

# **THE HAITIAN SEA SALT INDUSTRY: A COMMERCIALISATION STRATEGY**

March 2012

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## Glossary of Terms

ADP	ACCENTURE DEVELOPMENT PARTNERS
AGD	GENERAL CUSTOMS ADMINISTRATION
AMURT	ANANDA MARGA UNIVERSAL RELIEF TEAM
BE	BAUME
FDI	INDUSTRIAL DEVELOPMENT FUND
IDD	IODINE DEFICIENCY DISORDER
FOB	FREE ON BOARD
HIFIVE	HAITI INTEGRATED FINANCE FOR VALUE CHAINS AND ENTERPRISES (USAID PROJECT)
MSPP	MINISTRY OF PUBLIC HEALTH AND POPULATION
MI	MICRONUTRIENT INITIATIVE
MT	METRIC TON
NaCl	SODIUM CHLORIDE
TNS	TECHNO SERVE
UNDH	UNIVERSITY OF NOTRE DAME HAITI
USAID	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
USGS	UNITES STATES GEOLOGICAL SURVEY

## 2 Introduction

Within the context of the Haitian economy, sea salt is a small but important industry. While 280 million MT of salt is produced annually across the globe, only an estimated 30,000 MT - 40,000 MT is produced each year in Haiti. Yet, salt production and commercialization is the primary livelihood for approximately 50,000 Haitians, many of whom reside in one of Haiti's poorest regions: Commune Anse-Rouge and the greater Artibonite province. Furthermore, an estimated 7 million Haitians do not consume sufficient levels of iodine; therefore, salt iodization represents the most promising opportunity to protect 70% of Haiti's population from Iodine Deficiency Disorder (IDD)<sup>1</sup> and other conditions related to iodine deficiency. Due to these factors and others, growth of the Haitian salt industry holds promising potential to reinforce development goals across multiple dimensions, including: economic growth and poverty reduction, public health and child development, disaster risk reduction, agriculture and rural development, and gender equality. However, the industry's development is currently constrained by low production volumes and poor quality.

Salt is primarily produced along the northwest coast of the Artibonite province. Within this zone, Commune Anse-Rouge (with an estimated 275 hectares of salt basin surface area, stretching from Anse-Rouge south to Corridon) represents an approximately 70% of national production. The second largest production zone is Gonaives and the surrounding area (including Raboteau, Petite Desdunes, and L'Estère), followed by Baie de Henne and Grande Saline. Production in Aquin has reportedly been entirely destroyed by hurricanes, and production in Fort-Liberté is marginal if not also inexistent. However, small improvements to production in the North have the potential to result in displacement of Dominican imports with iodized salt for the population and commercial gains for salt production.

Haitian sea salt is produced using traditional methods, which produce low yields, poor quality salt and a highly volatile supply. While large volumes flood the market in the dry season, low production levels and inadequate storage capacity cause domestic salt prices to rise by 30%-50% during the rainy season. As a result of the low quality and volatile supply of domestically produced salt, an estimated 20%-40% of domestic demand is satisfied through imported salt. Industrial users and local wholesalers resort to importing crude salt when domestic salt prices are high, while quality-sensitive markets import table salt year-round.

In addition to modernizing production methods and improving quality of Haitian salt, TechnoServe, on its report of September 2011, also recommended to improve the capacity to produce and commercialize fortified salt, to develop a strategy for future exports, to introduce and enforce industry regulation and finally to take adequate action to reduce transportation cost which is estimated at US\$93.00 per metric ton from producer to retailer. With regards to actual production, this will be

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<sup>1</sup> Iodine deficiency damages fetal brain development, resulting in a loss in IQ of 10% to 15%, and in some cases even more extreme developmental disabilities (Micronutrient Initiative)

equivalent to US\$3,720,000.00. Other commercialization costs, such as marketing, are identified in other stakeholders documents.

In order for Haitian people to have sustainable, long term access to affordable iodized salt certain inefficiencies in the value chain must be improved so that the production and sale of inexpensive, iodized salt is profitable for producers. There are a variety of inefficient aspects of the value chain that can be considered the low hanging fruit of profitable changes to the value chain – the most obvious are production techniques and transportation.

As salt production becomes more efficient it also becomes more competitive, resulting in cost-savings for the consumer. Iodization of salt is an additional expense that can be offset by improvements to production and transport that result in the cost of iodized salt being made available to the population at approximately the same cost as today.

## 3 Salt market

### 3.1.1 The Global Market

Salt is a unique commodity in the global market for many reasons. First, it is not traded on any future exchanges. Second, salt's low value combined with its heavy weight makes transportation costs (which can represent 25%-60% of final costs) a driving factor in sourcing decisions.<sup>2</sup> Third, salt is produced in each region of the world. As a result, many countries produce primarily for domestic consumption, and global salt trade accounts for only 20% of world production. Furthermore, any international trade flows are largely intra-regional.

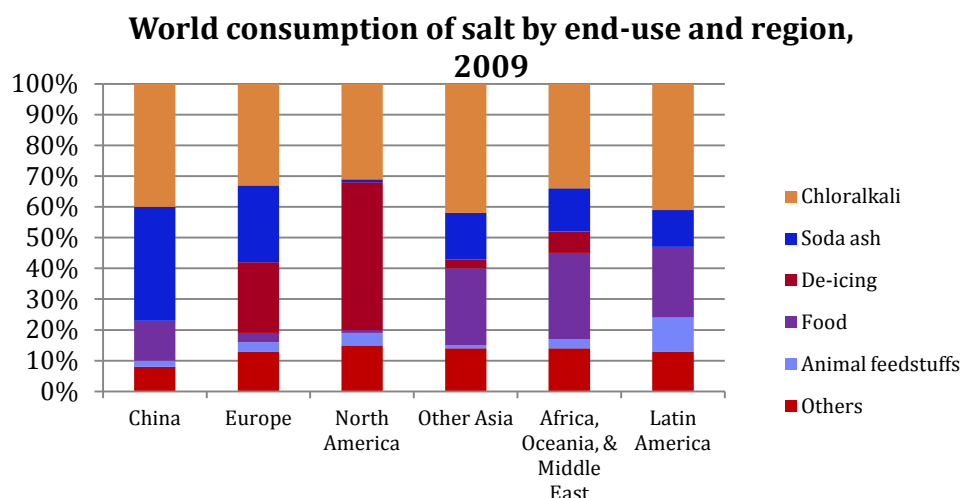
Caribbean salt production represents less than 1% of global production. Countries in this region generally produce low quantities of salt relative to the major global producers; output in most Caribbean countries falls between 19,000 MT/year to 160,000 MT/year

Trends in global salt consumption are driven primarily by industrial development, and secondarily by population growth. The primary uses of salt differ by region. For example, as shown in Exhibit 1 below, food salt and chemical production (chloralkali and soda ash) represent the majority of consumption in most regions, including Latin America, Africa/Oceania/Middle and Asia; whereas as de-icing is the largest market for salt in North America.

#### *Exhibit 1: Global salt consumption*

<sup>2</sup>Estimates were made for the region Anse-Rouge/Coridon to Port-au-Prince

<sup>3</sup> USGS 2009 MINERALS YEARBOOK: SALT [AVANCE RELEASE]

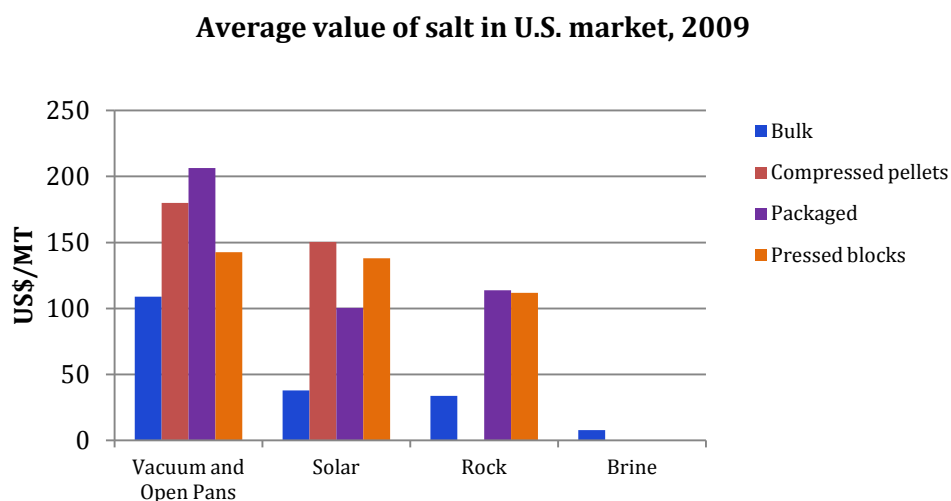


Source: Rothskill, "Salt: Global Industry and Markets Outlook" 2011.

Although salt consumption fell by 8% in 2009 on the heels of the global economic crisis, it rebounded in 2010 due to a combination of growth in Asia and severe winters in North America, which led to strong demand for road salt.<sup>3</sup> Global demand for salt is expected to grow annually by 2.5%-3.3% over the next three years, reaching 300-305 million MT by 2015

Regardless of the production method, there is significant value added by packaging salt or processing it into pellets or blocks. For example, the price of packaged solar salt is 250% that of bulk solar salt in the U.S. (See Exhibit 2 below).

*Exhibit 2: Example of variation in salt prices based on production method and product form*



Source: USGS 2009 Minerals Yearbook, Salt

<sup>3</sup> «Salt: global industry markets & outlook,» Rothskill 2011

### 3.1.2 Regional Markets (North America)

Given the intra-regional nature of salt trade, the North American salt markets are most relevant to this study due to their proximity to Haiti and size. In 2009, the United States consumed 56.4 million MT of salt. In this same year, it imported 14.7 million MT, equivalent to 26% of total consumption. U.S. salt imports as a percentage of consumption has risen by 11 percentage points since 2006. Rather than being a result of shortages in domestic production, increased reliance on imports is reportedly due to lower-cost imports. Due to lower production costs, exchange rates, and the fact that costs of ocean freight are frequently less than those for transportation overland by rail or truck, U.S. buyers can often source less expensive salt in regional international markets than at home. Although the U.S. imports salt from 25 different countries, 90% of U.S. salt imports originate from Canada, Chile, Mexico and the Bahamas.

Estimates of FOB prices for bulk salt from Haiti for U.S. municipal de-icing range from approximately US\$12- US\$15/MT. Bulk salt for U.S. consumer retail markets is anticipated to secure slightly higher FOB price, at US\$15- US\$18/MT. Bagged de-icing salt for consumer retail markets sells for approximately US\$40-US\$75/MT, yet transportation (which typically represents 25%-60% the final price of salt) is the responsibility of the seller.<sup>4</sup> Significantly higher prices are paid for chemical grade salt, which is more refined than road salt. This salt can secure prices as high as US\$150/MT.<sup>5</sup> Finally, high quality sea salt can be sold in gourmet markets for between US\$10,000- US\$15,000/MT.<sup>6</sup>

### 3.1.3 Industry Trends

In addition to consolidation, several salt consumption and usage trends are developing within the industry that may affect the volume and structure of salt demand in the future. Concern regarding the health risks of sodium (including high blood pressure and cardiovascular diseases) has led to initiatives to reduce table salt consumption across the developed world. For example, in 2008, the U.S. launched the National Salt Reduction Initiative, which encourages food producers and restaurants to reduce the salt content of foods by 25% over five years. Many U.S. food companies have voluntarily signed onto this initiative in order to avoid mandatory legislation. In the same year, the European Union adopted the EU Framework for National Salt Reduction to support and coordinate national initiatives to reduce salt consumption. This health concern has been a driving force

<sup>4</sup> Oxfam, "Haiti Livelihoods: Salt Export Market Assessment." *Accenture Development Partners*. March 2011; USGS 2009 MINERALS YEARBOOK: SALT [AVANCE RELEASE]

<sup>5</sup> Economist: <http://www.economist.com/node/15276675>

<sup>6</sup> Oxfam, "Haiti Livelihoods: Salt Export Market Assessment." *Accenture*. March 2011



behind consumers' increased interest in sea salt, which is believed to contain lower levels of sodium, and has fueled the birth of the gourmet sea salt market.<sup>7</sup>

### 3.1.4 Consumption

Consumption of salt in Haiti can be broken down into two channels: household consumption and industrial use (e.g. water treatment, ice and beverage production). Past estimates for annual household consumption have ranged between 40,000 MT and 60,000 MT.<sup>8</sup> Using the global average annual consumption of 3.65 kg per capita,<sup>9</sup> Haiti's current annual salt consumption would be 36,347 MT.<sup>10</sup> Additionally, we assume that approximately 10% of salt is lost in washing at the household level (as crude salt requires additional washing before it can be consumed). Therefore, Haiti's total annual demand for salt for human consumption is estimated to be approximately 40,000 MT/year.

Domestic salt demand for industrial use in ice and drink factories as well as in water treatment is difficult to measure. Based on interviews with industry experts, and factories in Port-au-Prince as well as Cap Haitian and Gonaives, we estimate annual industrial demand at approximately 10,000 MT/year, or 20% of total domestic demand for crude salt. Therefore, the total domestic demand for crude salt can be estimated at approximately 50,000 MT/year.

#### *Exhibit 3: Estimate of annual demand for salt*

##### **Estimate of Annual Domestic Demand**

Household consumption	
Global average annual consumption/capita, kg	3.65
2010 population in Haïti	9,958,175
Total consumption, MT	36,347
Assumed percentage lost in washing at the household level	~10%
Total estimated annual salt demand for consumption, MT	40,000
Estimated annual demand for industrial use, MT	10,000
<b>TOTAL DOMESTIC ANNUAL DEMAND, MT</b>	<b>50,000</b>

*Sources: World Development Indicators; ICCIDD; TNS interviews with industrial users and industry experts*

<sup>7</sup> USGS 2009 MINERALS YEARBOOK: SALT [AVANCE RELEASE]

<sup>8</sup> Micronutrient Initiative – World Food Program, "Improvement of Micronutrient Nutrition in Three Departments in Haiti: Final Activity Report," July 2006-July 2009; expert interviews

<sup>9</sup> International Council for the Control of Iodine Deficiency Disorders (ICCIDD): <http://www.iccidd.org/pages/protecting-children/fortifying-salt/how-salt-is-iodized/iodate-or-iodide--more-detail.php>

<sup>10</sup> Assumes a 2010 population of 9,958,175 (World Development Indicators)



### 3.1.5 Price

The price of salt in Haiti varies based on quality and on volume in the market. Household consumers value salt that is clean and white in color, in contrast to the grey or pink color results from salt produced in muddy, poorly maintained basins with high magnesium content (which can result from a variety of factors) or in those located in areas with many mangrove trees. Industrial users also define high quality as salt as that which is clean and white, reporting that dirty salt containing debris damages their machinery. Yet, industrial users also associate quality with the content of sodium chloride (NaCl). This is because they are able to use a lower quantity of salt in their ice and beverage production processes when it has a higher NaCl content. While the exact chemical composition of salt varies across and within production zones, Haitian salt produced using traditional methods generally contains 78% NaCl and 22% magnesium salts; whereas salt produced with modern methods contains an NaCl content of 97%.<sup>11</sup> Although only sophisticated industrial users measure the NaCl content at the point of purchase, all industrial users recognize that salt from certain production zones has a reputation for being stronger (often referred to as having a higher “salinity” level). Furthermore, among less sophisticated industrial users there is a general belief that salt with large, hard grains has a higher NaCl content than fine-grained salt.<sup>12</sup> As a result, locally produced salt that is either dirty or fine-grained sells at a 5%-30% discount to the price of clean, large-grained salt.

Haitian salt prices also vary based on the season due to fluctuations in volume on the market. During the rainy season (May/June through October/November), national salt production volumes are low as a result of weak evaporation rates and entire harvests being lost to storms and hurricanes. Therefore, prices during this season can be 30%-50% higher than prices during the dry season.

Overall, domestic salt prices in Haiti are high compared to those in neighboring countries with higher purity salt. While the average fob price for bulk salt in the Bahamas in 2009 was US\$ 16/MT, and \$20/MT in Mexico<sup>13</sup>, Haitian salt prices range from approximately US\$57/MT to US\$92/MT in production zones, and from US\$145/MT to US\$187/MT in Port-au-Prince. Price variation within the same point of sale is due to primarily to differences in the supply of salt on the market, and secondarily to differences in quality. Variation between prices in a production zone and major markets is due to the high cost of transport and the existence of various

<sup>11</sup> Roosevelt, Saint Dic and Jean Chesnel Jean, “Etude Sectorielle: Aribonite Filiere Sel.” December 2007, Fonds de Développement Industriel (FDI).

<sup>12</sup> Fine grained sea salt produced from modern production systems has a significantly higher NaCl content (97%) than large grained sea salt produced through traditional methods (78%). Yet, the fine grained salt typically found in the Haitian domestic market is likely to originate from traditional basins that have been harvested early (i.e. before the brine reaches its maximum NaCl content), rather than from modern production methods. This would explain the general negative association between fine grains and NaCl content found among less sophisticated Haitian industrial salt users.

<sup>13</sup> USGS 2009 MINERALS YEARBOOK: SALT [AVANCE RELEASE]

middlemen in the value chain. See exhibit 7 below for a detailed breakdown of domestic variation in price.

*Exhibit 4: Variation in price by season and point of sale*

Point of sale	City/Area	Minimum reported price (dry season), US\$/MT	Maximum reported price (rainy season), US\$/MT
Production zone	Commune Anse Rouge	\$58	\$93
	Baie de Henne	\$69	\$93
	Gonaïves	\$69	\$88
	North (Caracol, Jacquezy)	\$36	\$72
	Grande Saline		
Major market (wholesale)	Port-au-Prince	\$145	\$188
	Cap Haïtien	\$125	\$162
Major market (retail)	Port-au-Prince	n/a	\$275
Port-au-Prince	Avg. of Dominican Republic imports (informal & formal)		\$168
	Avg. of other formal imports of crude salt (Colombia, Mexico, Jamaica, etc.		\$220

\*Source: Haiti Customs Bureau and TechnoServe field interviews. Note: large commercial buyers source both from Cite Soliel and directly from production zones. As such, they report securing average prices as low as US\$97/MT to US\$112/MT. Price variation between zone due to differences in quality of salt and accessibility of area.

### 3.1.6 Salt imports

Imported salt is likely to account for a significant portion of salt consumption and usage in Haiti. Formal salt imports average 5,500MT per year, almost 90% of which is crude salt and the remaining 10% is high quality table salt.<sup>14</sup> In addition to formal imports, an estimated 5,000-15,000 MT/year is imported informally from the Dominican Republic.<sup>15</sup> See Exhibit 9 below for a detailed estimation of annual salt imports.

Imported salt arrives in the Haitian market through several channels, the largest of which are industrial users and Port-au-Prince wholesalers. These groups purchase salt from the Dominican Republic when prices of Haitian salt rise. According to interviews with a sample of enterprises and Port-au-Prince wholesalers, these actors substitute Haitian salt for Dominican salt an average of three months out of the year (during the rainy season); though they do so more frequently during years when Haitian production zones are damaged by severe weather. Industrial users importing salt from the Dominican Republic through formal channels generally pay a final price ranging between US\$145–US\$200.<sup>16</sup> Local wholesalers in Port-au-

<sup>14</sup> Administration Générale des Douanes (AGD)

<sup>15</sup> TechnoServe field interviews and analysis

<sup>16</sup> Administration Générale des Douanes (AGD); TechnoServe interviews with local wholesalers and industrial users. Note: AGD reports some Dominican Salt imports as high as US\$250/MT (these may be table salt).

Prince use informal channels to import salt from the Dominican Republic for approximately US\$85-US\$90/MT, not including transportation.

A significant portion of informal Dominican salt imports enter Haiti through the Dajabon market at the Ouanaminthe border in the North East. Here, the Dominican producers association of Monte Cristo sells roughly 5,000 MT/year to Haitian retail merchants at a price of approximately US\$76/MT.<sup>17</sup> It can be assumed that salt is also imported informally through southern land borders, given the existence of salt production zones in the south of the Dominican Republic (as well as in Monte Cristo in the north).

Food manufacturers, bakeries, supermarkets and non-governmental organizations working in iodization form the remainder of the salt import channels. These users import salt throughout the year because Haitian salt does not meet their quality standards.

*Exhibit 5: Estimated 2010 annual salt imports*

Type	Channel	Quantity (MT)	Avg. Price (US\$/MT)	Assumed importer
Table salt	Formal	660	\$1,300	Supermarkets, food manufacturers, NGOs (distributions of iodized salt)
Crude salt from the Dominican Republic	Formal	970	\$170	Industrial users, NGOs (for iodization)
Crude salt from other countries	Formal	3,870	\$250	Industrial users
Crude salt (from the Dominican Republic)	Informal	5,000 to 15,000 (est)	\$80	Port-au-Prince salt wholesalers and retail merchants
<b>Total</b>		<b>10,000-20,000</b>		

*Source: AGD; TechnoServe interviews with enterprises, wholesalers and retail merchants*

### 3.1.7 Haiti's competitive advantage

Due to the expensive nature of salt transportation, Haitian salt has a natural competitive advantage in the domestic market. This is supported by the fact that price-sensitive wholesalers and industrial salt users almost exclusively purchase Haitian salt (rather than importing salt from the Dominican Republic) during the dry season when ample supply is available. This price advantage would also transfer to high quality salt for iodization, sale in supermarkets, and use in food manufacturing if Haitian producers were to adopt modern production methods.

<sup>17</sup>Minimum informal imports: 5,000 from Dominican producers association to Haitian retail merchants at Dajabon market. Up to an additional 5,000-10,000 estimated to arrive through: other retail merchants who bring salt across other land borders with the Dominican Republic and Port-au-Prince wholesalers who import as much as 25% of their annual salt purchases (source: TNS interviews with DR producers' association, Haitian wholesalers and retail merchants).

Haiti's proximity to the United States also gives it a potential competitive advantage in the U.S. salt market, as the cost of shipping salt by oceanic freight from Haiti is estimated to be less than overland shipping costs within the U.S. Prompted by U.S. salt buyers' interests in purchasing bulk salt from Haiti, Oxfam America engaged Accenture Development Partners in conducting a "scan" of potential US markets for salt. The market scan identified bulk salt for the U.S. consumer and retail road de-icing markets as promising outlets for Haitian salt exports that merited further study. Alongside some industry experts, the scan also identified bagged road salt as a promising, albeit more complicated, U.S. market.<sup>18</sup>

It is important to note that the low value of salt demands that suppliers not only be cost competitive in shipping, but also in production and loading.<sup>19</sup> Therefore, realizing Haiti's potential competitive advantage in the U.S. bulk salt market requires annual export volumes of at least 100,000MT (implying significant expansion in current production levels of approximately 30,000-40,000 MT) and deepwater port with a minimum loading capacity of 12,000MT-15,000 MT/day to cover the costs of loading.<sup>20</sup> Dr. John Cox, with the support of Oxfam America, has estimated that the Commune Anse-Rouge area has the potential to produce more than 100,000 MT a year, and has confirmed that the surrounding coastal conditions could support a jetty for loading a cargo ship of the necessary size.<sup>21</sup> Yet, the construction of a jetty of this size could cost as much as US\$ 4 million,<sup>22</sup> relative to estimated bulk export revenues of US\$1.5-US\$3 million/year.<sup>23</sup> Bagged salt exports, on the other hand, have lower requirements for export volume and loading capacity.<sup>24</sup>

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<sup>18</sup> Source: Oxfam America, "Haiti Livelihoods: Salt Export Market Assessment." *Accenture*. March 2011. Note: The context in which ADP's market scan was conducted is also important to understand. At the time there was fear that modernizing production in Haiti would create a domestic market surplus. Therefore, before engaging in any modernization projects, Oxfam America wanted to ensure that export markets were available in order to absorb increased production levels. Therefore, the purpose of the scan was a general identification of export markets, rather than an in-depth analysis of Haiti's competitiveness in these markets (Oxfam America). Additional in-depth research should therefore include an evaluation of Haiti's production, loading, bagging and transport costs (expert interviews).

<sup>19</sup> Expert interview

<sup>20</sup> Cox and Speller, «Technoeconomic feasibility study to improve the salt industry of Anse-Rouge,» May 2011, Oxfam America; Oxfam, "Haiti Livelihoods: Salt Export Market Assessment." *Accenture*. March 2011; Expert interviews

<sup>21</sup> Necessary size of cargo ship for bulk exports is 25,000 dwt (long ton deadweight); Cox and Speller, «Technoeconomic feasibility study to improve the salt industry of Anse-Rouge,» May 2011, Oxfam America

<sup>22</sup> Expert interviews

<sup>23</sup> Revenue estimate assumes export price for bulk salt of US\$15/MT (which is an average of Accenture Development Partner's estimation of US\$15-\$18 for exports to U.S. consumer bulk de-icing market and \$12-\$15 for exports to U.S. municipal bulk de-icing market) and annual exports of 100,000MT-200,000MT.

<sup>24</sup> Expert interviews

Additional in-depth analysis is needed to evaluate Haiti's potential competitiveness in all export markets. Furthermore, annual rainfall data and evaporation rates must be collected in order to develop a more accurate estimation of the areas' production potential.<sup>25</sup>

### 3.2 Activities and actors

The salt value chain encompasses approximately 2,500-3,000 producers, 3,000 laborers, 300-400 wholesalers, and over 2,000 retail vendors. It is estimated that only 5% of salt production reaches end-users directly through sales between large producers and industrial users. The remaining 95% is channeled through wholesalers and/or retail vendors, who aggregate volumes from small producers in order to supply industrial users, commercial buyers and households.<sup>26</sup>

Approximately 80% of salt production is believed to pass through Port-au-Prince, and the remaining 20% is likely to be distributed directly from production zones to nearby regions; of that which passes through Port-au-Prince, an estimated 50% is consumed in the city itself and 50% is transported to markets outside of the city and in other provinces.<sup>27</sup> Within the capital, there are three areas that receive and distribute salt: Croix de Bossales, Warf Jeremie and the Cite Soleil. Approximately 50% of salt destined for Port-au-Prince lands in Croix de Bossales through an estimated 300 merchants (or medium-sized wholesalers), who bring salt in by truck from the production zones.<sup>28</sup> The majority of salt sold in this market is destined for consumption rather than industrial use; vendors report that their primary customers are smaller merchants purchasing salt for retail sale in other markets (including Ti Goave, Jeremie, Les Cayes, etc.), followed by bakeries. Warf Jeremie and Cite Soleil are believed to receive 30% and 20% of salt shipments to Port-au-Prince, respectively. Salt arrives in these areas by boat and is loaded into depots for storage.<sup>29</sup> Both large wholesalers and medium-sized merchants can be found in Cite Soleil and Warf Jeremie, and primarily supply commercial clients (including ice, beverage and water factories) that purchase in bulk.<sup>30</sup>

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<sup>25</sup> Expert interviews

<sup>26</sup> TechnoServe analysis based on interviews with value chain actors

<sup>27</sup> Estimate of 50% assumes 24,000 MTs is transported through Port-au-Prince (80% of total production of 30,000), PAP industrial use of 8,000 MT (80% of total industrial use) and 3,600 MT consumed by PAP households (3.65/capita and PAP population of 1 million). Thus of 24,000 MT transported through PAP, 11,600 is consumed in Port-au-Prince.

<sup>28</sup> Trucks reportedly carry between 100-150 sacks of 120kg based on interviews with wholesalers

<sup>29</sup> Boats reportedly carry appx. 500 sacks of 120kg based on interviews with wholesalers

<sup>30</sup> Field interviews in Cite Soleil, Warf Jeremie and Croix de Bossales

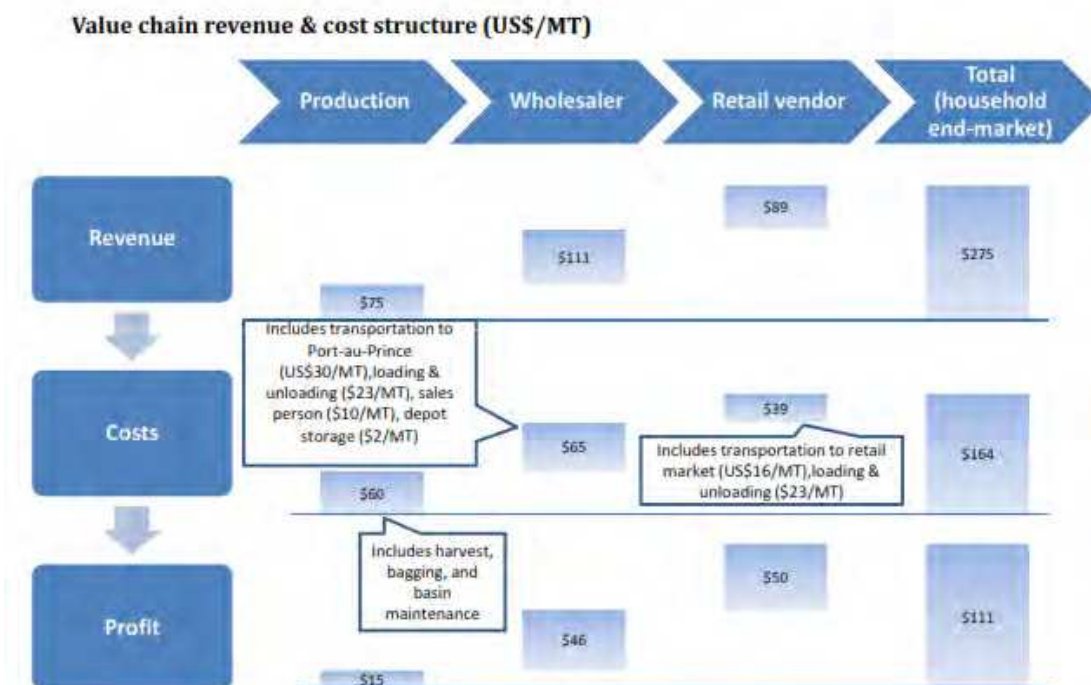


*Exhibit 6: Domestic salt trade routes*



Source: TNS field interviews

*Exhibit 7: Cost and revenue structure of the value chain*



Represents average revenues/costs for Commune Anse-Rouge producers, wholesalers that purchase in Commune Anse-Rouge and sell to retail vendors at Croix de Bossales. Transportation costs assumed by retail vendors depends on distance to retail market. Source: TNS analysis based on interviews with producers, wholesalers, retail vendors



*Exhibit 8: breakdown of transportation costs*

Level of sale	Estimate of transport costs	Cost, US\$/MT
Wholesale	Loading truck	\$12
	Transportation from Anse Rouge to Port-au-Prince (truck)	\$30
	Unloading truck into storage	\$12
	Total transportation costs for wholesale	\$53
	Average wholesale price	\$166
	<b>Transportation as a % of wholesale value</b>	<b>32%</b>
Retail (passing through Port- au-Prince)	Loading truck for transfer to retail market	\$12
	Transportation from wholesale to retail market	\$16
	Unloading truck at retail market	\$12
	Total transportation costs for retail sale	\$92
	Retail sale price	\$275
	<b>Transportation as % of retail value</b>	<b>33%</b>
Profit margin		\$15 20%

*Source: TNS analysis based on producer interviews. Average price in production zone is a weighted average of dry and rainy season prices across all production zones (assumes producers get rainy season price (high) 4.5 months out of the year)*

### 3.2.1 Wholesalers and retail vendors

The commercialization of salt in Haiti is managed by a network of large and medium wholesalers as well as small retail merchants. Salt is sold by volume, rather than weight. At the production site, salt is generally sold by the “barrique”: a group that currently consists of 18 large bags (though the amount of bags in a barrique seems to vary from year-to-year).<sup>31</sup> When filled, each bag weighs 120kg on average (though their weight can vary by 5%-15%). After purchasing by the barrique, wholesalers sell salt to bulk buyers by the bag (typically using bags equivalent to 120kg, though some sell smaller bags that are equivalent to 45kg-50kg). At the retail level, salt is sold by the bucket (approx. 17 kg), marmite (approx. 5 kg) or in small plastic bags.<sup>32</sup>



Less than 10 large wholesalers are estimated to work at Warf Jeremie and Warf Cite Soleil in Port-au-Prince, and are responsible for approximately 20% of salt brought from the production zones to Port-au-Prince. These actors generally live in Port-au-Prince and own multiple boats and storage depots. They send their boats to the production zones once to twice a month to purchase salt, which they then sell in bulk to industrial and commercial clients<sup>33</sup>. They also purchase salt in the Dominican Republic during the rainy season. These merchants have noticeably strong relationships with their commercial clients; they report supplying the same clients year-after-year, and offering their most loyal clients a fixed price throughout the year. Based on field interviews, large wholesalers move a total of approximately 8,000 MT of salt from the production zones to Port-au-Prince. They secure profit margins of 20% to 40% (depending on the percentage of sales that are sold at fixed annual prices) on average annual revenues of nearly \$130,000.<sup>34</sup>

An estimated 300 medium salt wholesalers can be found in Port-au-Prince, selling either in bulk to industrial/commercial buyers at Warf Cite Soleil or Warf Jeremie, or to retail merchants at Croix de Bossales. While some of these merchants are male and based in Port-au-Prince, most are women who live in the production zones. These women aggregate salt from small producers, transport it to Port-au-Prince

<sup>31</sup> Each large bag is often made by sewing together three smaller bags, which were originally used for rice or wheat.

<sup>32</sup> TNS field research and analysis.

<sup>33</sup> Large wholesalers sell primarily to industrial/commercial clients (including ice and beverage manufacturers, water treatment factories, bakeries, restaurants and others), and report selling any leftover salt to retail vendors (appx 5%)

<sup>34</sup> TNS analysis based on interviews with large wholesalers.

and sell it at one of the three market outlets an average of six times a year. It is also assumed that, similar to large wholesalers, Port-au-Prince based medium wholesalers purchase salt in the Dominican Republic during the rainy season when Haitian salt prices are high. As a whole, it is estimated that this group of merchants move between 30,000 MT of salt a year into Port-au-Prince. They secure profit margins between 10%-25% on annual revenues of US\$10,000-\$20,000.<sup>35</sup>

Small retail traders are predominantly women and can be found in markets all over the provinces. Those that reside in provinces close to production zones may travel directly to the production zone to purchase salt; otherwise, they primarily purchase at Croix de Bossales in Port-au-Prince.<sup>36</sup> A typical retail trader may purchase two to five 120kg bags at a time, twice a month from wholesalers (for a total of 14MT/year). Yet, the bags they purchase from wholesalers can vary by as much as 25% without an adjustment in the price. Retail vendors that purchase in Port-au-Prince secure average profit margins of approximately 15%-20% on average annual revenues of approximately US\$4,000.<sup>37</sup>

*Exhibit 9: Overview of sales, costs and revenues by merchant type*

Type of merchant	Estimated number	Yearly sales/ vendor (MT)	Total sales (MT)	Purchase zone	Sales locations	Purchase price (rainy season), US\$/MT	Sale price (rainy season), US\$/MT	Purchase price (dry season), US\$/MT	Sale price (dry season), US\$/MT	Total transport costs, US\$/MT	Range of profit margins	Est. annual revenue/ merchant, US\$
Large wholesalers	10	800	8,000	Anse Rouge, Grande Saline, Baie de Henne	Warf Jeremie, Warf Cite Soleil	\$85	\$187	\$60	\$145	\$32	20%-40%	\$128,432
Medium wholesalers	300	100	30,000	Anse Rouge, Grande Saline, Baie de Henne	Warf Jeremie, Warf Cite Soleil, Croix de Bossales	\$90	\$166	\$70	unknown	\$50	10%-25%	\$16,600
Small retail vendors	2500	14	35,000	Croix de Bossales (some in provinces)	Provinces	\$166 -- \$187	\$275	unknown	unknown	\$50	15%-20%	\$3,850

Source: TNS analysis based on interviews with retail merchants, large and medium wholesalers. Large wholesaler annual revenue assumes they receive the rainy season price 4.5 months out of the year. Est. that 1000 small retail vendors buy and sell directly in the provinces, the remaining 1500 purchase in Port-au-Prince and sell in provinces. Sales/cost/revenue figures for retail vendors only apply to those that purchase in Port-au-Prince

<sup>35</sup> TNS analysis based on interviews with medium wholesalers.

<sup>36</sup> Though some purchase from wholesalers at Warf Jeremie or Cite Soleil.

<sup>37</sup> Assumes average retail price of US\$270/MT (or \$0.123 per pound).

### 3.2.2 End-markets

There are two primary end-markets for salt in Haiti: consumption (through households as well as food manufacturers, bakeries, etc.) and industrial use (including ice and beverage producers, water treatment factories, beverage vendors<sup>38</sup>, etc.). The majority of Haitian households purchase domestically-produced, crude salt in local markets. In areas close to the Dominican Republic border, households consume a fair amount of Dominican salt. For example, the majority of salt found in local markets in Cap Haitien is from the Dominican Republic. Because crude salt found in local markets is not washed or processed, households must wash the salt themselves before consuming it.<sup>39</sup> A small percentage of the population (approximately 2%-5%) consumes iodized salt,<sup>40</sup> which is imported and sold through supermarkets or distributed by the Ministry of Population and Public Health and non-governmental organizations (including UNICEF, the World Food Program and the University of Notre Dame Haiti). Many food manufacturers and bakeries purchase domestically-produced salt through wholesalers at Warf Jeremie, Cite Soleil or Croix de Bosalles; though it is also assumed that some of these enterprises seek higher quality standards and therefore import salt from the Dominican Republic as well as other countries.<sup>41</sup>

Salt is commonly used in domestic industry as a water softener for water treatment and beverage factories or in the process of making ice. In the latter use, pure water is placed in metal basins that are then submerged in cold pools of concentrated saltwater. Because salt reduces the freezing point of water to -21.1 degrees Celsius, the pure water contained in the basins freezes while the surrounding saltwater remains in liquid form. Once the process is finished, solid blocks of ice can be removed from the basins.

Industrial users purchase salt through three channels: local wholesalers, large producers and direct imports from the Dominican Republic. A critical measure for quality among industrial users is a salt's sodium chloride content, as less salt can be used in their processes when it contains a higher level of sodium chloride. While some water treatment factories import salt from the U.S. in order to be assured high sodium chloride content, the majority of industrial users are generally satisfied with the quality of domestically-produced salt.<sup>42</sup>

<sup>38</sup> Beverage vendors use salt in their ice boxes in order to keep drinks cold for a longer period of time.

<sup>39</sup> It is estimated that 10% of purchased salt is lost in washing at the household level.

<sup>40</sup> Ministry of Population and Public Health

<sup>41</sup> TNS interviews with industrial users

<sup>42</sup> TNS interviews with industrial users

### **3.2.3 Bearing the risks of transport**

Merchants are typically responsible for transporting salt from production zones to wholesale or retail markets. They either choose to ship salt by sail boat, or overland by truck. Transportation by sailboat is risky, and most merchants report that they have lost at least one shipment of salt due to a boat capsizing in rough water. Yet, transportation by truck is more expensive and is not without its risks due to poor infrastructure, particularly within the production zones.

Improved physical infrastructure would both lower the costs of salt transport and reduce the risk of losing one's inventory en route to market.

Creating and enforcing industry quality and packaging standards would alleviate these challenges. Furthermore, consistency in quality and packaging would increase the competitiveness of Haitian salt relative to imports (which already meet these standards) and would prepare the industry for future exports into the international market.

1. Securing contracts with new markets so as not to displace other producers in the zone (these markets include: iodization, commercial users and wholesalers currently relying on imports for either part or all of the year, and – in the future – exports)
2. Setting up a network of storage depots near major markets (including Port-au-Prince and borders through which Dominican salt is informally imported). This will enable the enterprises to vertically integrate and create a more efficient transport/storage system, which will both reduce costs and enable the business units to capture a greater portion of the retail value of salt.
3. Iodization interests need to consider all possibilities involved in keeping the cost of production, iodization, and transport low so that the consumers have access to affordable iodized salt without the continued need for subsidies and policing of iodization and sales, which has proven unsustainable in other countries that have not invested in value change improvements that benefit producers.

### **3.3 Improve capacity to produce and commercialize iodized salt**

Salt is such a low value commodity that the cost to transport it to the ultimate consumers often can add double or triple the cost to the end user. What this means is that an inefficient producer near a market outlet often can compete against a more efficient distant producer. A National Salt Strategy for Haiti needs to identify which salt producing areas are geographically best placed to supply each specific regional market outlets, keeping in mind that any production area that is not part of the overall salt strategy for iodization will continue to produce salt in competition with the salt that is iodized. Thus, it is best to include all production areas in the



national strategy. An initial survey of these areas and their potential value with respect to production and commercialization is described below.

Transport is likewise an important aspect of getting affordable iodized salt into the hands of consumers throughout Haiti. Whereas TNS put the cost of harvesting at no more than \$30/tonne (\$10/tonne may be a realistic average), the cost of transport to the wholesalers (80% goes to Port au Prince) is over \$50/ton<sup>i</sup>. So the companies that transport the salt usually make more income from salt than the producers. As a corollary, the potential return from an investment in alternative transportation is greater than is possible from improvements to the production methods<sup>ii</sup>. In other words, changes to transport can reduce costs to the consumer, while increasing profits to the producer, ensuring that the producer continues to have a vested interest in production and commercialization. Thus, a National Strategy for the industry has to study alternatives to the way salt is currently transported – as well as how production methods can be improved.

### **3.3.1 Locations**

Solar salt is best produced in areas of low rainfall and should not be produced on lands that could be used to grow food, which has a higher value than salt. The rainfall map shows that the best area for salt-making is in Commune Anse-Rouge, followed by Gonaïves and Grande Saline and lastly the relatively wet area in the north east (which, although wet, is the driest area along the relatively populated area near Cap Haïtien). In general it is more economical to iodize at the production site, but there may be cases where this is not practical because of poor quality even after production improvements or where the salt may be better suited to industrial uses. Each production site in Haiti needs to be examined on a case-by-case basis, but some details on each are provided here:

- North-East Department (Caracol and Jacquezil) – Production improvements in this region could replace salt imports from the Dominican Republic and satisfy salt demand in the north. The existing saltworks occupy <150 hectares but their potential output could exceed 5,000 tpa and satisfy the anticipated demand of this region. While the existing production environment in the North-East may not lend itself to the kinds of efficiency gains from production improvements as is the case in other places such as Anse Rouge, the potential to offset the imported Dominican salt which currently dominates the market means that even small improvements to production can result in creating profits for producers, and making the commercialization of iodized salt in this region competitive with imports.
- The Gonaïves area - Improved salt production plus fortification near Gonaïves could satisfy the demand for iodized salt in Gonaïves and its surrounding communes and possibly export to Port-au-Prince. There are possibly four or five distinct production areas in the Gonaïves area, all of

which may require different technical solutions for upgrading. For example, there are significant technical challenges to improved production in the areas near Raboteau, specifically because of the vulnerability to floods and unhygienic conditions of the basins near Raboteau. If the region is not able to achieve acceptable quality through production upgrades, it may be difficult for iodized salt from upgraded saltworks elsewhere to penetrate the market due to the higher cost as opposed to the availability of low cost and quality not iodized salt. This may mean that a centralized processing facility subsidized by the government may be necessary to achieve salt quality necessary for iodization for penetration of the local market. A techno-economic study should be conducted to determine best-cost options for these areas.

- Grande Saline - As at Gonaives, these salt basins need technical and financial assistance but no design studies have been conducted to date or are planned. If these basins are modernized, their annual output could exceed 5,000 tonnes. However, there is no immediate population center that Grand Saline would serve so it may not be economically feasible to invest in production improvements in this location. Further, the areas surrounding Grand Saline appear to be fertile agricultural land, which would prohibit growth of production outside of existing basins. A techno-economic study is needed to assess the best strategies for improvements to production, iodization and commercialization at this site. One possibility is that production improvements in this zone could target the production of salt for commercialization for industrial use.
- Magazen and surrounding areas in Commune Anse-Rouge - This area is the only region in Haiti that is capable of shipping large volumes of salt within Haiti or for export because of its high existing and potential production volumes and its close proximity to a body of water deep enough to allow ships to load large volumes of salt. Modernization here has been studied in detail and its potential annual output could exceed 100,000 tonnes. Development of this region should include facilities for fortification and to enable shipments by sea to Port au Prince, Sud and Sud-Est, Grande-Anse and exports.
- Other areas in and near Commune Anse-Rouge (Coridon, Pointe des Mangles, Baie de Henne) - Flood protection will be one of the most important investments in improved production in the regions of Coridon through Bakade, which could also serve to protect existing villages. Coridon and surrounding areas have the potential to produce about 60,000 MT of salt per year. If modernized, Coridon and PDM could both ship to the PAP market as is the practice today. A techno-economic study is needed to evaluate the best possibilities for improvements to production and iodization in this area. At the time of the last evaluation by Cox & Speller, producers in Coridon had not expressed the same motivation levels



towards modernization as had producers in the Magazen area of Commune Anse-Rouge.

### 3.3.2 Iodization

Iodisation can add several \$/t to the production cost and if margins remain low (as now), it is highly probable (as has happened in several comparable countries), that salt producers will be tempted to economise on the purchase of potassium iodate and fortification - and sell non-iodised salt or only partly-iodised salt to save money.

Compliance is a major issue in several countries and Haiti needs to be aware of the logistical difficulties of ‘policing’ the salt producers. Legislation can be helpful in ensuring compliance – but it may be more effective if it defines the packaging than if it obliges the police to conduct on-the-spot tests for effective fortification.

It is therefore prudent that the National Salt Strategy should try to ensure that the salt producers that undertake iodisation and fortification have greater commercial viability than those that do not and, as and when USI is achieved, introduce legislation to discourage any reversion to the present situation.

Although circumstances vary at each saltworks location, the common factor that is today preventing the production salt of sufficiently high quality (for iodisation) is the lack of provision to drain away the magnesium-rich effluent brine before the drained salt crust is harvested. To overcome this problem, the crystallisers have to be elevated above sea level (§3.4) – which can be quite a major investment cost.

The National Salt Strategy needs to draw up very clear guidelines to ensure that any saltworks contemplating modernisation does elevate its crystallisers and does not support any proposal that merely recycles the magnesium-rich effluent back to the seawater intake (§3.5). Such a measure might have little effect for its first harvests but, in time, would lead to the entire saltworks having to be abandoned.

In addition to raising the quality of domestic salt, the capacity to produce and commercialize iodized salt must also be improved. Current capacity to iodize is only 2,100 MT/year and previous distributions of iodized salt have been roughly 1,000 MT/year, in contrast to potential demand for 36,000 MT/year.

We recommend achieving this goal by re-establishing a public-private sector partnership for salt iodization.<sup>43</sup> In this partnership, the public sector partner would have the role of subsidizing the cost of iodized salt, managing the social education and marketing required to promote consumption, and setting and monitoring quality standards. The Haitian private sector partner would secure supply contracts with new business units engaging in modernization, and manage the iodization, packaging and commercialization. Further, we recommend that the private sector enterprise be located at or near major production zones; this would

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<sup>43</sup> In the late 1990s the MSPP had a public-private partnership with the Lolita Factory for iodization (see appendix for description)

not only decrease the current unit cost of iodized salt by an estimated 15%, but would also facilitate improved distribution of fortified salt to target populations. Finally, we recommend that the enterprise acquires iodization equipment that enables flexible capacity; so that salt can be co-fortified with either DEC or fluoride in order to alleviate other severe health issues that plague parts of Haiti. Facilitating access to finance to fund these investments will be critical.

### 3.4 Develop a strategy for future exports

While the existence of significant quantities of salt imports signals that the domestic market should not be immediately flooded by increases in domestic production, it is important to develop an export strategy that can be implemented once production exceeds domestic demand. A variety of export markets exist, including: bulk or bagged salt for industrial or retail de-icing, as well as niche markets, such as gourmet sea salt. Yet, the potential profitability of Haitian exports to these different markets is unknown. While prices for Haitian salt exports have been estimated by Accenture and Oxfam America,<sup>44</sup> in-depth cost analyses are required in order to develop reliable profit estimates.

If no more than a modest twofold increase in productivity is assumed for the upgraded Magazen salt basins, Haiti's total needs could be satiated simply by planned improvements at Magazen. In that event, the current selling prices in Port au Prince could drop so low as to put many salt producers out of business (as I have witnessed in Ghana whenever there is a 'good' season with a 'bumper' salt harvest).

These characteristics, common to every salt industry, were confirmed by the TNS study and report for Haiti. The only way that price stability can be achieved is by ensuring that any **excess production** over domestic demand **is exported**. But, due to the costs of the investment, it is unrealistic for small producers (<10,000 tonnes/year) to export – only the largest (at Magazen), next to a natural harbour, could do so.

Realistically, in order to export competitively, the saltworks has to be able to export by sea in shipments exceeding 2,000 tonnes (as bags) and ideally up to 20,000 tonnes (in bulk). Ideally, this would be through long-period contracts with shipments totalling at least 20,000 tonnes/year. This is feasible from the proposed Pilot Project + near Magazen – but not one of the smaller saltworks (below 10,000 tonnes/year) will have the size or facilities or capability to satisfy these criteria.

So, for price stability to be feasible, the National Salt Strategy will need to rely on the proposed large-scale saltworks at Magazen becoming export-capable.

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<sup>44</sup> Oxfam, "Haiti Livelihoods: Salt Export Market Assessment." *Accenture Development Partners*. March 2011;

### 3.4.1 Salt Exports

Salt is traded internationally in millions of tonnes/year – in bulk shipments of 100,000 tonnes in bulk down to packages and sachets of only a few tonnes. Our first assignment in Haiti in May 2010 (facilitated by AMURT), was for a Boston-based salt buyer who wished to explore the feasibility of a 200,000+ tonnes/year investment to be built near Magazen to export salt in bulk to the USA.

Although large for Haiti, this is far smaller than the solar saltworks at Great Inagua that exports 1 million tonnes/year at ~\$11/tonne. This price is way below the current ex-works salt prices in Haiti - yet is consistent with international competition from other modern solar saltworks and rock salt mines supplying de-icing salt in bulk.

Subsequent studies<sup>iii</sup> by Accenture and TNS confirmed an annual demand for several hundred thousands of de-icing salt along the east coast of the USA and that at least 200,000 tonnes/year of output would be needed to justify the costs of the loading facilities needed for 20,000dwt ships and obtain competitive freight rates. Although this is commercially feasible, this investment has features that make it undesirable as part of a National Salt Strategy, most notably because it

- 1) would have to be highly mechanized and so displace hundreds of livelihoods,
- 2) would not produce salt that could be made available for iodization in Haiti.

Responding to the Article 29 perspective for the people of Commune Anse-Rouge, *Cox & Speller* later reviewed its design proposals with the aim of providing:

- 1) better working conditions and livelihoods for the salt-producing community,
- 2) better-quality salt that would be suitable for iodization and sale in Haiti.

For this new context, the 200,000 tonnes/year bulk salt exports perspective has been replaced by a reduced tonnage perspective with a higher unit value. The plan is now to export bagged de-icing salt that already has received all its relevant additives at the Magazen quayside (“added value”) - a more realistic perspective. Already we have an expression of interest from a US distributor in relocating his bagging plant from outside Boston to Magazen.

From the standpoint of a National Salt Strategy, the purpose of the salt exports is to ensure that modernization does not lead to overproduction in Haiti and so create commercial problems for the salt industry, which could destabilize the supply of iodized salt to the population. But preliminary costings of the bagging investment indicates that this could be a significant source of work and income for the salt-producing community and worthwhile in its own right.

We believe that it is unlikely that Haitian producers will be able to compete in the bulk salt market due to its high volume requirements and the cost competitive nature of the market. Additionally, while there may be a market for gourmet or fair trade sea salt from Haiti in the future, this is also not a viable export market at the present time due to health concerns (particularly those associated with the recent

cholera outbreak in Haiti). Therefore, we recommend concentrating further analysis into the U.S. market for bagged de-icing salt. Haiti is more likely to be competitive in this market than in the bulk salt market due to the value-added through bagging along with lower volume and loading requirements.<sup>45</sup> Yet, bagged salt is still a competitive market. Therefore, we recommend conducting an in-depth analysis of Haiti's potential production, packaging, loading, handling and shipping costs for bagged salt. Specifically, the potential for "return loads" should be researched, as this could significantly reduce transport costs for bagged salt exports.<sup>46</sup>

We also recommend evaluating niche markets, including regional markets for crude salt (e.g. small Caribbean islands). International salt companies with strong corporate social responsibility mandates have also expressed interest in sourcing salt from Haiti; therefore this niche market may also merit further study. These markets may be less price-competitive, and could serve as an intermediate step between fulfilling domestic demand and entering traditional salt export markets.

Salt should be iodized at the production site rather than in Port-au-Prince in order to tighten value chain coordination, reduce transportation and handling costs, and broaden distribution.

Other approaches to iodization that attempt to short-cut or work around changes to production and transportation will not result in price drops to the consumer and will likely result in major losses to existing producers. The following scenarios are described in brief:

- Construction of a few central processing plants that wash, iodize and package iodized salt without improvements to production - This approach will add significant cost to the product similar to what the University of Notre Dame experiences today. The salt in its existing form at the production site would need to be packaged, transported to the washing site, washed, iodized, repackaged, and then transported again. The cost to the consumer (if unsubsidized) would be at least four to five times higher. Even if the sale of not iodized salt was made illegal by the state, the black market for not iodized salt would inevitably prevail as the state does not have the resources to police the sale of salt throughout Haiti.
- New production - New production may be able to produce cheaper salt for fortification. Unless existing salt producers abandoned their production however, non-iodized salt would persist on the market undermining state efforts for the widespread consumption of iodized salt. New production would also result in depressed prices for salt, creating surplus, and would have extraordinary consequences to the livelihoods of existing salt producing

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<sup>45</sup> Expert interviews

<sup>46</sup> Expert interviews

- communities. In at least one prior instance, salt producers revolted against new production in Commune Anse-Rouge, forcing one family to abandon its modern salt production.
- Grouping a small number of basins together to produce with the elevated crystallizer system – In many zones, especially where there are hundreds of basins (or more) grouped together, the cost to re-engineer basins to produce with the elevated crystallizer method may be more than the benefits to production. Small groups of modernized basins are unlikely to be able to take advantage of changes to transport which may increase profits for producers.

### 3.5 Assumptions used in cash flow projection for individual producers using modern method

Assumptions	
original yields (MT/ha)	75
new yield (MT/ha)	175
current price (US\$/MT)	\$72
new price - sale to domestic commercial buyer) - (US\$/MT)	\$145
bagging/transport cost - trad'l (US\$/MT)	\$19
bagging/transport cost - modern (US\$/MT)	\$19
transport to PAP (US\$/MT)	\$30
loading/unloading (US\$/MT) in PAP	\$25
<b>Total distribution cost (US/MT)</b>	<b>\$93</b>
modern basin productivity in year 1	0%
"" year 2 replacing imports	20%
"" year 3	40%
"" year 4	60%
"" year 5	80%
"" year 6 Reaching 100000MT	100%

*Source: based on TNS interviews with value chain actors and industry experts*

The demand for salt in Haiti is about 50000 MT (40000 for consumption and 10000 for industrial use). Transportation costs are the same for both end-users, about US\$93.00 per Metric Ton or US\$ 4,650,000.00 (four millions six hundred fifty thousand dollars) per year. With suggestions to modernize saltworks, in year 6, production will reach more than 100000 tons and transportation cost will be then US\$ 9,300,000.00 if no action is taken to change the transport mode.

<sup>i</sup> TNS report, Exhibits 15 and 14

<sup>ii</sup> TNS report, Section 3.3.2

<sup>iii</sup> Oxfam, "Haiti Livelihoods: Salt Export Market Assessment" *Accenture Development Partners*, March 2011 and the TNS report, Section 3.2.4