is known that in the Lagoon of Urao, near the town of Lagunillas, Mérida State, the natives extracted the *Urao*, a saline compound that mixed with tobacco produced a stimulating substance and it was even used as currency, been traded with people of the Sierra Nevada, Maracaibo, El Tocuyo and the central plains of Venezuela (TROCONIS, 1977: 89). Of this same town of

Lagunillas there is information that in 1810 during the war of independence, the city of Mérida could not obtain marine salt from Maracaibo which was under the control of Spaniards, so Father Juan de la Rosa Mercado carried out experiments and succeeded in the extraction of salt from the waters of the lagoon (URBANI, 1989).

Salt was also extracted by Indians but the process used unknown at Aricagua, Mérida State (FEBRES CORDERO, 1944).

On the salt trade during the pre-Hispanic period, ROJAS (1995: 171) says that it was one of the most important exchange items among the Caquetíos natives from Coro, which extracted the product off the coast of Mitare, Adícora, Guaranao, and traded it in the towns of the interior as the area of Carora and Barquisimeto, becoming an important commercial trading route.

In this work details are given about the salt extraction by aborigines people in the XVI century in the area of Quíbor, Lara State, Venezuela. Field work was also performed and saline earth was collected and a laboratory experiment of extraction salts trying to reproduce the native techniques was carried out. The Indians that worked in this industry were called *salineros* (salt workers) and the toponymy of the place where it took place is *Salinero* (salty place).

## The documents

### 1. CEY, circa 1546 (1995: 61-62)

This author presents a detailed chronicle of the origins of the cities of El Tocuyo, Quíbor and Barquisimeto, regarding salt he says that it was of a "big esteem between Indians and Christians, that some of it is brought from the sea, but it does not last neither half-day. The Indians manufacture a very artificial one ... in the plains of Quíbor, and they make it from a superficial and salty earth, placing it with water and cooking it until its clots in certain vessels ... they strain it with rain water in that earth, later they cook it, adding some powdery earth and they make in this way certain breads ... (Fig. 1); they have an earth color, veined of white and black, hard as stones and they make it small and big for sale or exchange for corn, with Indians and Christians. This salt makes food a little bitter, ugly to the sight, but it is perfect to salt any meat and such salting gives to the meat a crimson red color ... The Indians that make salt do not work in agriculture, because they only assist this labor ..."



2. VILLEGAS (1552, 1979: 313-314)

This is the author of an official resolution protecting the *salineros*, stating that "... no person of those having them under their custody shall perturb neither remove them from their production and exchange activities as they use to do with any person from the city of Barquisimeto or any other, since there are no other sources of salt with the exception of those where the *salineros* live, at the contrary they would loose them ... so they could not make molestations neither nuisances to the *salineros* ..."

3. PONCE DE LEÓN et al. (1578, 1964: 157)

In a description of the city of El Tocuyo they say that at five leagues from the city there is a place of salty earth from which the "... Indians make salt taking the earth and distilling in a pot, and from the leachate obtained they fill pots and cook during three days and their nights without turning off the flames from under that is made of hefty wood. When dried they obtain a bread of earth color that the Indians use as salt, and the Spaniards eat also due to the lack of other. They salt meat, making a better cured meat that with marine salt ..."

4. GONZÁLES DE ARÉVALO et al. (1579, 1964: 196)

These authors when describing the city of Barquisimeto say that in this area a little salt is produced and said to be of earth, that it is not much liked by the Spaniards since makes foods bitter. But it is good to salt meat, while marine salts is brought for the Spaniards from the sea that is 40 leagues from Barquisimeto.

5. NECTARIO MARÍA (1947: 25)

When referring to the first settlements in the region of Quíbor indicates that on the second half of the XVI century the Indians from the place of Salinero were reorganized by Captain Don Diego Gómez of Alvarado. In the location map of this author's archaeological excavations, the place Salinero is indicated, which was visited by the author as explained latter on.

6. TROCONIS DE VERACOECHEA (1977)

This work reproduces a map of El Tocuyo region made in mid-XVI century by an unknown author locating the salt works as "Salinas of Quíbor" (Fig. 2).

#### 7. NECTARIO MARÍA (1978)

In this work the site of Salinero is mentioned several times but no reference is made to the salt industry.

#### 8. ARCILA FARIAS (1979: 119-120)

In his history of economic activities of El Tocuyo and Barquisimeto area, he reviews previous sources and says that the only Indians that escaped the heavy load of personal service and to whom a tax in species was imposed were the *salineros* Indians. They were protected by a resolution of marked local character but that had an enormous importance since salt in the first times of the colonization was a scarce item of first necessity to the Spaniard which lived with very limited resources, their establishment were precarious and the small groups were isolated in an extensive hostile territory. Under those conditions, food preservation was a serious problem.

The *salineros* had the freedom to work and exchange the salt with any person and were protected by law in order to stimulate them to continue such exploitation. They would give to their Spanish owners the quantity of salt necessary for the their home consumption and the remaining could be freely sold or exchanged.

### Experiment of salt extraction

The site of Salinero at the north of Quíbor was visited, there in the margins of the dry Atarigua creek ( $69^{\circ} 37' 40$  longitude West,  $10^{\circ} 00' 25$  latitude North) (Fig. 2), several kilograms of the exposed young clay-rich sediments covered with saline minerals eflorescences were collected.

When analyzed by X-ray diffraction such natural eflorescences were identified as *gypsum* (hydrated calcium sulfate) and *thenardite* (sodium sulfate), while the bulk material is made up by illite and smaller quantities of kaolinite, calcite and quartz.

In the laboratory distilled water was added to the sediment, revolving to dissolve the salts and allowing to decant, after two days the same process was repeated again. Three days later when the decanted water was clear, it was separated from the remainder mud.

Then we took 4 liter of the clear and brackish water, and proceeded with its evaporation. In the process a white-grayish mineral precipitated and a floating white fraction appeared even though the turbulence due to boiling, both were identified as gypsum (Fig. 4). This compound continued to



precipitate until arriving to the final 1/2 Liter fraction of concentrated water. The evaporation of this final volume only produced the precipitation of the mineral thenardite ( $\text{Na}_2\text{SO}_4$ ) (Fig. 5). This is a highly soluble phase which explains why it is formed in the final volume. The individual crystals have a dog-tooth morphology in the order of 0,1 mm, forming corn-flakes like aggregates from 5 to 10 mm and yellowish white color. The quantitative results of the process is summarized in Table 1:

Table 1. Results of the salt separation

Initial weight of the salty earth collected:	32,4	Kg
Distilled water added:	16	L
Evaporation process:		
Initial volume of water used:	4	L
The reduction of volume from 4 to 1/2 L:	Produces 6,1 gr of gypsum	
The evaporation of the final 1/2 L water:	Produces 25,3 gr of thenardite	
Concentrations of the obtained salts:	Gypsum	Thenardite
gr/L of evaporated water	1,5	6,3
gr/Kg of initial earth	0,94	3,9

The brackish water obtained in the previous process was analyzed with the following results: pH 8,7, Conductivity 10,1 mS/cm, Cl 250 mg/L,  $\text{SO}_4$  6590, Na 2250, K 115, Ca 517, Mg 98. With this data the potential precipitation per liter of water of gypsum and thenardite, can be calculated as 2,2 and 6,9 gr respectively, which compares quite well with the 1,5 and 6,3 gr obtained in the real evaporation.

These results indicate that at least under the current hidrogeological conditions of the valley of Quíbor, a process similar to the one used by the *salineros* of the XVI century produces calcium and sodium sulfates (gypsum and thenardite). The gypsum is not usable, but thenardite is very soluble and has a salty flavor with much resemblance to the common salt (halite, NaCl) and could have been used for human consumption.

The current inhabitants of the site of Salinero indicate that several decades ago in the Atarigua creek there were several points of "alive water" (natural

springs) and larger areas with white efluorescence were present. Such efluorescences are now licked by goats for its salt content. The overexploitation of the aquifers have depressed the water table but could also have produced significant changes in the water chemical composition, therefore it is feasible that in the past, the extraction of salts could have produced some other mineral species (perhaps halite), additionally to the sulfates obtained in our experiment.

Alvarado (1989: 119) in his hydrogeological study of the Quíbor valley points out that in the northern section the groundwater is brackish, consequently not usable for human consumption, which coincides with the location of the site of Salinero. Likewise the saltiest water he found had a total dissolved solids (TDS) of 1807 mg/L and with the following ions in order of abundance:  $\text{SO}_4 > \text{HCO}_3 > \text{Cl}, \text{Ca} > \text{Na} > \text{Mg}$ , which explains the formation of calcium and sodium sulfates efluorescences.

## Discussion

During the first few decades after the foundation of the cities of El Tocuyo and Barquisimeto, their inhabitants continued making use of the salt extracted locally, and the production process was in the hands of specialized natives who possibly continued a traditional activity known by them from centuries.

Due to the loss of this tradition it is not certainly known the places where the salineros carried out the production of salt and the map of the XVI century presented by TROCONIS (1977) does not have the detail as to contribute to the knowledge of the exact location. NECTARIO MARÍA (1947) presents a map where at the north of Quíbor the site of Salinero appears. This place continues to be called in this way and there we collected the earth samples with efluorescences of saline minerals.

The process used by the aborigine people was based on finding a site with salty earth, possibly near a brackish water spring that impregnated the ground which as sun-heated would evaporate and produce salts efluorescences.

The extraction process could have been similar to our experiment, namely: 1) Take portions of the salty earth with their efluorescences, placing it in pots adding water and revolving so that the salts are dissolved, perhaps heating for a more complete dissolution. 2) Separation of the decanted clean water. 3) Heating of the water until complete evaporation, obtaining as final product the precipitate salts.



The documents available show that the Spaniards found this salt of poor quality, but used anyway since at that time it was the only available and expressly declare that it was good to prepare cured dried meat. This extraction fell in disuse as commercial routes improved, so that by mid to late XVII century the salt consumed in El Tocuyo and Barquisimeto was marine and brought from Coro (Troconis, 1977: 296). In the experiment that we carried out gypsum and thenardite were obtained. Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) it is not useful but it is easy to separate since it is the first to precipitate, and with subsequent boiling when the water is concentrated about 8 times the final evaporation precipitates only thenardite ( $\text{Na}_2\text{SO}_4$ ). With these results we suggest that this compound could have been the same extracted for human consumption by the *salineros*. In our experiment the process surrendered 3,9 gr of thenardite for each kilo of the original material used, this is a low yield but surely it can be improved with more experimentation and using a more saline raw material. The color of the precipitated thenardite is yellowish, which fits with the XVI century's descriptions.

## Abstract

The occupation of El Tocuyo and Quíbor valleys, central-western Venezuela, started in the mid-XVI century, there the Spaniards found that the Indians extracted salt for their consumption from salty earth. This strategic activity was made by the *salineros* (salt workers) which were protected by local laws. The improvement of communications with the coast and the Spaniards preference for marine salt made disappear this local industry. The extraction procedure was tried to be reproduced in the laboratory leaching salty earth and evaporating the liquid, this resulted in the precipitation of gypsum and thenardite, this last mineral is a sodium sulfate, highly soluble and with salty flavor that could have been the "salt" produced by the Indians.

*Key words:* XVI century, salt, gypsum, thenardite, indigenous industry.

## Resumen

### *Producción de sal en el siglo XVI por los indígenas de Quíbor, Venezuela.*

En el siglo XVI los europeos inician la ocupación de los valles de El Tocuyo y Quíbor, Venezuela centro-occidental, encontrando que los indígenas extraían sal para su consumo a partir de las tierras salobres de la región. Los que trabajaban en esta estratégica actividad, los *salineros*, fueron protegidos por las ordenanzas locales, pero al mejorar las comunicaciones con la costa y por la preferencia de los españoles por la sal marina, esta industria indígena desaparece. En el laboratorio se trató de reproducir el proceso de extracción, lixiviando tierra salobre y evaporando el líquido resultante, obteniéndose la precipitación de yeso y thenardita, este último mineral es un sulfato de sodio, muy soluble y salado, que pudo haber sido la „sal“ producida por los indígenas .

*Palabras claves:* siglo XVI, sal, yeso, thenardita, industria indígena.

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Fig. 1. Graph of Galeotto Cey (circa 1546, 1995: 61) showing the form of the vessels used for preparing the salt and the black and white veined resulting „bread“.

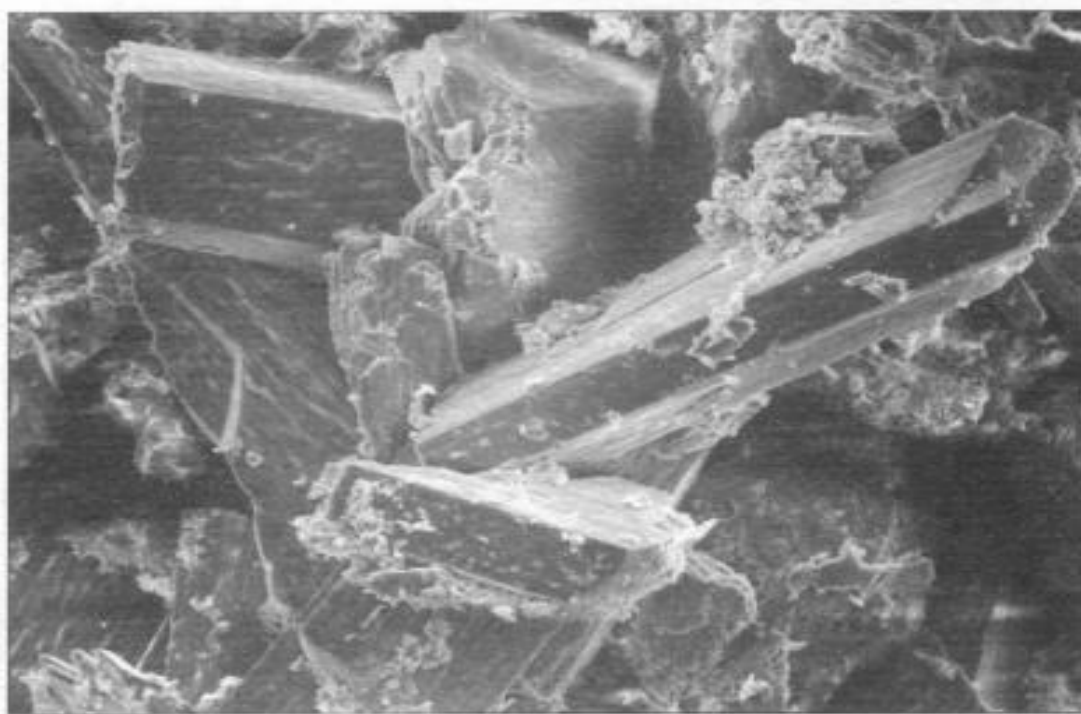
Fig. 2. Mid-XVI century map of the area of El Tocuyo showing the location of the salt works of Quíbor („[S]alinas de Quíbor“) (Troconis, 1977).



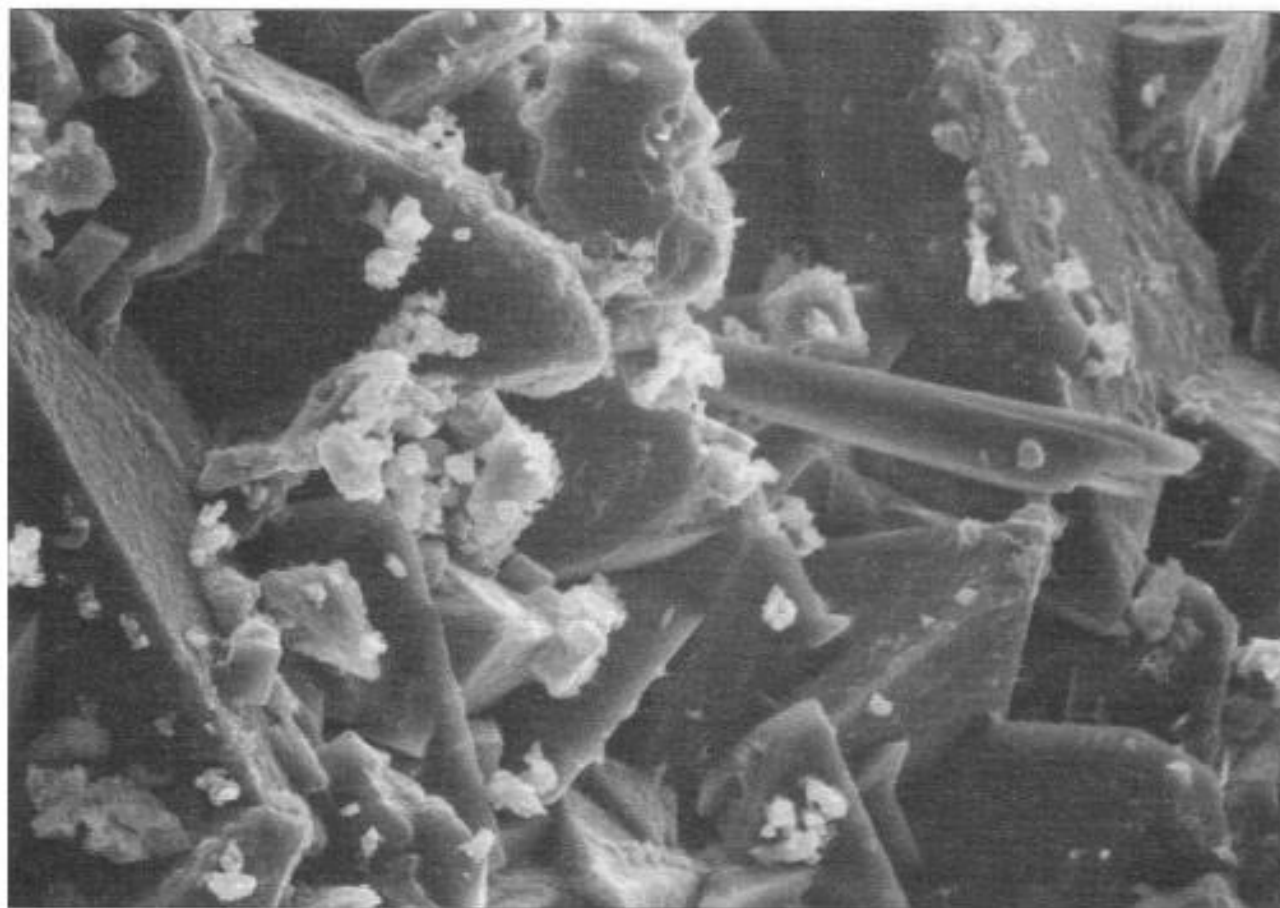




*Fig. 3. Atarigua creek in the site today called Salinero.*



*Fig. 4. Scanning electron microscope (SEM) image of the precipitated gypsum.*



*Fig. 5. SEM image of thenardite.*