

# STRUCTURE OF THE SALT INDUSTRY IN THE REPUBLIC OF SOUTH AFRICA, 2007

DIRECTORATE: MINERAL ECONOMICS



**mineral resources**

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

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AFRICA, 2007**

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Picture on cover page by courtesy of Swartkops Sea Salt.

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## 1. INTRODUCTION

Salt, or sodium chloride, is a readily available inexpensive bulk mineral that can be produced by a variety of methods:

- Solar brine – seawater evaporation in shallow coastal basins or artificial ponds. Lake brine is also used as feed in conventional solar ponds.
- Underground deposits of halite or rock salt, mined by room and pillar, or solution mining which forms a large underground cavity.
- Vacuum evaporation – brine dehydration to crystallise salt in a series of multiple-effect evaporators operated under vacuum to reduce process temperatures.

Over a 100 countries produce a significant amount of salt with many others on a small scale. The USA is the biggest producer of salt in the world, accounting for approximately 21%, with China providing about 15% and Europe just over 20%, of which Germany and France are the biggest contributors. Other major producers are India, Australia, Mexico and Canada.

The main uses of salt irrespective of production method are:

- Chemical production;
- Cooking and food processing;
- De-icing of roads in winter;
- Agriculture;
- Other industrial uses such as oil and gas exploration, textile dyeing, aluminium refining, glazing, soap making and leather tanning.

The biggest consumer of salt is the chemical industry. The chloralkali sector is a major consumer using salt to manufacture chlorine and sodium hydroxide. Salt is a popular raw material in the industry as it is the cheapest and most common source of soda and chlorine. About 1,75 tons of salt are required to make 1 ton of chlorine and 1,1 ton of caustic soda co-product.

## 2. OCCURRENCE OF SALT IN SOUTH AFRICA

South Africa's salt resources are confined to underground brines associated with inland salt pans, coastal salt pans and seawater. There are no known economical rock salt deposits in the country.

The majority of inland pans lie on rocks of the Karoo Sequence, in a curved belt between 50 and 60 km wide, extending from near Vryburg in the North-West Province to Hopetown on the eastern border of the Northern Cape, continuing westwards past Brandvlei [Figure 1]. Most of the pans have formed on shales of the Dwyka and Ecca Groups, which, in that area, were deposited under marine conditions.

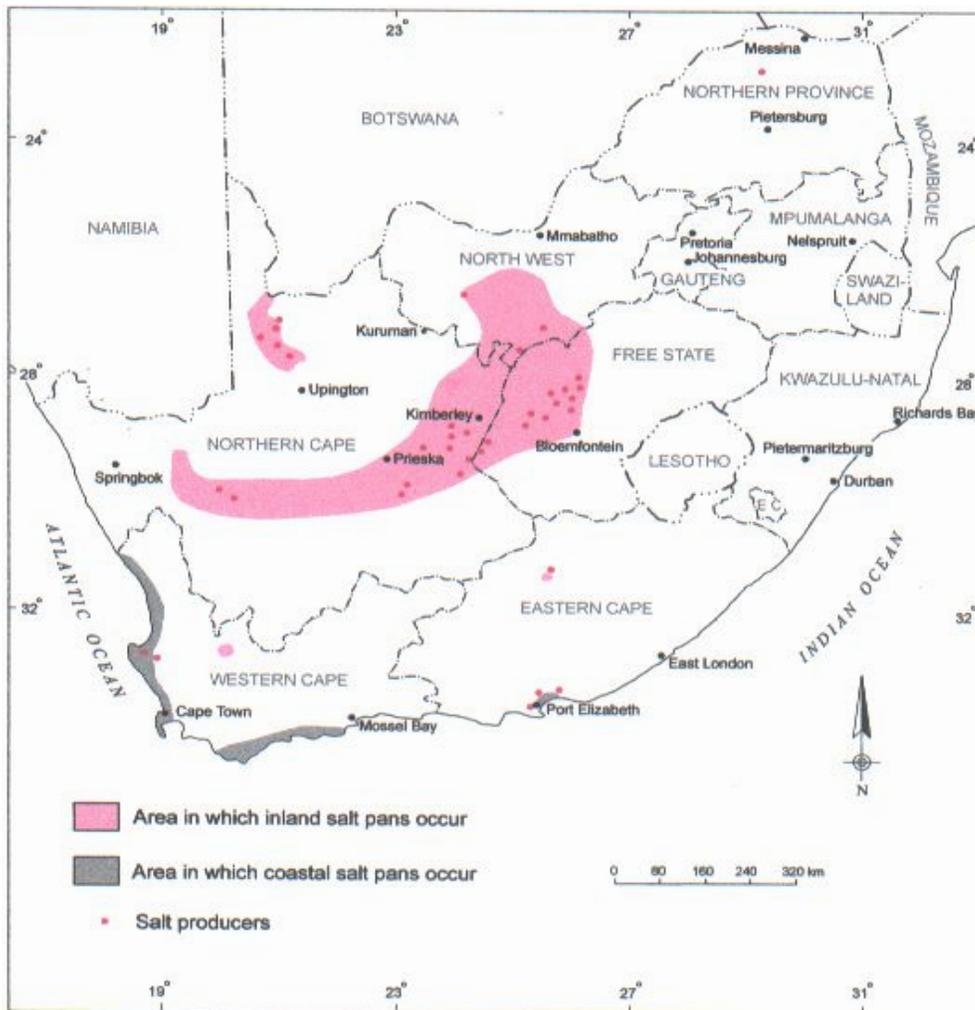


Figure 1: Occurrence of Salt in South Africa (Source: Council for Geoscience)

A considerable number of large salt pans are found in the Kalahari region to the north of Upington. These also lie on shales of the Dwyka Group. Near Waterpoort, at the foot of the Soutpansberg in the Northern Province, a salt pan occurs on basalt of the Lebombo Group.

The salt pans in the vicinity of Delareyville in the North-West Province are mostly underlain by lavas of the Ventersdorp Supergroup.

The salt obtained from pans underlain by the Dwyka Group rocks has a relatively high sodium sulphate content, this probably results from the oxidation of iron sulphate to sulphate.

Along the west and south coast of the country, coastal salt pans, or salt-reaping localities, generally occur within 25 km of the sea. Some of the coastal pans derive their saline constituents directly from the sea by periodic flooding or seepage, and others from underlying marine sediments. All obtain a certain amount of replenishment by rainwater leaching surrounding, salt impregnated dunes.

In 1974, the salt resources of South Africa's inland salt pans were conservatively estimated at 53 million tons. This figure represented salt contained in the top 3m of pan soil, which is only recoverable after the salt has been leached into the underground brine. South Africa's production of salt from 1974 – 2006 is estimated at 17 Mt, including production from coastal pans and Walvis Bay. Salt resources still appear to be large, but drier weather conditions experienced in the Northern Cape have put some pans under pressure, eg. Brandvlei.

World reserves of salt are simply classified as "large"; the oceans comprise an inexhaustible supply.

### 3. SALT PRODUCTION PROCESS

In South Africa, salt is obtained by the solar evaporation of brines. In general, the production methods do not differ materially from those implemented elsewhere in the world.

In 2006, there were 24 pans. The flow diagram of the industry is shown below.

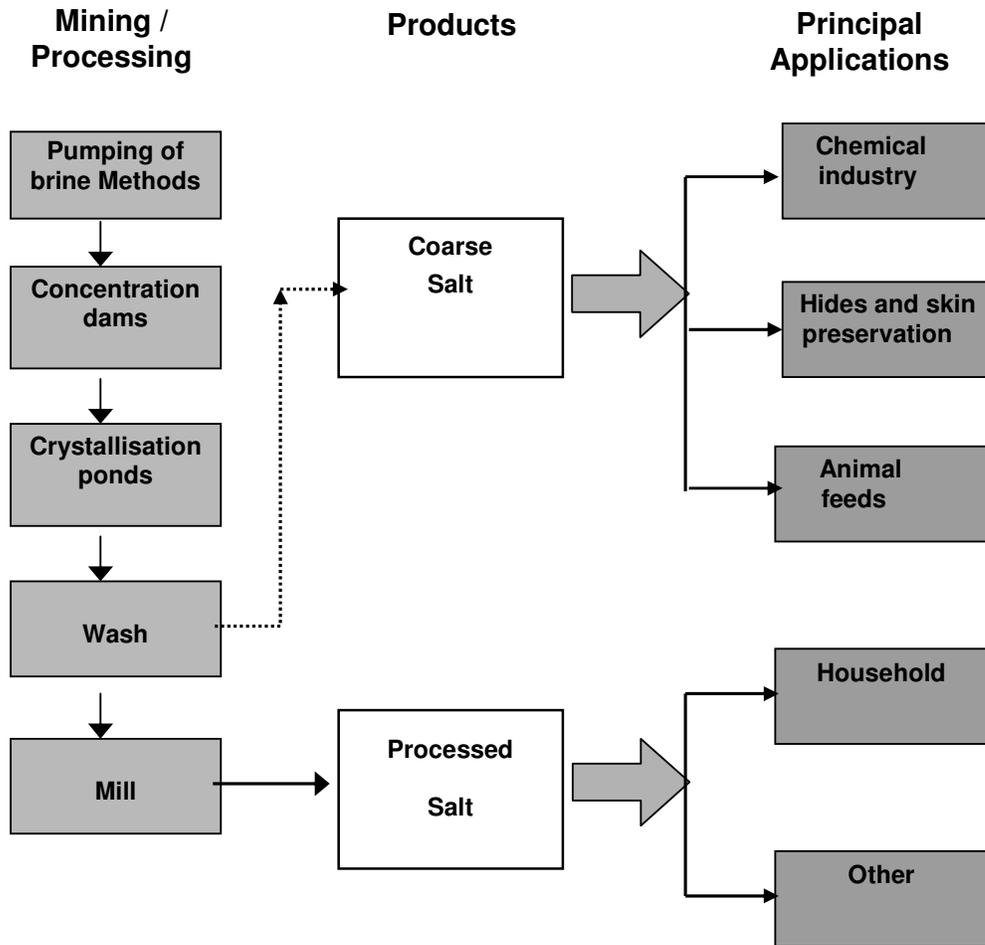


Figure 2: Basic flow diagram of salt production

Notes: Various grades of salt are available in South Africa:

- **Grade I** coarse or milled; >95% NaCl, 1.5% SO<sub>4</sub>
- **Grade II** coarse or milled; 85-95% NaCl
- **Grade III** coarse; 75-85% NaCl
- **Grade IV** coarse; < 75% NaCl or contaminated grades I, II, III

In the case of inland pans, salt production starts with the pumping of brine from suitable openings in the floor of the pan into large, relatively deep dams where some concentration takes place. The brine is then allowed to evaporate in fairly shallow concentration dams until ready for crystallisation. Saturated brine is subsequently transferred to a series of shallow crystallisation pans where further evaporation takes place, resulting in the deposition of salt.

Production techniques at the various coastal pans differ widely. Nearly everywhere, however, the water filling the pans is left to evaporate completely prior to harvesting of the salt. Although attempts are made at selective crystallisation, the overall product is of good quality owing to the absence of noteworthy quantities of deleterious impurities in the brine.

Sea salt is produced in Port Elizabeth. Production is based primarily on the evaporation of seawater, which usually contains 3,5 percent of dissolved solids, of this 74,8 percent is sodium chloride. At the saltworks, the seawater is concentrated by solar evaporation in artificial ponds until a relative density of 1,204 is attained, the brine is then fed into crystallisation pans for eventual harvesting.

#### 4. OWNERSHIP AND SMALL SCALE MINING

South Africa has 18 operating salt companies, of varying size, including one co-operative operation with more than forty small-scale producer members. Salt Refiners and Packers is the largest producer, followed by United Salt, Swartkops, Upington, Cerebos and Kalkpoort. Ownership is as follows:

- **Salt Refiners and Packers** owned by the Sutherland and Krok families.
- **United Salt** owned by the Donald Brown Group.
- **Swarkops SeeSout**, owned by Gert Schombee.
- **Upington Super Salt**, owned by AJ Blaauw, CJ Blaauw, Gift van Staden and J Block.
- **Cerebos**, owned by management and Khumo Bathong Strategic Investments.
- **Kalkpoort Soutwerke** owned by Rueben Joodt and JCK du Toit.

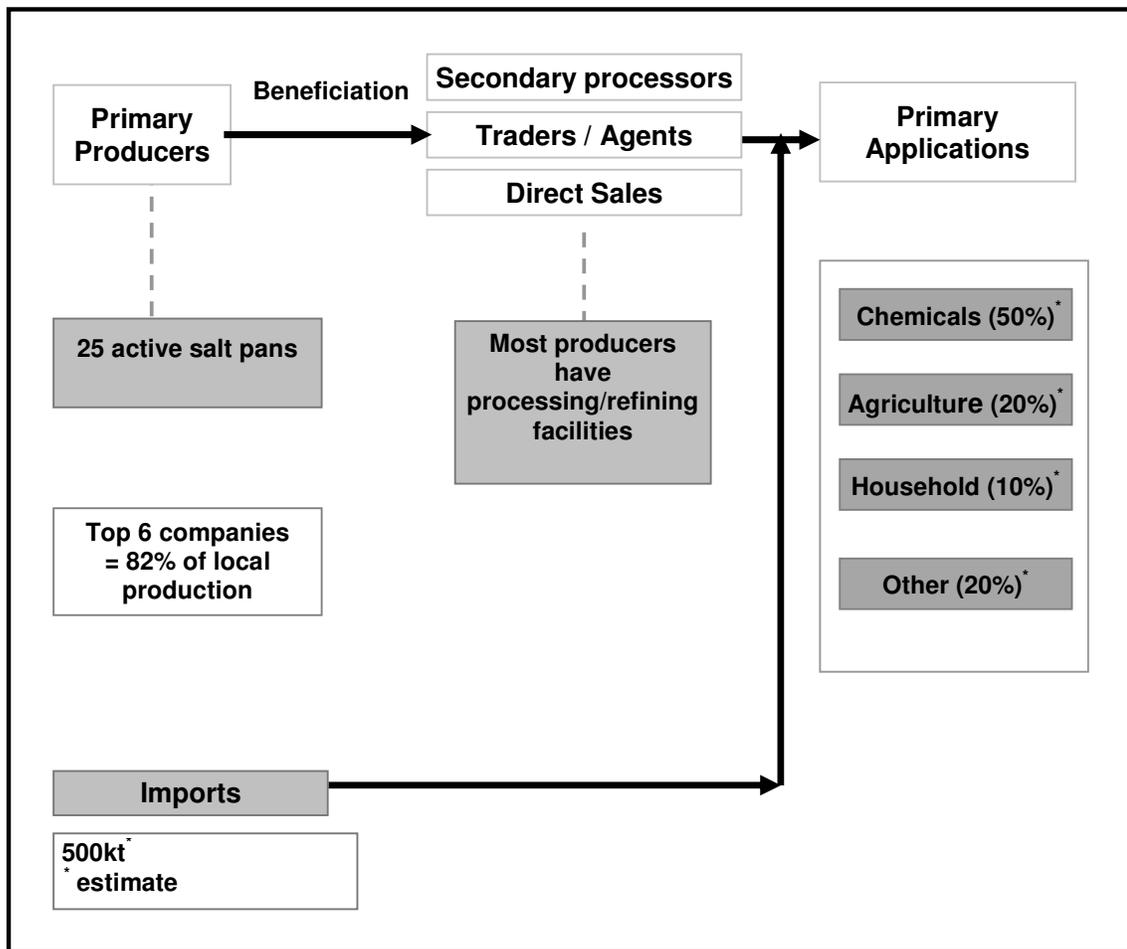


Figure 3: Industry and company structure

Cerebos and Kalkpoort Soutwerke have completed BEE transactions with Khumo Bathong Strategic Investments and Rueben Joodt respectively, and United Salt is in the process of completing a transaction with its employees through the United Salt Workers Trust. Salt Refiners and Packers is to conduct a transaction with previously disadvantaged managers in the company.

#### **4.1 SMALL SCALE MINING OPPORTUNITIES**

The extreme dryness of the Northern Cape makes it ideal for salt production. Some salt producers have indicated that in terms of the Mineral and Petroleum Resources Development Act (MPRDA), they have applied for mining permits instead of mining rights. Mining rights require a comprehensive application that should include a geological report, details of the market, social and labour plan, royalty payments and evidence of detailed financial and technical competence and an Environmental Management Programme (EMP). Mining permits, on the other hand, require very basic information on financial and technical competence and EMP's, but more importantly restrict the area mined to 1,5 hectares.

The MPRDA is currently being amended and the size of the area covered by a mining permit is being considered to be increased, which could unlock further potential opportunities for small scale miners.

Ubiquitous salt reserves in the country, as well as growing demand, consistent with unprecedented levels of economic growth, create further opportunities for increased supply needs for salt. Small Scale miners are therefore encouraged to seize the opportunity of entering this market, particularly as South Africa imports more than 50 percent of salt to meet its demand levels.

## 5. SALT SUPPLY, DEMAND AND PRICES

Production of salt from 1996 – 2006, exhibited average growth of 2,8 percent per annum. Production has been on the increase from 2004 and reached 465 kt in 2006. The trend seems to be in line with strong performance of the economy. The top six companies contributed 82 percent to local production.

Because local production cannot supply all of South Africa's salt, imports are necessary. Imported salt is sourced mainly from Botswana and Namibia, who are both members of the South African Customs Union (SACU). No statistics of salt import is available from these countries.

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**Figure 4: South African salt production, 1996 – 2006  
(Source: Directorate Mineral Economics)**

Local demand is dependent on production and follows the same trend.

The chemical industry utilises imported high grade, coarse marine salt. NCP Chlorchem and Sasol are the two biggest users. NCP manufactures downstream chlorine products whilst Sasol uses chlorine as an intermediate in the manufacture of polymers, the major being polyvinylchloride (PVC). NCP Chlorchem is a captive producer (i.e. produces its own salt) and sources its salt requirement from Walvis Bay Salt Holdings in Namibia and Sasol Polymers, imports from Botash in Botswana and Walvis Bay.

The challenge facing the chlor-alkali industry is that of a "chlorine sink", i.e. South Africa produces excess chlorine and storing and transporting chlorine is an environmental hazard. Export of chlorine is problematic, as no port in the world will allow more than 30 tons on a ship.

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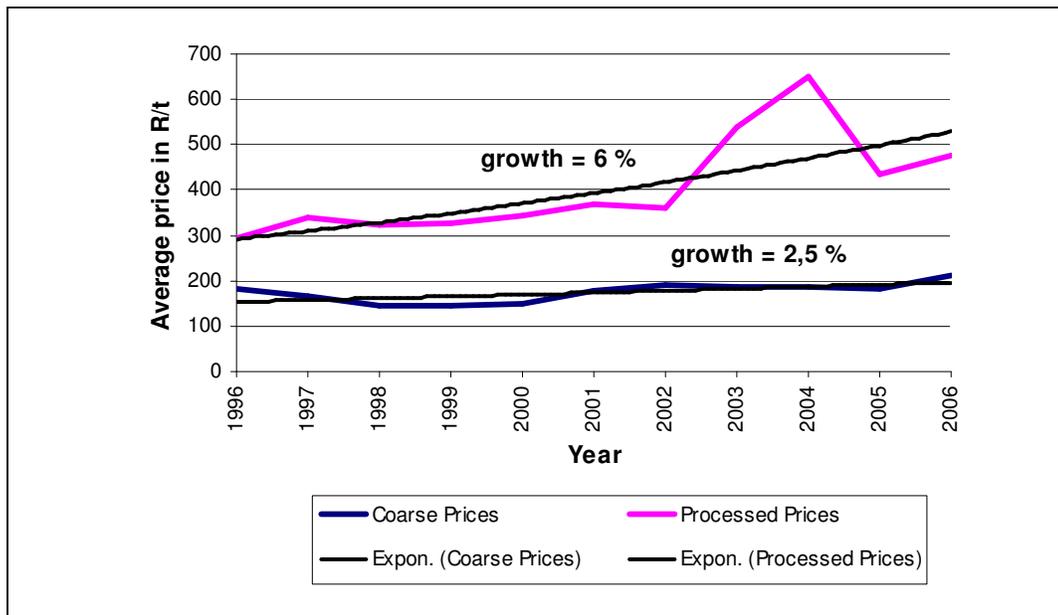
**Figure 5: South African sales of salt, 1996 – 2006  
(Source: Directorate Mineral Economics)**

Sales of salt grew at an average rate of 2,2 percent per annum and reached a record high of R90 million in 2006, which represented 0.05 percent of total revenue generated from mining.

The local market is quite competitive. Cerebos controls the 'top-end' of the food market i.e. it sells branded salt to the major retailers. Swartkops SeaSalt supplies the wholesale market, particularly the Free State, Eastern Cape and KZN regions. The Western Cape market is supplied by United Salt.

Salt Refiners and Packers supplies the KZN and Gauteng markets, but in addition does contract packaging for other producers.

South African salt producers are situated in remote locations, where transportation can become a major cost. Pumping brine is an economic means of transportation but cannot be used for dry salt. Large bulk shipments of dry salt by ocean freight are low cost but are restricted in points of origin and consumption. As salt is packaged, handled and shaped in small units, the accompanying cost increases are reflected in higher sales prices.



**Figure 6: Average local prices of salt, 1996 – 2006 (nominal terms)**  
**(Source: Directorate Mineral Economics)**

Various types of salt have unique production, processing and packaging factors that determine their selling price. Salt sold in bulk is naturally less expensive than salt that has been packaged, pelletised or pressed into blocks. Vacuum pan salt is the most expensive because of the higher energy cost involved in processing and purifying the product (99, 9%).

The average local price of coarse salt has shown an average growth of 2,5 percent per annum and processed salt, and average growth of 6 percent per annum probably due to increased usage in the food industry.

## **6. INVESTMENT IN THE SALT INDUSTRY**

Cerebos has recently announced a R85 million expansion and relocation project into the Coega Industrial Development Zone (IDZ). The project will see Cerebos using innovative technology to produce high purity sodium chloride known as pure vacuum dried salt (PVD), which is of better quality and produced through an environmentally friendlier process. The new facility in the Coega IDZ will include state of the art technology with a production capacity of 45 000 tons per annum.

Straits Chemicals envisages spending R5,8 billion on a chlorine manufacturing and water desalination plant at the Coega IDZ. The project will involve seawater desalination and thermal evaporation technologies would create around 630 000 t/y of 99,9% pure salt, some of which would be used at the plant, while the rest would be sold to the local market. The plant will have the capacity to produce 600 tons of chlorine per day and will supply both the local and export market. The first phase of the investment will total R1,1 billion and construction is expected to take between 18 and 24 months and the plant is to be officially commissioned in mid-2009. The project is expected to create 600 jobs during construction and once operational, will employ about 250 people on a three shift basis, excluding management positions.

## **7. ENVIRONMENTAL IMPACT**

Salt production essentially entails the pumping of brine onto hardened surfaces where crystal growth occurs by solar evaporation. The salt is formed by the process of evaporation and no waste is created. The coarse salt crystals are then harvested and transported to processing plants where it is refined, packaged and distributed.

Salt mining is characteristically conducted in an unconventional manner in that no rock is broken in the process and the fact that the impact on the environment and hence rehabilitation is less than any other mining project, with minimal environmental impact.

## **8. RESTRAINING AND DRIVING FACTORS ON GROWTH**

### **RESTRAINING FACTORS**

- Salt pans are located in remote areas of the country, and transportation is a major cost. As salt is a bulk, low value commodity, available wagons on the rail network are diverted to commodities which have better yields.
- A serious handicap to the salt industry is the relatively poor quality of salt produced at a number of the inland pans. This is due mainly to wide daily fluctuations in temperature and the composition of the brine at the time of crystallisation, often aggravated by faulty layouts of many of the works as well as a lack of adequate technical control during crystallisation. The most common impurities in pan salt, apart from dust, are the sulphates of sodium and calcium.
- Desertification, or drying up of underground resources has put pressure on salt pans, particularly in the Brandvlei area.

### **DRIVING FACTORS**

- Small scale mining and Black Economic Empowerment
- Current state of the economy (i.e. its performance and capacity to create jobs)
- Growing demand for the products in the chemical industry

## **9. OUTLOOK**

The recent investment by Straits Chemicals will increase South Africa's production of salt and could help reduce South Africa's reliance on imported salt, provided that the company can secure offtake agreements with the local chlor-alkali industry. The usage of salt in the chemical industry is expected to grow, on the back of the strong performance of the economy.

Demand in the agricultural industry is seasonal i.e. during cycles of above average rainfall and when animal grazing is abundant, demand for salt is low compared to drought periods when demand increases. Salt demand in this sector would be based on forecast data for rainfall and herd sizes.

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A special thanks to the salt industry for their invaluable input.