

CHAPTER IV

THE ARCHAEOLOGY OF SALT PRODUCTION

Although in-depth archaeological studies of salt production in Africa are rare, ethnographic and historical literature describing salt production provide a body of comparative data to create a framework for prehistoric salt making activities at Baleni. In this Chapter I review some of these examples in order to create a working model of prehistoric salt production methods at Baleni.

Salt Sources and Methods of Production: Examples from Africa

Most of the archaeological case studies pertain to the salt producing areas of Uganda, Tanzania and South Africa (e.g. Connah 1991, 1996; Evers 1974, 1981; Fagan and Yellen 1968; Sutton and Roberts 1968). A specific aim of these studies was the reconstruction of culture historical sequences. Salt production sites are uniquely suited to these aims as they usually have a long history of exploitation and production deposits typically have well stratified sequences and large ceramic assemblages.

Archaeological research on salt production sites in the South Africa, are typical examples of this predominant approach of reconstructing the culture historical sequence. Besides Baleni, three other brine springs in close proximity to each other have been recorded in the Lowveld. The three other sites, Rhoda, Harmony and Eiland, are all located within 100km of Baleni.

Rhoda

The Rhoda spring is located south of Phalaborwa, on the southern bank of the Selati River. In 1937 mention was made of the presence of soapstone bowls on the site which were probably used in prehistoric salt making (Schwellnus 1937). In his account of salt extraction at Rhoda during the early 1960's, Witt (in Terblanche 1994: 189) described that brine was placed in the soapstone bowls and was turned into crystalline salt by means of solar evaporation. No archaeological excavations have taken place on the site, and since it has been destroyed by construction activities, its archaeological significance is lost.

Eiland

The archaeological salt extraction site of Eiland consists of low mounds of leached earth and debris scattered along the banks of the Mamazapi stream, between the eye of a mineral spring and the Groot Letaba River. Radiocarbon dates (Pta-1524 and Pta-1608) indicate that the site was worked from *c.* AD 300 (Evers 1981). The earliest ceramic component in the assemblage was identified as Mzonjani. Excavations of the debris mounds yielded large quantities of potsherds. In the more recent levels of salt production, the excavations recovered soapstone bowls and comparatively fewer shards, which could indicate that the more durable soapstone bowls replaced ceramic pots in the production process.

Harmony

In his analysis of salt production at Harmony, Evers (1974, 1977) showed a direct link between the salt production site, a nearby soapstone bowl factory site, and a Late Iron Age settlement located 1,6km from the salt extraction area. Analysis of the faunal assemblage from the salt extraction area showed that butchering probably did not take place at the site itself. This, and the absence of any signs of habitation at the salt source, leads Evers to argue that the saltworkers made forays from the village to the source. The presence of a perforated soapstone strainer, shallow soapstone bowls as well as ceramics in context with hearths, indicates that a variety of salt extraction methods were employed at the Harmony sites. Evers (1974) found that the Harmony deposits were largely similar in content to that of the Eiland deposits. The dating and time depth of the Harmony salt production site is still problematic. Only one C14 date (RL 206) is available and this is calibrated to 320 BP. Ceramic data, however, indicates that salt was produced from at least the 4th century A.D. As found at Eiland, the earliest ceramic assemblage phase identified at the site was Mzonjani.

Other Archaeological Examples

A longstanding research project was carried out by Graham Connah on the salt production site of Kibiro (Connah 1991, 1996; Connah *et al.* 1990). In his research at Kibiro, located on the shore of Lake Albert in Uganda, Connah (1991, 1996) uses the archaeological data from the salt production site, to inform him on regional socioeconomic developments. Present-day salt production at Kibiro is a crucial activity for the inhabitants of Kibiro village. The surrounding soils are shallow and rocky and as a result, little or no cultivation of crops can

take place. Only by producing salt for trade at local markets can the village obtain essential food items (Connah *et al.* 1990: 25). This specialised level of production is facilitated by the use of saltgardens, which enable the producers to maximise production activities. Connah's excavations of the salt production area showed that the surplus production of salt for trade, was directly linked to the rise and expansion of the historical Bunyoro State (Connah 1991).

Sutton and Roberts (1968) excavated four salt production sites located around brine springs in the Uvinza region of Tanzania. Excavations yielded three stratigraphically defined saltmaking ceramic assemblages, some exclusively associated with salt production. Circular clay lined pits, 0,5m to 1,5m in diameter, were also uncovered during excavations. By reference to early nineteenth century descriptions, the authors interpret these features to be tanks used to concentrate brine (Sutton and Roberts 1968: 50, 61). Oral traditions and historic accounts indicate that salt production at Uvinza was a purely seasonal activity, with saltmakers living in temporary structures on the site during salt production. One nineteenth century description of salt production describes the aftermath of a salt production season at Uvinza:

Near the crossing on either side are the salt-pans of Uvinza, which furnish a respectable revenue to its king. A square mile of ground is strewn with broken pots, embers of fires, the refuse of the salt, lumps of burnt clay, and ruined huts.

(Stanley 1880: 325 in Sutton and Roberts 1968: 50)

Accounts indicate that salt produced here was widely sought after and traded (Sutton and Roberts 1968: 46-47, 67-70). By the mid-nineteenth century, frequent caravans passed through the village to obtain salt, which was traded en route for food and other necessities. Production was also encouraged by local leaders who collected tribute from the producers. Nineteenth century accounts indicate that, to meet their own demands, up to 20 000 people came from areas as far away as Burundi to harvest salt (Sutton and Roberts 1968: 69). The authors also indicate that the territories of three nineteenth-century "chiefdoms" converged on the brine springs (Sutton and Roberts 1968: 70). All the surrounding villages were allowed to make salt and the revenue generated by the output at the brine springs were subsequently shared by the "chiefs". This implies that aspects of territoriality and resource control might have been modified in the context of access to the areas of salt production.

A second archaeological study conducted on a salt production site during the 1960's, was that by Fagan and Yellen on the Ivuna salt pans (1968). Although excavations were primarily aimed at creating a culture historical sequence for Tanzania, the detailed analysis of ceramics identified no specific vessels linked exclusively to salt production activities (Fagan and Yellen 1968: 31). The authors were able to interpret their excavated data in the light of oral traditions of more recent production methods at the site (Fagan and Yellen 1968: 30-31). Excavations also uncovered signs of permanent occupation on the salt production site from the thirteenth century onwards. Evidence points to a scenario where salt production took place within the village, along with other economic activities such as cereal cultivation, stock keeping and hunting.

The work at Kibiro, Ivuna and Uvinza, serves as a good example of how archaeologists working on salt production sites use historic and ethnographic examples of traditional production methods to interpret the archaeological data. Ethnographic and historical descriptions form part of a relatively large body of work on un-mechanised salt production in Africa. In the absence of archaeological excavations, however, no data on the age or nature of salt production is available for most of these sources. This means that the technology used in the production of salt, as well as its economic and social roles in many prehistoric African contexts, remains speculative. The available literature on salt production points to a variety of production methods, with similarities from different areas, geographically separated by thousands of kilometres. Below I will discuss selected salt making practises from Africa by drawing on ethnographic and historic accounts.

Unprocessed Salt Collecting

The most basic form of salt extraction is the collection of unprocessed crystalline salt. This characterises a variety of salt production methods that do not entail any additional refinement processes to obtain crystalline salt. Since no refinement is involved, this collection usually only takes place at sources where salt can be found in a very pure form. An exception is Guelele, in Niger, where the unprocessed salty crust, formed on the low-lying ground around salt springs during the dry season, is sold for animal intake (Gouletquer 1975: 47).

Rock salt or haline sources are very rare in Africa. These are pure deposits of crystalline salt that can be quarried in slabs without any further processing. Most documented haline sources

are found in the deserts of Mauritania and Mali (Alexander 1997: 538) as well as Kisama in Angola (Birmingham 1999: 34-36).

Another method of unprocessed collection of crystalline salt occurs on the southern Sahara fringe. Here, a salt crust forms along the bottom of salt pits located within artificial depressions dug in the desert sand. These depressions vary from 10 meters to 30 meters in diameter, and are several meters deep. At the bottom of these depressions, salt pits are sunk; usually two to three meters deep. The saline groundwater that seeps into these pits forms salt crystals which can then be collected (Gouletquer 1975:47-49; Lovejoy 1986: 56-61).

In Uganda and Tanzania, salt crystals form on the water surface of shallow salty lakes late in the dry season. Strong winds blow these crystals across the water surface where they accumulate against low brush barriers, erected for this specific purpose. From here the salt can easily be collected (Parsons 2001: 210).

Leaching Devices

Although brine can be obtained directly from the water of saline springs (e.g. Lovejoy 1986; Sutton and Roberts 1968), it is more commonly produced by the leaching of water through salt rich material (Connah 1991: 483; Connah *et al.* 1990: 47; Davison 1993: 16-33; Gouletquer 1975; Junod 1927: 35; Lovejoy 1986: 63; Stayt 1968: 47-48; Terblanche 1994: 197). Ethnographic accounts describe a variety of leaching methods employed throughout the continent. The two most common leaching devices are woven or basket-type filters and perforated ceramic strainers.

Various accounts describe the use of vessels with perforated bases (Connah *et al.* 1990: 33; Davison 1993: 12-13; Junod 1927: 35; Stayt 1968: 47-48). Salt rich material such as plant ash or saline earth is placed within the pot. Before filtering, the holes are covered with small stones or grass. Water is poured over the mixture to produce brine, which slowly drips from the holes, and is collected underneath. Leaching pots are sometimes arrayed as more permanent facilities in lines of 4-8 vessels incorporated within a supporting earthen embankment (e.g. Anonymous 1939, 1958 in Parsons 2001: 216).

While perforated ceramic strainers are identifiable in the archaeological record, basket filters perish easily. Accounts that describe the use of woven strainers are found throughout sub-

Saharan Africa. Descriptions from Ghana (Sutton 1983: 17) and Niger (Gouletquer 1975: 49), indicate the use of a clay lined, woven basket supported on a wooden frame. In the Manga region of the Sudan, Lovejoy (1986: 80) describes the use of funnel-shaped filters made from woven straw mats measuring 1,5m in diameter being supported on wooden posts about a meter high. In Malawi, Davison (1993: 11-12) reports the use of woven filters similar to that of West Africa, which she associates with a high level of salt production. Basket-type filters are all associated with the leaching of salt rich earth. The collected soil is placed inside the basket and water is poured over it to produce brine, which is collected in a receptacle underneath the filter. Once all the salt has been leached, the filter content is discarded. This process typically results in the formation of large mounds around areas of salt production (e.g. Connah *et al.* 1990: 33; Fagan and Yellen 1968: 4; Gouletquer 1975: 49; Sutton and Roberts 1968: 61).

A third example of a filtering device has been recorded at Ivuna in southern Tanzania. Here, Fagan and Yellen (1968: 30-31) refer to a process where brine is strained through a large wooden trough or gourd, supported on wooden posts. The resulting brine is then passed through a second trough before it is poured into clay pots for boiling.

Leaching from Plants

While leaves or roots can be used directly in cooking to achieve a salty taste, plant derived crystalline salt can only be obtained by collecting large quantities of suitable plants, burning them and filtering water through the ashes to make brine (Alexander 1997; Davison 1993: 10-16; Gouletquer 1975: 51; Parsons 2001: 222-227). Some cultivated plants also yield potassium-rich salts, the “strongest” coming from cassava-peelings. Other sources of salt include shelled maize cobs and sheaths, banana leaves and husks from finger millet (Davison 1993: 10-11). Because salt from plants is potassium rich, it has a bitter taste, and crystalline salt from mineral sources is generally preferred.

Salt Gardens

Saltgardens at Kibiro in Uganda, harness the capillary actions of salt ions from the uppermost few centimetres of soil, to maximize the precipitation of salt on the ground surface (Connah 1996-46). At Kibiro village, saline springs and a resultant stream seeps into the lacustrine plain on the edge of Lake Albert. This seepage impregnates the surrounding soils with salt.

Saltgardens are prepared within this area by first cleaning and levelling a piece of earth in order to form an evaporation surface. After this has been done, a thin layer of loose soil is spread over the surface. Salt becomes concentrated within this loose layer of soil by means of the capillary actions of salt ions. The salt rich soil is scraped up at the end of each day to prevent salt from leaching back into the ground when temperatures drop during the night. Each morning the soil is re-spread and the process repeated until the salt content of the soil is sufficiently high. When it reaches this stage, the salt impregnated soil is placed in a leaching device where the salt is transferred to clean brine for evaporation or boiling (Connah 1996: 47-48). Salt gardens can remain in use for a long time and are only abandoned when the yield falls and they are fallowed, or if too many stones appear on the surface (Connah 1996: 46; Connah *et al.* 1990: 33).

Solar Evaporation

In the south central Sahara and neighbouring savannah, saltmakers build brine ponds that rely on solar evaporation to produce crystalline salt. This is made possible by the high temperatures and low humidity in the dry season. The ponds are often constructed in the muddy areas around the diminished salt lake at the beginning of the dry season. These ponds are usually shallow enclosures, defined by low earth walls, and plastered with impermeable clay or lime to prevent seepage. These are kept in good repair throughout the salting season in order to prevent seepage. In some cases the brine is kept within a single pan, and the salt crystals are skimmed off the surface and piled up against the edges of the surrounding embankments (Parsons 2001: 208-209). In other examples the brine is carried or led through a series of interconnected ponds (Gouletquer 1975: 47-48).

Brine Boiling

In most cases, solar energy alone is not enough to efficiently produce salt crystals, and brine is boiled to help the process along. Usually brine boiling consists of simply placing pots filled with brine over a fire, and refilling the pots as liquid evaporates. This process is repeated until the solution acquires a certain texture, which is usually a porridge-like consistency (Parsons 2001: 213). At this stage the fire is allowed to go out and the contents left to cool down (Lovejoy 1986: 71). In the Lake Chad Basin, Lovejoy (1986: 68-69) as well as Gouletquer (1975: 51) in Niger, describes a complex furnace system that could accommodate between 40 and 170 individual boiling vessels. These furnaces are formed by piling earth around wooden

posts, forming kiln-like walled hearths in which boiling vessels are placed above burning fuel on ceramic pedestals. These pedestals are usually pointed at the bottom end and trumpet-shaped at the top. The pedestal tops' were connected to each other and to the walls of the kiln, by balls of soft clay and supported by pedestal fragments.

The brine boiling process can take as little as two hours when small batches of salt are made (Connah *et al.* 1990: 34), but in one recorded case it took 4,5 hours to reduce 6,4 litres of brine to 1,4 litres of salt (Grey 1945: 468). In other cases it can take up to 24 hours of non-stop boiling to reduce the brine to crystalline salt (Parsons 2001: 221). Brine boiling is an exacting task, since it is quite easy to burn the salt. The saltmaker needs to carefully watch the changing nature of the crystallization process in order to remove the mixture from the fire at the appropriate stage.

Salt production results in masses of ceramic shards that usually end up on refuse mounds in the salt workshop. Boiling vessels are subject to great physical stress due to the caustic nature of the brine, as well as the intense heat from the fire. In some cases the boiling vessels only serve as moulds for shaping hard cakes of salt and are broken to remove the salt after a single use (Gouletquer 1975: 50; Lovejoy 1986: 63, 71; Parsons 2001: 214). Most boiling vessels used more than once, are wide-mouthed pots, some employed exclusively for salt boiling (Grey 1945: 468; Sutton and Roberts 1968: 57; see also Muller 1984: 492; Cardale-Schrimppff 1975: 84; Flad *et al.*: 12619) while others are undistinguishable from domestic wares (Connah 1991: 490-491; Fagan and Yellen 1968: 15-16; Sutton and Roberts 1968: 53-56).

Salt Production at Baleni

Although the present study is the first systematic archaeological investigation at Baleni, archaeologists have visited the site in the past - drawing on the modern salt extraction activities for comparative data applicable to their own studies (e.g. Evers 1974). Evers (1974: 64-65, 1981: 78), remarked on the similarities of the Baleni deposits to that of other Lowveld salt production sites such as Harmony and Eiland. Observations at Baleni have also been used to reconstruct traditional salt production methods at the Tsonga Kraal Open Air Museum. The continued extraction and the methods employed at Baleni have further been recorded by ethnographic observers (e.g. Terblanche 1994; Witt 1966). The first detailed account of salt production at Baleni was published by Witt (1966), curator of the Tzaneen

Museum. The most recent description of the process was presented by Terblanche (1994), in her graduate dissertation on traditional crafts practised by Tsonga women. The following description is largely based on accounts of these two authors.

Background

Observation in recent decades indicates that present-day salt extraction at Baleni is an exclusively dry season activity. The “salt-season” usually starts in May. The precise day of commencement is decided by consulting the ancestral spirits (Terblanche 1994: 194). Before any activities start on the site, a ceremony takes place in which the spirits are implored for a successful season. This involves the placing of offerings (usually bundles of sticks, tobacco, snuff or copper coins) at the base of a dead Leadwood tree (*Combretum imberde*) near the northern edge of the swamp. Witt observed in 1966, that the salt workers brought sleeping mats with them and that they erected temporary structures when making salt.

Salt Extraction Methods at Baleni

Harvesting starts during the dry winter months when the waterline of the swamp recedes and a salt crust forms on the low-lying ground around the water’s edge. The first step in the production process, is to construct the strainers or filters through which the brine is leached. The strainers are mostly made from the branches and bark of the mopane tree (*Colophospermum mopane*). Although they vary in size, the filters must be high enough to place a container underneath. The strainer is built by first planting four forked poles into the ground approximately 40 – 60 centimetres from each other to form a square. Four other poles are then placed in the forks of the planted poles and tied together using bark from a mopane tree. A hanging sieve of bark and thin branches is then woven onto this structure. This sieve is held in position by supple mopane rods and lined with dry grass. The inside is built up into a cone shape using clay from an anthill, leaving only a small hole in the bottom through which water can drip. This hole is also usually covered with dry grass or leaves (Terblanche 1994: 197-198).

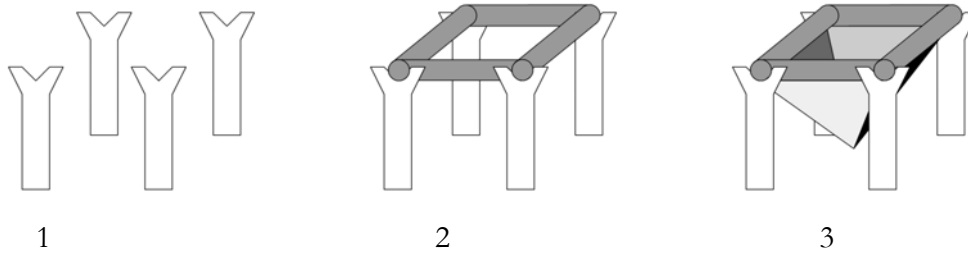


Figure 8: Steps in filter construction. (1) Four forked poles are planted in the ground. (2) A frame is placed in the forks of the planted poles. (3) A hanging sieve is woven onto the frame.



Figure 9: Salt filter at Baleni.



Figure 10: View of woven basket in which the collected salt crust is placed.

The next step is to scrape off the salt crust on the edge of the swamp. Terblanche observed that the shell of a freshwater mussel is used for this practice. This mixture of soil and salt is then taken to the filter where it is mixed with an equal amount of river sand. The river sand loosens the texture of the gathered crust, which would otherwise be too clayey. A suitable quantity of this mixture is then placed in the filter. Once in the filter, water is poured over the mixture. This process is repeated until the receptacle underneath the filter is filled with the saltwater extraction. After water has been poured over the salt-soil mixture two or three times, the content of the filter is scraped out and discarded next to it (Terblanche 1994: 198).

The brine mixture is then placed in a container over a fire and boiled slowly to evaporate the water, and leave only moist salt behind. The crystallized salt is then scraped into a pot, a large potsherd or calabash, again using a freshwater mussel shell. On questioning the meaning of the shell's use, Terblanche (1994: 198) was informed that it had always been the practice since iron objects will rust on contact with the salt.



Figure 11: Typical salt production workshop at Baleni with a filter and the leached out content discarded next to it on a mound.

When there is a sufficient amount, the damp salt is formed into a cone shape (Figure 12). This is done by pouring the damp salt onto a flat surface and forming a cone by shaping it with the hands. Embers are placed on the cone to form a hard crust on the surface. Sometimes the cone is also placed on dry grass, which is then burnt in order to produce the same effect. Witt (1966: 21) mentions a process where the cone is placed in the sun in order for it to dry, and then baked in a clay pot placed on a fire. Measurements of the cones found that they weighed between one and two kilograms (Terblanche 1994: 200). Terblanche (1994: 199-200) asked her informants why the cone shapes were used and was provided with a variety of different answers. Some of the reasons provided include, it being easier to transport and trade this way.



Figure 12: Salt cone produced at Baleni on display at the Baleni Ivory Route Camp (scale in centimetres).

Remarks

Present day salt production at Baleni is very similar to activities observed at other locations where salt is harvested from brine springs. General trends observed at these sites offer plausible interpretations for prehistoric salt production at Baleni.

Overall, salt extraction at brine springs, is largely a seasonal activity and during the rest of the year, salt workers are involved in other economic pursuits. In all the examples where salt extraction relied on the collection of salt crusts around brine springs similar to Baleni, production was a dry season activity since the process relies on a receding waterline around the aquifer. A common feature on sites is the filtering of the unprocessed saline crust. As witnessed at Baleni, this results in significant transformations of the local landscape. Active and abandoned salt working sites are associated with mounds of leached (see Figure 11) earth and debris that contain many ceramic fragments from vessels broken during the process of boiling and moulding salt (see Figure 13). A variety of ceramic vessels is often required in the saltmaking workshop for drying, storing, moulding, packaging and transporting the finished salt. In many cases, these vessels are types exclusively associated with salt making (Davison 1993: 12; Grey 1945: 468).



Figure 13: Ceramic fragments visible on the surface of a salt production mound.

Several actions may be taken to maximize salt production output. Salt gardens for example encourage the precipitation of salt on the ground surface. Since producers make use of the capillary action of the sun, they do not need to wait for the water levels to drop before salt production can take place. Excavations at Uvinza indicate the use of brine tanks to concentrate the salt content of brine. Using special ceramics vessels in production activities can also speed up production. These include the use of temporary moulds that are broken after production, or enlarged vessels that can contain more brine. Specialist furnaces, such as the pedestal and arrayed furnaces found in West Africa, offer more efficient evaporation techniques than boiling in single vessels. In South Africa, the archaeological sites of Harmony and Eiland, have soapstone bowls in the upper limits of the excavations. These represent more durable and efficient production tools than fragile ceramic vessels used in earlier times.

Traditional salt production therefore offers the archaeologist valuable analogous data. The next chapter will focus on the empirical archaeological research covered during the course of this dissertation. In this chapter, I discuss the archaeological research and methodology carried out at Baleni.