

**Human-Plant Interactions in Semi-Arid Regions: An
Archaeobotanical Study of the Iron Age Site of Mtanye,
Southwestern Zimbabwe**



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DECLARATION

This is to certify that the results and conclusions presented in this thesis are my own and where the work of others has been used, is appropriately referenced. This thesis has not been submitted for a degree at any other institution of higher learning.

Signature:

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Abstract

Humans have always interacted with plants for thousands of years ago. The origin of plant domestication is a clear example of human-plant mutualism. This mutual relationship has gradually developed into a co-entangled relationship where both symbionts benefit each other in an environment. The evidence of this relationship is confirmed by the use of plants across the globe, which constitutes a critical component in the livelihoods of people. It is likely to have been the case during the Iron Age period in Southern Africa, particularly in southwestern Zimbabwe where diversity of plant resources and other economic activities supported the Early farming communities in a variety of ways. Unfortunately, the available information about plant use, the role of crops and wild plants beyond diet and subsistence is widely dispersed. Studies that adequately analyse plant remains from Early Iron Age sites to understand the purpose of plants especially wild in the daily livelihoods of early farming communities is lagging. The labour and decision making invested in the selection, management, gathering, processing and consumption of these plants is not known. This research explored an analysis of archaeobotanical remains at Mtanye site, one of the early farming communities in Gwanda, southwestern Zimbabwe. Ethnobotanical and archaeobotanical techniques, as well as further microscopic analysis of seeds in the laboratory, were performed. The assessment of ethnobotanical examinations and archaeobotanical remains concluded that plants were vital to Mtanye community's daily livelihoods, by offering an essential contribution to social, religious and economic development in the face of environmental challenges. The people at Mtanye treated crop cultivation and gathering of wild plants with more considerable ingenuity just like other sectors of their economies. Considering that the environment was not conducive for adequate crop farming, the intensive use of wild plant resources likely underpinned their ability to survive in a semi-arid environment for a prolonged time.

Keywords

Plant economy, livelihoods, Mutualism, Human-plant interactions.

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CHAPTER 1: INTRODUCTION TO RESEARCH AIMS AND OBJECTIVES.

1.1. Introduction

Throughout human history, from early hominids to modern humans, the role of plants in human life remains significant (van der Veen 2018; Pearsall 2015). Plants provide a wide diversity of products, which constitute critical social, religious and economic components in people's day-to-day livelihoods around the world (van der Veen 2018; Pearsall 2015). Likewise, various plants have also benefited from interacting with humans, making it a mutual exchange of benefits such as protection, dispersal and carbon dioxide (Crites 1984; Rindos 1984; van der Veen 2018). Indeed, some small societies were able to develop into complex societies due to an expanding diversity of foodways and other domestic uses of plants (Rindos 1984; van der Veen 2018; Pearsall 2015). Given this, research into the emergence of agriculture and food economies remains a significant and topical focus of archaeological research globally. It is now common in the context of southern Africa that the development of many complex states was centred around the introduction of agriculture and other economic activities such as long-distance trade, iron production and crafting (Chirikure et al. 2014; Huffman 2007; Nyamushosho et al. 2018; Pwiti 1996).

The spread and introduction of agriculture in southern Africa are attributed to the arrival of the Bantu language speaking groups. These communities are said to have arrived in southern Africa around AD 200, with a full 'Iron Age' cultural package, characterised by the evidence of crop domestication, livestock production, iron production and a particular ceramic technology (Huffman 2007; Pwiti 1996). Due to intensive agriculture, iron smelting, trade and other essential activities, these early communities accrued wealth and developed into complex societies during the Middle Iron Age (AD 900-1300), and Later Iron Age (AD1300-1840) (Huffman 2007). This all took place within the Shashi-Limpopo basin, which has been for a long time, considered an essential area regarding the emergence of farming communities in southern Africa (Huffman 2000, 2007; Manyanga 2006). Of particular focus are the sites of K2 (AD 1000-1200), Mapungubwe (AD 1250-1300), Great Zimbabwe (AD 1300-1450).

Most of the discussions about subsistence, food security, people's livelihoods, development of farming communities in southern Africa was based on inferences from ceramics, animal bones,

metals, beads and amongst others (Denbow, 1999; Chirikure 2007; Huffman 2007; Manyanga 2006; Plug 1997a, 2000; Pwiti 1996a; Shenjere 2011; Soper 2002; Summers 1958). Ceramic sequences have foregrounded understandings about the development of political and cultural settings of the Shashi Limpopo region (Huffman 2007). Pots and potsherds were used by researchers to identify several cultural identities that inhabited this region such as Zhizo (AD 900) and Leopard's Kopje (AD 1000-1300) (Huffman 2007a).

Research into the understanding and appreciation of plant utilisation in Zimbabwe is limited, despite systematic efforts by few scholars to include Jonsson (1998), Manyanga (2006), and Chikumbirike *et al.* (2016). However, the value of these pioneering studies is of great importance not only to Zimbabwean archaeology but the whole region of southern Africa and beyond. Be that as it may, the area under investigation is poorly represented in terms of looking at the diversity of plants that were utilised by people in the past and also plants that are currently used by communities in the region. Against this background, this research aims to study the plant remains from an Iron Age site of Mtanye, which existed in contemporary with Mapungubwe and Mapela between AD 900-AD 1390 (Huffman 2008; Scholfield 2017). This research targets to understand the importance of both crops and wild plant resources to people's daily livelihoods, attempt to reconstruct past environments during the Mtanye period, and how humans and plants interact in the past.

On the other hand, research at Mtanye wants to correct the tendency of studying only cereals and other legumes that were brought by early farming communities as only necessary while underestimating the significance of wild plants in the daily livelihoods of Iron Age communities. One of the significant opinions extracted from the available literature about the archaeology of farming communities is that wild plants were mostly considered famine foods, food for the poor and a supplement to poor harvests (Campbell 1987; Gomez 1988). This research wanted to find out more from the present communities about the importance of wild plants beyond diet and subsistence to that which include the social, religious and economic values.

1.2. The Iron Age site of Mtanye on the Map



Figure 1. Location of Mtanye in relation to other Iron Age sites mentioned in the text (adapted from Nyamushosho et al. 2018).

GPS coordinates for Mtanye Iron Age site are at S 21°22'59.1" E29°15'12.1" in Gwanda, south-western Zimbabwe. It is a semi-arid region with periodic droughts (Vincent and Thomas 1961). Mtanye is one of the potential sites where one can derive information about the diversity of plants utilised, the social and economic values associated with people and plants of this region. The site is within the Selonga community adjacent to Sibizini and Mtanye rivers which offloads into the main Umzingwane River and Shashe-Limpopo rivers. The first excavations at Mtanye were undertaken in 1972 by Thomas Huffman and the Rhodesian Schools Exploration Society (Huffman 1972, 2008). The site is approximately 90 kilometres north of Mapungubwe World Heritage site and about 50 kilometres north-east of Mapela in the same region. Excavations undertaken in 1972 by Thomas Huffman unearthed hut features, grain bin features, grindstones and stonewalling on top of the hill and at the bottom. Ashy mounds, dolly holes and several potsherds, as well as animal bones and so forth, were found scattered across the site (Huffman, 1972, 2008). East of the Iron Age site of Mtanye approximately 200 metres there is rock art, and

some Stone Age material was in association with Iron Age material culture such as ceramics, clay figurines, metal, slag and beads (Walker 1972).

Recent studies at Mapela, Mananzve, Mwenezi, Malumba and other Iron Age sites in the region have explored interrelated factors of subsistence, food economies, people's livelihoods and the development of complexity (Manyanga 2006; Chirikure *et al.* 2013; 2014, House 2016; Nyamushosho *et al.* 2018; Manyanga and Magbwe 2017). However, we still do not know much about the domestic and wild plant economy in this region. Our knowledge about human-plant interactions is still elementary. Thus, against a background of the importance of crops and plants in shaping human life in southern Africa, it is noted that "*The lack of archaeobotanical research is surprising because ethnographic, historical, and archaeological information all suggest that plants formed an integral component of these societies*" (Antonites and Antonites 2014: 225).

1.3. Aims and Objectives

In quest of trying to fulfil the problems identified in previous sections, the principal aim of this research was to investigate the plant economy of the Iron Age site Mtanye in Gwanda, southwestern Zimbabwe.

The following objectives guided the aim:

- To identify the diversity of plants in the archaeological record of Mtanye and from the present communities around the site.
- To investigate the mutual relationship between humans and plants in the semi-arid region of south-western Zimbabwe
- To examine the contribution of both the domesticated and wild plants to people's daily lives in the semi-arid areas using Mtanye site as a case study.

1.4. Research Questions

Huffman (1972), in his excavation report from the site, noted the evidence of plant utilisation in the form of grain bins and pit storage infrastructures at Mtanye. This invoked pertinent questions about human-plant interactions in the past at Mtanye. These questions include:

- Which plants were kept in these storage infrastructures?

- What is the difference between plants utilised in the past and those by current communities around Mtanye site?
- What was the role played by plants in the development of Mtanye community in the face of environmental challenges?
- What can the storage of grains and wild plants tell us about the social, economic as well as the environmental situation at Mtanye in the past?
- Do people in the past favour domesticated plants most that wild plants?

1.5. Theoretical and Methodological Framework

The aforementioned, research questions, aims and objectives were formulated based on *Mutualism theory*, which is an ecological and evolutionary approach broadly rooted in the concept of understanding the symbiotic relationships and interactions between organisms in the environment around them (Butzer 1971; Rindos 1984; Shackley 1981; Wilkinson and Stevens 2003). *Mutualism theory* is all about interactions between organisms in their environment (Boucher *et al.* 1982; Rindos 1984: 255). Building on, such a framework, this research considered the relationship between humans and plants as a mutual relationship whereby both humans and plants benefit from each other (see chapter 4). This theory helps us to understand better the role played by plants in enhancing livelihoods of past human societies and accompanying contributions of humans in changing the plant ecosystems. Using this theory, we can answer significant questions such as Which plants did they utilised?; and What was the role of plants in promoting food security, sustainable development and other household roles besides diet and subsistence? It also helps us to understand why individual plants were favoured and not others. This theory and its potential can only be realised when supported by adequate data recovery techniques in the field to include ethnobotanical investigations, Archaeological excavations, *bucket flotation*, macroscopic and microscopic laboratory techniques (see Beldados *et al.* 2018; Boivin *et al.* 2014; Champion and Fuller 2018; Cowling *et al.* 2006; Fahmy *et al.* 2011; Miller 2019; Nesbitt 1995; Pearsall 2000; Stevens *et al.* 2014; van der Veen 1999).

1.6. The Organisation of The Thesis

Chapter 1 is the introduces the research, outlining the research problems, present the research area, aims and objectives, research questions, theoretical and the organisation of the research project. **Chapter 2** is a literature review section based on recent archaeobotanical studies. It discusses the major themes and debates addressed by researchers in understanding human-plant relationships in the past. The chapter appreciates the pioneering studies as fundamental and identifies existing gaps in the current research. It builds a step towards a strong foundation in uplifting archaeobotanical investigations in the regions and southern Africa at large. **Chapter 3** introduces the biophysical world of Mtanye, which was integral to the everyday life of its inhabitants and their neighbours in the region. The environmental and socio-cultural background of the Iron Age site of Mtanye will be presented in this chapter. **Chapter 4** outlines the theoretical framework that guided this research. The theory is explained in greater detail, indicating how humans and plants benefit each other. **Chapter 5** presents the materials and methodological approaches that conducted the study and provided an overview of the strengths and weaknesses associated with the methods selected. **Chapter 6** outlines the results based archaeobotanical remains recorded from the field and ethnobotanical investigations from the current community near Mtanye. **Chapter 7** provides a discussion and interpretation of the final results as well as a summary based on the results recorded from both ethnobotanical and archaeobotanical records. It ends with a conclusion, future research, references and appendix.

CHAPTER 2: A BRIEF REVIEW OF RECENT ARCHAEOBOTANICAL THEMES IN ARCHAEOLOGY.

2.1. Introduction

The chapter provides a brief history of archaeobotanical studies globally and in Africa. It traces the changes in the development of the discipline globally and to determine how far southern Africa is lagging. It is noteworthy that the section also provides insight regarding new archaeobotanical themes and methods that are implemented, across different regions. The discussion in this chapter also seeks to identify lacunas that need to be fulfilled either by this study or in future archaeobotanical research in southern Africa. Lastly, the emphasis is placed on the significance of undertaking the study of archaeobotanical remains in southern Africa and provides essential context for this study.

2.2. Archaeobotany In Other Parts of The World: A Brief History.

A detailed history about the development of archaeobotanical studies in India, America, Europe Italy is eloquently described by Fuller (2002) and Pearsall (2015); hence this chapter will not dwell much on that. Archaeobotany is the “analysis and interpretation of plant remains to provide information on the interactions of human populations and plants” (Popper and Hastorf 1988: 2). It uses an archaeological and ecological narrative to understand human-plant interactions (Stuart 2018: 2). This field of research seeks to elucidate which plants were used and for which purposes, how they were used, and on what basis were other plants chosen while others were not (Stuart 2018: 2). Archaeobotany is a subdiscipline of Archaeology which involves techniques and methods borrowed from disciplines such as Botany, Ecology, Anthropology and others. Archaeobotanical studies include the *macro botanical* remains such as seeds, fruit fragments, charcoal, wood, grass, twigs, basketry remains and amongst others (Hastorf 1999; Fuller 2002; Pearsall 2015). It also involves the studies of *micro botanical* remains such as pollen, phytoliths, starch, diatoms (Hastorf 1999; Pearsall 2015). Archaeobotanists also make use of specialised scientific techniques such as isotopes, residue analyses and DNA (Hastorf 1999; Miller 2000; Pearsall 2015). The development of this field of study in Europe and America emerged between the 1960s and 1970s, during the development of New Archaeology (Pearsall 1989; 2015).

However, during this period, it is recorded that plant studies were a part-time job for botanists and agronomists (Pearsall 1989, 2015). Fortunately, studies of desiccated plant seeds found in jars within the ancient Egyptian tombs and more archaeobotanical remains from villages in Switzerland sparked further interest in systematic archaeobotanical training (Pearsall 1989 3-4; Hastorf 1999). Likewise, in the Americas these studies had started in the 1950s with Gilmore and Jones investigating desiccated plant remains from rock shelter sites in the United States (Pearsall 1989). Research agenda in the Americas was on the use of plants by humans, while, in the British field of archaeobotany, they had moved to cultural interpretations, addressing issues more than just the morphology and taxonomy of plant remains (Pearsall 1989: 7). This same period saw the use of archaeobotanical remains to address critical questions such as the origins and rise of food production in areas such as Egypt and the Middle East (Helbaeck 1966; Harlan *et al.* 1973; Minnis 1981: 143).

One of the most exciting and fundamental studies that influenced the discipline of environmental archaeology is the research by Butzer (1982) in the book *Archaeology as Human Ecology*. It is one of the most informative books that most archaeobotanists make can use. Butzer 1982 made use of geo-archaeology, archaeobotany, zoo-archaeology and archaeometry to examine interactions between human communities and their biophysical environment. Of great importance is an articulation he made on the impact of human settlements on site formation and the effects of subsistence activities on plants, animals, soils and overall landscape modification. Butzer (1982) focused on examining the processes of cultural change and continuity, and from his assessment, he makes a point that environment is dynamic and not static, hence efforts to understand past situations must deal with dynamisms as well as with the complexities of the interactions. Based on Butzer's (1982) assessment the theoretical and methodological frameworks contained in this book remains fundamental towards investigating human-plant interactions in the past.

In India, archaeobotanical developments were also at the forefront with flotation improvements that saw the need for full-time professional archaeobotanists (Pearsall 1989; Fuller 2002: 257). The development of flotation techniques was targeted on fragile samples that could not be dealt with using dry sieves (Harlan *et al.* 1973; Pearsall 1989; Hally 1981; Minnis 1981; Miksicek 1987). Around the 1980s and 1990s in the Mayan Neotropics and other parts of the world, flotation became the method of recovering plant remains. However, as noted by Hageman and Goldstein (2009), the flotation methods produced minimal results due to a lack of understanding of the soil content processes outlined by Pearsall (2001). Hageman and Goldstein (2009) in the Maya residencies, integrated flotation and dry sieving methods to understand their impact on the

recovery of archaeobotanical remains. They used what they call Flote-tech A, which is a straightforward machine; easy as well as efficient in processing more samples (Hageman and Goldstein 2009). In that study, 58% of the seeds were recorded during flotation while dry sieving managed to recover mostly charcoal and wood fragments (Hageman and Goldstein 2009). In recent years, flotation methods have developed positively in Italy, Jordan, Israel and other parts of the world. For instance, Shelton and White (2010) managed to create what they call “The Hand-Pump flotation method” which uses manual hand power to pump the water in flotation tanks. According to Shelton and White (2010: 316), this flotation method is easy to construct and operate as it only requires the minimum effort of an individual. They used this flotation method at Acquachiara in Italy, el-Hemneh in Jordan and Beisamoun in Israel, and it yielded positive results. The *Bucket flotation* is also widely used in many archaeobotanical investigations outside Africa. Pearsall (2000), and Hosch and Zibulski (2003) recommended the use of the bucket flotation based on its advantages and effectiveness. VanDerwarker et al. (2015) noted that bucket flotation is time-efficient as many samples can be processed concurrently and with limited possibility of cross-sample contamination. Thus, developments on flotation methods in archaeobotanical investigations outside Africa are at an advanced stage compared to Africa in general, and particularly southern Africa.

Morphometric analysis of botanical remains using video and computer-aided software is also a recent development in archaeobotanical studies outside Africa. Morphometric analysis is widely used in other disciplines and was recently introduced in archaeobotany to focus on the analysis of seeds, phytoliths, pollen, wood charcoal and starch grains (Pearsall 2015; Portillo et al. 2019: 3). Morphological characteristics such as shape, size, coat texture and colour can be determined using this method (Pearsall 2015; Werker 1997). The technique uses digital images analysed using computer software (Pearsall 2015). This method has been helpful in archaeology and other disciplines over the years, especially in distinguishing domesticated from their wild progenitors (Dahlberg and Wasylikowa 1996; Terral et al. 2012; Hunter 1992; Snir and Weiss 2014). Researchers have used different programs to analyse botanical remains depending on their effectiveness. For instance, **Olympus Stream Basic Software** is designed for image analysis. These advanced techniques are gaining momentum in other parts of the world, and Africa is lagging in that regard.

The developments in the Americas' recent archaeobotanical studies have moved in to understand plant DNA (Schlumbaum et al. 2008), which is more advanced than just looking at the morphological classification of seeds which can be affected by preservation conditions that can alter shape, texture, colour and size of seeds (Schlumbaum et al. 2008). Other methods which were used to explore human-plant interactions in the past include phytoliths analysis, starch grains, residues analysis and isotope analysis and so on (Binford et al. 1987; Paterno 2009; Zeder et al. 2006; Hutson et al. 2007). These studies are entirely lacking in Africa, particularly southern Africa. Although this study is not in a position to implement these advanced methods due to time and resources, it is a welcome development that influences the survey of plant remains in southern Africa.

Major themes that are exploring using archaeobotanical remains outside Africa include the use of wild plants by farming communities. For instance, Fairbairn et al. (2007) examined these studies at Catalhoyok and recorded that wild plants were significant in people's daily lives. Hasayo (2011) addressed nut processing in Japan. Issues relating to the use of plants in ritual practices, agricultural practices, the importance of weeds as indicators of land use and crop production, social status and development of social and political complexity are at an advanced stage (Beauchair et al. 2009; Bouby et al. 2015); Nasu et al. 2012; Pearsall 2015: 30).

2.3. Archaeobotanical Studies in Africa

A significant turning point in African archaeobotanical studies came around the 1990s, leading to a conference called "The International Workshop on African Archaeobotany" (IWAA) which was held in 1994 in Krakow, Poland (Van der Veen 1999; Fahmy et al. 2011). According to Stevens et al. (2016:19), the conference defined some African archaeobotanical research problems while offering a powerful platform for the advance of archaeobotanical research. IWAA was more than just a gathering of presentations because the open laboratory session offered researchers a chance to bring their samples and analyse them microscopically in the presence of many archaeobotanical specialists (Stevens et al. 2016: 19; Fuller *et al.* 2014: 19). The conference participants agreed to meet after every three years (Stevens et al. (2016). While one cannot underestimate the impact of IWAA conference in shaping African studies on plant use, the meeting was partial towards research conducted in West and North Africa. Fuller et al. (2014) have shown that studies that carefully look at archaeobotanical remains in southern Africa were minimal at this time, except

for a few studies conducted in South Africa, that were restricted to Stone Age contexts, for instance, Sievers (2006); Schiegl et al. (2004); Wadley and Whitelaw (2006) et cetera. It is in recent years that archaeobotanical developments from Southern Africa started to appear in IWAA conferences, specifically with South Africa on the lead and very little to none from other parts of Southern Africa. For instance, only one paper so far appeared from Zimbabwe, by Chikumbirike *et al.* (2016). In trying to show this poor representation in Southern Africa and other parts of the continent, Fuller *et al.* (2014) presented a map based on IWAA conference attendance in 2006 (see figure 2).

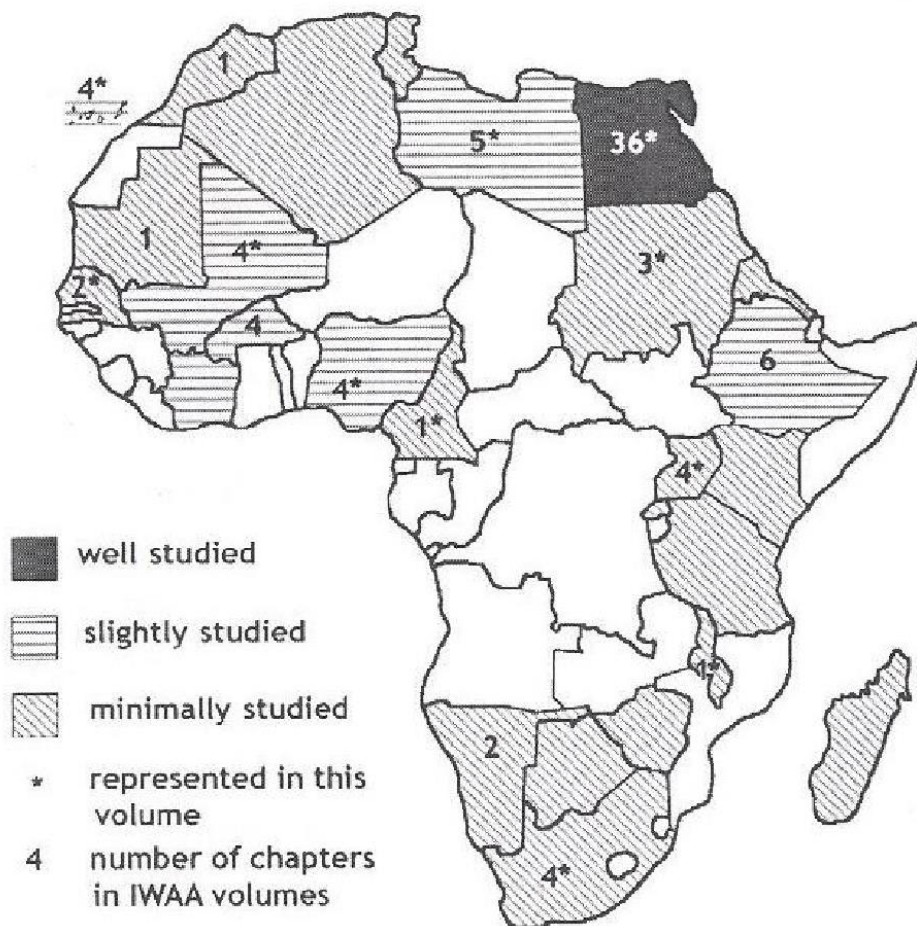


Figure 2. Archaeobotanical representation and research at IWAA 2006 (adapted from Fuller et al. 2014)

2.3.1. Recent Archaeobotanical Studies in North, East, West and Central Africa

The map by (Fuller *et al.* 2014) figure 2, clearly shows that North Africa, East Africa and West Africa were better represented as compared to southern Africa. At present, the most recorded archaeobotanical publications are from these regions, and their methods of data collection and theoretical frameworks are growing tremendously. Recent studies in these regions have given so much hope that more information about the lives of people in past societies can be understood using plant remains (Fuller *et al.* 2014; Walshaw 2005; Crowther *et al.* 2015; Neumann 2003, 2018).

One topic that recently gained momentum in these regions is the origins of agriculture, especially following the transition from hunter-gatherers to farming communities (Crowther *et al.* 2018; Boivin *et al.* 2013; Kusimba and Kusimba 2005; Kusimba 2005; Lane 2004, 2015). In south-eastern Kenya, Crowther *et al.* (2018) looked at subsistence mosaics, forager-farmer interactions and the transition to food production in East Africa. Using botanical and faunal remains excavated from forager and early farming sites, they examined timing and tempo of the agricultural change, the nature of forager-farmer-pastoralist interactions and the role that domesticates played in the local economies (Crowther *et al.* 2018). The study highlights complex pathways and transitions that happen during the transformation from foragers to farmers in the East African coast. The paper eloquently assesses the interactions that were taking place between foragers and farmers, where some crops and other items were exchanged. The conclusion from this study was that the transition from forager to farmers in eastern Africa was as a result of interactions between these groups who brought various economic, social and political transformation over time. Besides, Kusimba (2005) using ethnographic and symbiosis model looked at hunter-gatherer-farmer interactions in Eastern Africa and recorded that these two groups co-existed for long, exchanging wild plants with agricultural produce. This has shifted focus towards understanding different pathways that may have inspired the transitions from foraging to agrarian lifestyles, for instance, technology, environmental knowledge, labour organisation among others (Kusimba 2005; de Luna 2016).

Archaeobotanical research in East Africa by Walshaw (2005) analysed botanical evidence to understand Swahili Urban food production in the past. The study was based on the combined sources from linguistics, ethnohistorical data and archaeobotany. Walshaw (2005) concluded that Swahili food production occurred at a household level and linked to Asian trade networks.

Archaeobotanical evidence highlighted that although there was external trade with the Asians, local food production via agriculture and gathering of wild plant resources contributed highly towards food production at an indigenous level. The use of ethnobotanical information and flotation methods during excavations is fundamental to new studies that may need to pursue archaeobotanical studies in southern Africa.

In West Africa, archaeobotanical studies have addressed issues about the Early and Middle Holocene, foragers and pastoralists who utilised wild grasses as food (Neumann, 2018). Neumann noticed combined exploitation of cereals, legumes, wild grass and wild fruits which he said formed the cultural landscape of present-day West Africa. Likewise, several sites in Nigeria, Mali and Senegal provided evidence of wild grasses being gathered and consumed (Murray, 2005, 2018; Gallagher et al. 2018, Gallagher 1999; McIntosh 1995). As noted by Neumann (2005, 2018), it is becoming a common feature in most sub-Saharan rural communities for agricultural activities to be combined with the exploitation of wild resources. Hence undertaking studies that address wild plant exploitation in the archaeology of southern Africa provides a window into the past.

More so, Fahmy (2003) used archaeobotanical remains recorded in Predynastic cemeteries to answer questions on the diet and subsistence of the Egyptian Pharaohs. Using dry sieving, he managed to recover weeds, vegetables and fruits utilised by the Egyptians in the past. Crawford (2003) explored archaeobotanical investigations focusing on weeds. Excavations were done at Tell-al-Maskhuta in Wadi Tumilat of Egypt (1750-1550 BC). Using weeds recorded, Crawford (2003) concluded that weeds are indicators of land-use strategies and cereal cultivation. Similar studies were done to the Saharan tribes, looking at the importance of grasses in diet and as animal fodder (Pelling 2003; Harlan 1989a). It is revealing that evidence of grass and weeds from archaeological sites can give us information about diet, subsistence as well as indicators of land use. Such studies remain a welcome development towards understanding human-plant interactions in the past

There is also growing interests in these regions towards understanding people's livelihoods and food security in the past (Reed and Ryan 2019; Logan 2012, 2016, 2017). In West Africa, among the Banda people in Ghana, Amanda Logan has articulated the concept of food security and agricultural resilience using archaeobotanical remains (Logan 2012, 2016, 2017). She used archaeobotanical and ethnographic information to investigate the impact of changing environmental conditions on food security (Logan 2016, 2012). She tried to understand how people

experienced life in times of food insecurity and found out that people used various foodways strategies to cope up with multiple threats to their livelihoods (Logan 2017).

Moreover, archaeological studies in these regions are taking into consideration, the research of grinding stones found in many archaeological sites (Shoemaker et al. 2017; Ambrose 1998; Stahl 1993). According to Shoemaker et al. (2017: 415), the studies of grinding stones in archaeology are an under-discussed component, yet they inform us about food and material processing in the past. Shoemaker et al. (2017) recorded several grinding stones in Marakwet in Northwest Kenya. Complementing with ethnographic investigations, they found that grinding stones were not only used for grinding cereals but for a whole range of functions such as grinding wild plants, cereals, other iron materials, pigment, ceramic clay and so forth. Similar studies were conducted in West Africa among the Kintampo people, confirming that the presence of these grinding stones signified food production (Stahl 1993). Also, among the Kintampo communities, it is noted that grinding stones were used to process plants, for instance, cowpeas (*Vigna unguiculata*), oil palm tree (*Elaeis guinnensis*) (D'Andrea et al. (2001, 2007). Nixon-Darcus and D'Andrea (2017) also recorded grinding stones from the Aksumite site of Mezber in Gulo Makedo. While these lines of research are limited in Africa, their realisation opened a window into the past, towards understanding variation in sizes of grinding stones as well as their capacity and efficiency in executing multiple roles. Thus, a step towards this direction at Mtanye provides fundamental knowledge in understanding the lives of people in the past.

2.3.2. Archaeobotanical Studies in Southern Africa

Judging from the map presented by Fuller et al. (2014) (figure 2) which is based on IWAA's 2006 report, South Africa was fairly represented compared to other parts of southern Africa. However, it is vital to trace various efforts made by researchers in southern Africa towards the development of archaeobotany. In South Africa, the growths in the discipline of archaeobotany in South Africa can be attributed to researchers who in their works attempted to mention archaeobotanical remains.

As early as the 1930s archaeological excavations were already underway in southern Africa, at major sites such as K2, Mapungubwe and Great Zimbabwe. Fouche (1937: 31) in his report at Mapungubwe recorded a list of archaeobotanical remains that were found during excavations. Although the report remains silent on the strategies that were used to retrieve the seeds, it is fundamental to note that the information is relevant towards understanding how people in the past relate with the environment.

In addition, Gardner (1963: 82) reported some archaeobotanical remains recorded from K2 and Mapungubwe sites. In 1978, Eloff also recorded a detailed list of plant remains that were recorded during excavations at K2 site. Research that specifically focuses on the analysis of archaeobotanical remains during this time was still elementary, where only a list of these plant remains appeared in the appendix, with limited methodological and theoretical frameworks that address human-plant interactions.

Analysis of literature by Antonites and Antonites (2014) indicated that, within the three leading Archaeological journals in southern Africa, since 1980 such as the *Southern African Humanities*, *Southern Africa Field Archaeology* and *South African Archaeological Bulletin* only 12 articles were published. Archaeobotanical research in South Africa has mostly been done at Sibudu Cave where plant assemblages within Middle Stone Age layers were recorded (Wadley et al. 1992; Sievers 2006; Wintjes & Sievers 2006; Allott 2005; Schiegl et al. 2004). Other significant areas that were addressed by plant remains in the archaeology of South Africa include seasonality, vegetation changes, paleoenvironmental reconstructions and paleoclimates through the use of pollen analysis, charcoal analysis, phytoliths, isotopes and others (see Cartwright & Parkington, 1997; Shackleton & Prins 1993; Dowson 1988; Esterhuysen 1992, 1996; February 1994a; Prior & Price-Williams 1985; Scholtz 1986; Tusenius 1986; Murungi and Bamford 2015). As far as the paleoenvironmental researches in South Africa are concerned, it should be noted that due to anthropogenic disturbances at Sibudu cave site, the reconstruction of palaeoenvironments was problematic (Murungi and Bamford 2015).

Interesting archaeobotanical studies at Sibudu looked at deliberate harvesting of Sedge nutlets (*Cladium mariscus* subsp. *Jamaicense*) identified using micromorphological experiments (Sievers and Muasya 2011; Miller and Sievers 2012). They concluded that these species were consciously harvested, brought to the site and used as bedding. Looking at the development of archaeological studies in South Africa, the studies undertaken at Sibudu showed a departure from the way archaeobotanical remains were previously treated. The methods used in data collection, analysis and theoretical frameworks improved. However, while extensive archaeobotanical studies at Sibudu cave have shaped the development of the discipline in southern Africa and beyond, the only limitation is that the bias is towards Stone Age sites. The research about past environments, wild plant use, food security, and livelihoods amongst early farming still require equal attention to have a proper understanding of how both hunter-gatherers and first farmers relate to the environment.

Recorded archaeobotanical studies amongst farming communities in southern Africa is scant and widely dispersed. As noted by Antonites and Antonites (2014: 225); “*The lack of archaeobotanical research in Southern Africa is surprising, because ethnographic, historical, and archaeological information all suggest that plants formed an integral component of these societies*”. In South Africa, few studies that use archaeobotanical remains from farming community sites include Greenfield et al. (2005), Schoeman (2006, 2009), Antonites and Antonites (2014) and recently Steyn and Antonites (2019). These few studies have directly addressed archaeobotanical remains with clear aims and objectives influenced by archaeobotanical perspectives.

Greenfield et al. (2005) explored the possible garden locations among Early farming communities’ sites (AD 400-900), for example, the Ndongondane site in Thukela River Basin. Using a bulk of plant remains from these Early Iron Age sites, they managed to locate places where gardens could have been established (Greenfield et al. 2005: 325). The conclusion was that gardening was carried within and outside human settlements (Greenfield et al. 2005: 325). The assessment of understanding what was grown in these gardens and where these gardens were located remains fundamental towards understanding how people interact with the environment in the past. This research by Greenfield and colleagues opened a window into the past by considering the importance of open spaces in many Iron Age sites.

Also, studies of plant use among Iron Age farming communities were explored by Schoeman (2006, 2009), investigating rituals and rain calling activities. A wide range of wild and domesticated plants found at hilltop sites in Limpopo dated 9th – 13th century (Schoeman 2006). Plants such as *Grewia flava*, *Strychnos sp* and others were found and are ethnographically known to be associated with rituals (Schoeman 2006). Schoeman (2006: 269) noticed from ethnographical information that individual plants were cooked and burned to produce black smoke that induces rain clouds. Schoeman’s assessment provides a platform where we begin to think that plants in the past were not only used for food but other roles in their day-to-day livelihoods. It adds up much water if more studies are conducted to explore more issues about agricultural systems, other social aspects of plants, food security, gathering behaviours which are silent in Schoeman’s paper.

Recently, Steyn and Antonites (2019) explored plant use at Mutamba believed to be one of southern Africa’s Middle Iron Age site. They found evidence of cereals such as finger millet (*Eleusine corocana*), *Sorghum bicolor*, Pearl millet (*Pennisetum glaucum*), Cowpeas (*Vigna*

unguiculata) and mung beans. The assessment is of great importance because it has allowed a better understanding of potential crop package, harvesting and processing methods and plant utilisation in the past. The study has also paved the way for understanding the diversity of wild plants that were utilised by agro-pastoralists during the Middle Iron Age, for instance, *Grewia sp* and *marula*. This understanding of a wide range of plants that were utilised during this period also lacks in the archaeology of southern Africa. The study also made use of ethnographic information to understand plant use, for instance, beer brewing and cotton spinning. It could have been more exciting if they go further to assess more about the use of wild plants during this period beyond diet and subsistence since wild plants were also significant to the development of these communities. Although there are sections which focus on the presence of wild plants at Mutamba, their primary attention is cereal such as sorghum, millets, cowpeas, and how vital was cotton during this time.

It should be noted that South Africa is leading developments towards understanding past plant utilisation in southern Africa. Despite being dominated by Stone Age archaeobotanical investigations, the systematic theoretical and methodological frameworks being used are fundamental to the development of archaeobotany in the region and beyond.

In Mozambique, Ekblom (2012), carried out exciting research that is related to the understanding of the relationship between humans and the environment. Ekblom (2012), looked at livelihood security, vulnerability and resilience at Chibuene in Mozambique. She found out that in Chibuene wild plant resources are used throughout the year as a complement to daily diets and also during the month of scarcity between October and November as well as February and March. Furthermore, she did related studies with colleagues looking at “Land Use History and Resource Utilisation at Chibuene from AD 400 to present” (Ekblom et al. 2014). They used different proxies such as charcoal, pollen, marine resources to understand resource utilisation by people at Chibuene and their interactions with the environment over time. The assessment by Ekblom et al. (2014) is critical because they use a combination of scientific techniques, such as pollen analysis, charcoal analysis, bone and shell analysis. They identified four phases at Chibuene, which include Phase 1 AD 400-900, Phase 2 AD 900-1400, AD 1400-1800 and AD 1800-1900. Thus, Ekblom et al. (2014) concluded that Chibuene landscape experienced four phases of land use and resource use that have interacted with changes in the environment. This research also revealed that people at Chibuene through social networks traded wild resources with other societies to enhance their livelihoods both in good years and during months of scarcity. Again, lots of charcoal was found

and analysed, giving inferences on wood fuel selection and collection (Ekblom et al. 2014). However, in as far as this research opens a window into the past land-use history and resource use, little archaeobotanical remains were analysed. It could have been very revealing to address human-plant interaction, agricultural systems, the importance of wild plants along with crops if adequate seeds from Chibuene were recorded. It is common in many archaeological sites that the ubiquity of archaeobotanical remains is affected by preservation conditions; hence studies that include residue analysis, as well as isotopes, can help bring more light at Chibuene and other sites across southern Africa

2.3.3. Archaeobotanical studies in Zimbabwe

There is no doubt that the study of archaeobotanical remains in Zimbabwe is scant, compared to other parts of the region, for instance, South Africa, Mozambique amongst others. Studies that seriously engage clear archaeobotanical aims and objectives in Zimbabwe include Jonsson (1998) and Chikumbirike et al. (2016). In as early as 1958, records of archaeobotanical remains started to appear in excavation reports in Zimbabwe. Summers (1958) identified seeds from Ziwa ruins in the lowlands of Nyanga. Grains and legumes were noted down, for instance, *Sorghum*, *Pennisetum glaucum*, *Eleusine corocana* (finger millet) *Vigna unguiculata* (cowpea), *Vigna subterranean* (Summers 1958). Also, while studying ancient fields and the history of agriculture in Nyanga, Soper (2002) recorded botanical remains in addition to what Summers (1958) had found. These studies are essential as they provide information about plants utilised in the past. However, during this time, more emphasis was on ceramics, bones, metals, beads and other material culture. Due to preservation conditions, archaeobotanical remains were regarded as remains of low archaeological visibility.

Walker (1995), also recorded a bulk of archaeobotanical remains from hunter-gatherer sites in Matopos. The research by Walker (1995) indicated a wide range of wild plants that were utilised by hunter-gatherers in Matopos. Although Walker focused more on plants that were used by foragers, it is of great importance to understand the diversity of plants that these people were using in the past. While studies by Summers (1958), Walker (1995), and Soper (2002) have noted plants utilised during the Stone Age and farming communities, it remains inadequate to base our conclusions about past societies using data recorded from different sites, with different environmental conditions.

Jonsson (1998) explored the plant economy of Zimbabwe, focusing on continuity and change between hunter-gatherers and early farming communities. His research should be considered the first with clear aims and objectives influenced by archaeobotanical perspectives. Jonsson (1998) found out more wild plants and a few domesticates at many other sites, for instance, at Mwenezi farm. He also found domesticated seeds of sorghum from Kadzi site in Northern Zimbabwe (Jonsson 1998). His pioneering study towards understanding and appreciating the relevance of plant remains in the archaeology of Zimbabwe is fundamental. While not underestimate Jonsson 1998's contribution it is also essential to investigate other areas with different vegetation and environmental characteristics because sites are dynamic. His conclusions might not be suitable to other areas, and above all, there is a need for context-specific studies since humans and people interact differently depending on the environment that is prevailing.

Recently, Chikumbirike et al. (2016) analysed charcoal at Chigaramboni and Great Zimbabwe, to reconstruct palaeoenvironments, vegetation and wood purposes in the past. They recorded woods with unique qualities such as *Spirostachys Africana* and *Colophospermum mopane*. They concluded that miombo woodlands dominated past flora and that the environment was not necessarily different from the past. Chikumbirike et al. (2016) also noticed that certain woods were brought into the area for particular uses such as iron smelting and other domestic purposes. Their study contributes to an understanding of vegetation and past environments. However, it could have been more revealing if Chikumbirike and colleagues further investigated other plant remains such as seeds and other proxies to have an integrated approach about past vegetation and environment. The problem that arises when trying to deal with charcoal alone is that not all trees were burnt; some were deemed taboo; thus, they were protected in the past. Therefore, their absence in the charcoal record might not confirm that they did not exist. It is essential to observe from this research by Chikumbirike et al. (2016) that it is only biased vegetation and past environments while silent on other issues that plants can tell such as diversity of plant foodways, agricultural practices, livelihoods of people and how people in the past could have used plants to cope up with prevailing environmental conditions. Thus, while Chikumbirike et al. (2016) and Jonsson (1998) have done a notable work and despite influenced by systematic archaeobotanical perspectives, there is still more that needs to be done in Zimbabwe to have a fuller understanding of human-plant interactions.

2.4. Ethnobotanical Studies: A Brief Background

Outside Africa, in as early as the 1970s, ethnographic studies were already underway, focusing on addressing a myriad of archaeological questions. For instance, the works of Gordon Hillman in the Ancient Near East and others (Hillman 1973; Ford 1978; Nesbitt 1995; Huysecom and Augustoni 1997; David et al. 1989; Dewey 1991; Schmidt 1997). Ethnoarchaeological approaches can help us to understand daily life patterns such as decision making in crop husbandry, plant procurement and processing, with implications on interpretations of changes in agrarian systems and plant use in archaeological records (Nesbitt 1995). Also, Ford (1978: 83) outlined three significant objectives that can be addressed by ethnobotanical studies to include: (a) identification of plants that have particular uses (b) discovering how people classify, identify and relate to these plants and (c) to examine the reciprocal interaction of plants and people. It is worth noting that traditional knowledge about plant use among several communities is experiencing significant changes across the globe (Nesbitt 1995), therefore documenting traditional knowledge and techniques on crop farming and wild plant use before they vanish is vital and worth pursuing. Ethnoarchaeological studies in Africa, and Zimbabwe, in particular, have been more extensive towards understanding pottery production (Bwerinofa 1990; Huffman 1980; Lindal and Matenga 1995; Marufu 2008; Ndoro 1996; Nyamushosho 2014), metal production (David et al. 1989; Dewey 1991; Huysecom and Augustoni 1997; Mathoho et al. 2016; Schmidt 1997), rituals, rainmaking and burials (Huffman and Murimbika 2003, Murimbika 2006; Schoeman 2006). Ethnobotanical studies that focus on plants were limited to disciplines such as ecology, medicine, pharmacology, botany, sociology and economics (Maroyi 2009; Ngugi and Muasya 2011; Cunningham 1988). The most influential ethnobotanical researchers in southern Africa include (Liengme 1983; Cunningham 1988, 2001; Shava et al. 2009; Harris and Muhammed 2003; Gomez 1988; Campbell 2000; Maroyi 2009, 2012, 2015, van Wyk and van Wyk 1997). Issues they targeted during these ethnobotanical investigations include medicinal uses of plants, fuel use, subsistence systems, rituals et cetera.

2.5. Conclusion

Based on the information provided above, there is little doubt that archaeobotanical studies in Zimbabwe are limited and widely dispersed. The literature review has shown that, in recent decades and presently, archaeobotanical research outside Africa, for instance, in the Americas, in

Italy, Japan, China, Asia and so forth, has advanced. The theories, the methods of collection and analysis are far much better compared to Africa-based studies. As shown by Fuller et al. (2014), East Africa, North Africa and West Africa have taken the lead in terms of developing capacities for archaeobotanical research. In southern Africa, archaeobotanical research is more considerable in South Africa than in any other regions. Zimbabwe is poorly represented; therefore, more research needs to be done to incorporate these studies in the archaeology of southern Africa. The challenge lies in how to assimilate archaeobotanical studies into the mainstream of the archaeology of farming communities in southern Africa for them to be treated the same with lithics, faunal analysis, ceramics, beads, metals and other material culture (Antonites and Antonites 2014). These archaeobotanical remains are not carefully recorded and analysed to help reveal human-plant interactions in the past. Novel theories and techniques that require specialist training and high-powered microscopic facilities are not dedicated to archaeobotanical investigations as is the case in other parts of the world.

Furthermore, over the years, research about the development of Iron Age farming communities in southern Africa has been biased towards significant sites such as K2, Mapungubwe, Great Zimbabwe, Khami and others. Archaeological research in south-western Zimbabwe lagged for some time because the area previously considered inhospitable for human settlement (Huffman 2015; Vincent and Thomas 1961; Sinclair and Lundmark 1984). Recent studies, for instance at Mapela (Chirikure et al. 2013,2014; House 2016), Manhanzve (Nyamushosho et al. 2018) and Manyanga (2006, 2000), have given so much hope that there is a potential to get more information about past farming communities in the region. Therefore, the site of Mtanye is strategically crucial for a study seeking to find out more about the livelihoods of people who once stayed in this semi-arid region.

CHAPTER 3: THE ETHNO-ECOLOGY AND ARCHAEOLOGICAL BACKGROUND OF MTANYE, SOUTHWESTERN REGION OF ZIMBABWE.

3.1. Introduction.

This chapter presents the environmental background of the Iron Age site of Mtanye in Gwanda, southwestern Zimbabwe. The sections include various ecological parameters in the past and the current environmental settings of the region. The discussion goes further to present multiple strategies contributed to people’s livelihoods in the area. These include plant cultivation, livestock production, wild plant gathering, among others. The final section of this chapter explains the archaeological background of the Iron Age of Mtanye and the previous research conducted at Mtanye.

3.2. The Environmental Background of Mtanye Site

3.2.1. Rainfall and Natural Regions of Zimbabwe

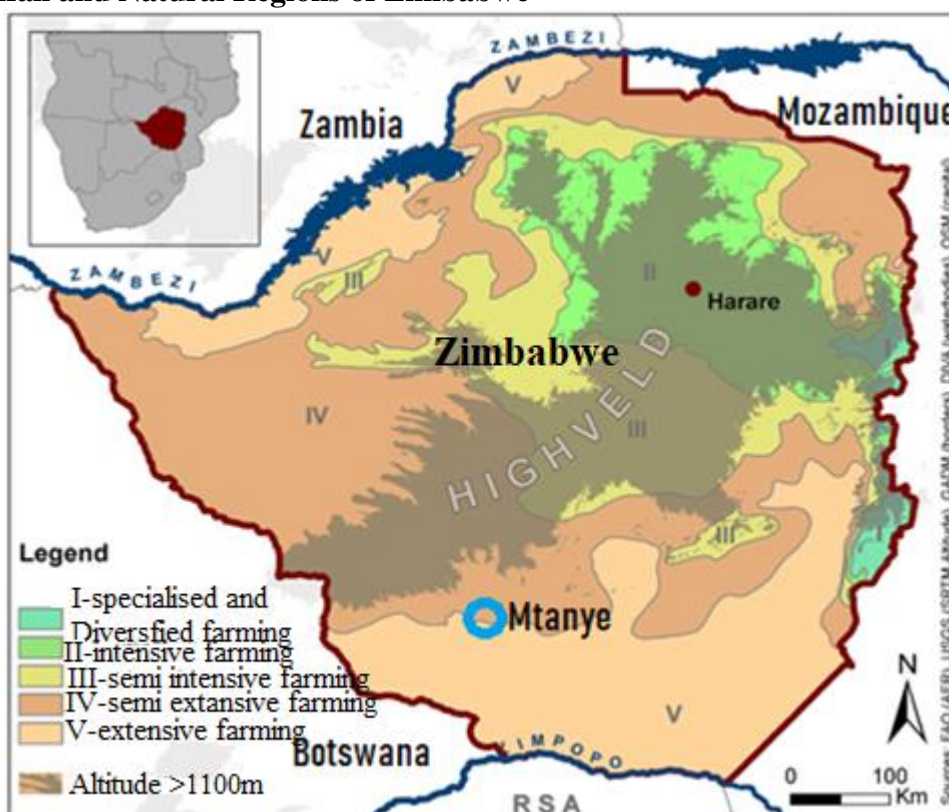


Figure 3. Natural regions of Zimbabwe (Adapted from Hentze et al. 2016).

Mtanye site (figure 3) is located in two agro-ecological regions 4 and 5 of Zimbabwe. It is in the semi-extensive and extensive farming regions 4 and 5. These two regions are ideally suitable for livestock production and low crop production (Vincent and Thomas, 1961). Accordingly, these regions are characterised by low rainfall of about 450-650 mm per year (Vincent and Thomas 1961). Luckert et al. (2000; 384) noted that these poor annual rainfall patterns necessitated seasonal droughts with risky dry spells. As a result, this semi-arid region was previously dubbed “marginal and inhospitable” (Huffman 2015; Vincent and Thomas 1961). The hottest month is October with the mean temperatures reaching 31°C. June and July are the coldest months, reaching low temperatures of about 9°C. There are few natural lakes; hence the human-made dams remain the largest source of water for domestic use, gardening and livestock production. Seasonal wetlands that are known as *dambos* also add up as sources of water. However, they quickly dehydrate due to seasonal droughts. The shortage of rainfall in the region resulted in the adoption of alternatives such as dryland farming, garden irrigation along river banks and dams being employed by households to cope with the semi-arid conditions and manage risks. It is believed that most of the Iron Age farming communities had a symbiotic relationship with environmental parameters to such an extent that they could situate themselves in a specific locational behaviour (Pwiti 1996; Mushangwe 2014; Manyanga 2006). In this case, the sections below describe environmental parameters that could have been important in the past.

3.2.2. Vegetation

The south-western region of Zimbabwe is comprised of bushvelds commonly regarded as the *Acacia*, *Terminalia*, and *Combretum* species as well as the open grasslands (Timberlake et al. 1999; Vincent and Thomas 1961). This same type of vegetation runs across Matopos and Khami world heritage sites (Mukwende 2017; Vincent and Thomas 1961). The primary vegetation type around Mtanye site is the mopane woodlands (*Colophospermum mopane*) on more clay-rich soils. Small trees and bushes of different species formed the general vegetation in open Kalahari sands which occupies a considerable portion of the region. There is an excellent combination of other species in the area such as *acacia embescenns and combretum*, *Sclerocarya birrea*, *Lannea. schweinfurthii*, *Adansonia digitata*, *Grewia bicolor* et cetera. These species are frequently foraged because of their nutritional and dietary requirements, especially fruits, leaves and seeds. They are also used for fuel, fencing, building and brick firing, but this is causing rapid deforestation leading, soil erosion and land degradation (Timberlake et al. 1999, Gomez 1988, Wild 1984). Grasslands

are also found in wet areas called *dambos*, where crop gardening and livestock production is favourable (Jonsson 1998). Thatching grass is harvested from these areas, along with various wild edibles that are sold mostly by the main road, by women and children, to purchase food and clothes, as well as to pay school fees (Ndiweni 2015; Luckert et al. 2000).



Figure 4. Vegetation at the Iron Age site of Mtanye

3.2.3 Geology and Soils



Figure 5. Granite outcrops at Mtanye Iron Age site

Granite outcrops surround Mtanye Iron Age site (figure 5), and the site is on top of the hill. Southwestern Zimbabwe is generally endowed with many geological features, that are mainly granite outcrops. It is characterised by a wide distribution of dominant landforms, bare hills, flatlands and flat rock structures. Many granite hills are covered with woodland and grassland vegetation. The granite available at the site could have been used to build stone walling promoted stonewalling since there are remnants of granite stone walls on both sides of the hill. The soils in the valley consisted of sandy loam, mostly derived from these granitic-gneissic rocks with low agricultural potential caused by low fertility and water-holding capacity (Huffman 2008).

The geology of the region also offers mineral resources such as gold, a precious trade commodity for Iron Age communities in the area, in their trade with Swahili and Portuguese traders (Beach 1980; Randles 1981; Mudenge 1988; Summers 1969; Swan 1994). Gold mines are distributed

along the Umzingwane catchment, some of which are registered, and others being unregistered. The unregistered mines are regarded as illegal gold panning happening on the sandy river beds (Ndiweni 2015). Due to worsening economic and drought stresses and shocks, many unemployed youths opt for this illegal gold panning process as an adaptive measure and income-generating activity.

Having said the above, the biophysical settings of the region could have played a crucial role in settlement choices. In Northern and Eastern Zimbabwe, a locational behaviour of Zimbabwe tradition sites indicated a symbiotic relationship between sites and environmental parameters (Pwiti 1996; Katsamudanga 2005; Mushangwe 2014). This realisation could mean that many prehistoric sites were not chosen randomly but with higher considerations.

3.3. Current Livelihood Assets in the area

Households in this region depend on vast resources to manage risks and cope up with drought stresses and shocks. These assets range from land, crops, livestock, natural resources, and other facilities with values attached to them. Based on the observed information and first-hand accounts, the sections below explain in detail, the vast resources which promote food security and people's livelihoods in the area.

3.3.1. Agriculture

The land is generally considered a valuable asset which supports agriculture and community development. Like in other parts of Zimbabwe and southern Africa in general, agriculture remains an essential activity in modern-day communities, and in the past (Jonsson 1998; Nyamushosho et al. 2018, Manyanga 2006). Crop production played a pivotal role in ensuring food security and community development (Mabgwe and Manyanga 2017); For instance, within the communities around Mtanye, households own about 3 hectares of land. Crops grown include maize, pearl millet, sorghum, peas and groundnuts. *Sorghum bicolor* and pearl millet (*Pennisetum glaucum*) remain the most frequently grown traditional staples in the region. Sorghum is perfect for making the local beer, and together with millet, they can survive in dryland conditions where soils are not fertile. Rice is also vital in this region. However, successful harvests are constrained in waterlogged areas known as *dambos* (Jonsson 1998). These crops above are intercropped with pumpkins and melons (*Citrullus lanatus*) in dryland systems. Maize cultivation remains essential. However, since this crop is rain-fed, the area does not provide adequate rainfall, and this leaves people at risk of getting poor harvests. Donor assistance and government's intervention offer extra food, seed and fertiliser as incentives to the communities, to enhance food security and livelihoods. More crops in the fields

include sweet potatoes (*Ipomoea batatas*), peanuts (*Arachis hypogoea*), beans (*Vigna sp*), Bambara groundnuts (*Vigna subterranean*), Okra (*Hibiscus esculentus*). Green vegetables such as pumpkin leaves, *munyeye* and *derere*, and so forth, supplement their relish (see table 1).

In addition to the above, legumes form part of the nutritionally rich crop plants which boost dietary requirements in this region. They are generally recognised as maintaining the fertility of agricultural fields (NRC 2006). Legumes in the area include cowpeas (*Vigna unguiculata*), groundnuts (*Vigna subterranea*) and Bambara groundnuts. There are also varieties of indigenous and exotic vegetables that are mainly grown in gardens and also intercropped with significant crops. Some of these vegetables grow wild, but at the same time, people take care of them, for example, *Hibiscus esculentus*, *Vigna unguiculate* *Cucurbita maxima* *Gynandropsis gynandra* and *Bidens pilosa*.

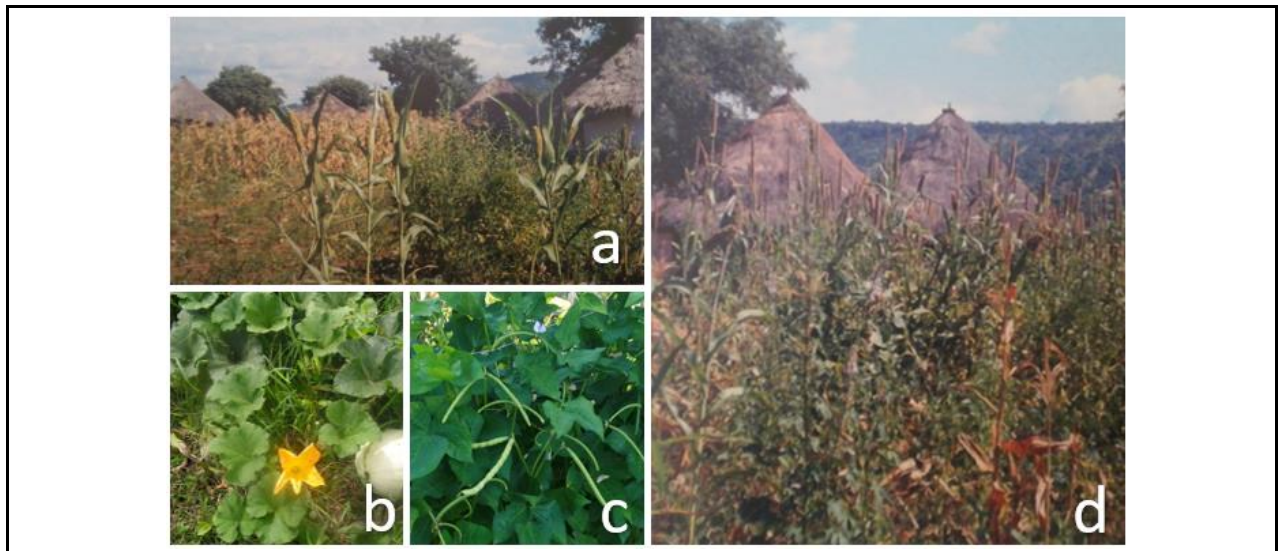


Figure 6. Examples of crops grown in the area (adapted from Huffman 2007).

a) Sorghum and Zea mays, b) Pumpkin c) Cowpeas, d) millet and Zea Mays

In many rural communities in Zimbabwe, crops in such as sorghum, millet and *Zea mays* are intercropped with legumes to boost soil fertility (Maroyi 2013). These crops are widely grown in south-western Zimbabwe because they are drought resistant. *Zea mays* were introduced by the Portuguese and Europeans (Jonsson 1998).

3.3.2. Wild Plant Resources

In addition to significant crops and legumes in this region, people supplement their livelihoods with wild fruits gathered from woodland systems. There are a lot of wild edible plants in the area; for example, Baobab (*Adansonia digitata*), monkey orange (*Strychnos coccoloides*) et cetera (see

table 2). The woodland in this region offers vast opportunities such as selling wood carvings, basketry, mopane worms, wild fruits, fuelwood, thatching grass and construction materials (Braedt and Gunda 1988).

It is noteworthy that women, men and children are involved in the gathering of edible fruits, greens, mopane and mushrooms, which is regarded as a vital seasonal activity. Some of these edibles offer medicinal value and nutrients such as vitamin C, calcium and proteins (Maroyi 2009, 2015, Cunningham 1988). They can help promote livelihoods in both communal and urban areas. As noted by Luckert et al. (2000: 385) woodlands provide “green social security”, the last safety net for poor rural households during drought or periods of economic depression and high urban unemployment. However, against this background, one would want to point out that not only the poor but also the rich, resort to plants in their daily lives. This has been a significant shortfall, where only the poor are regarded as the consumers of plants. A lot of these plants are being sold to the rich in urban market areas, and they contribute a lot to urban food security and people’s livelihoods. Thus, plants do provide green social security to the poor and the rich, to enhance food security and livelihoods. It should also be noted that the utilisation of plants in the region is not only restricted to wild edibles only. There are a lot of other plants with many uses. These uses range from construction, wood fuel, medicinal, household utensils and implements, hunting and fishing tools, musical purposes, et cetera.



Figure 7. Some significant examples of wild edible plants from southwestern Zimbabwe

- | | |
|---------------------------------|-------------------------------------|
| a) <i>Uapaca kirkiana</i> | i) <i>Parinari curatellifolia</i> |
| b) <i>Ximenia caffra</i> | j) <i>Sclerocarya birrea/caffra</i> |
| c) <i>Flacourtia Indica</i> | k) <i>Azanza garckeana</i> |
| d) <i>Vitex payos</i> | l) <i>Adansonia digitata</i> |
| e) <i>Ziziphus mauritiana</i> | m) <i>Lennea edulis</i> |
| f) <i>Berchemia discolor</i> | n) <i>Strychnos spinosa</i> |
| g) <i>Syzygium cordatum</i> | o) <i>Grewia discolor</i> |
| h) <i>Pilostigma thonningii</i> | p) <i>Curissa edulis</i> |

3.3.3. Domestic Animals

Domestic animals are vital in this region, and they are symbols of wealth. The risk of crop failure caused by poor rains has diverted people's attention to livestock production. Cattle, goats, sheep, chicken, dogs, pigs and donkeys are the main domesticated animals in this region. Goats (*Capra hircus*) are the commonly selected stock because of their resistance to tsetse flies and due to being drought tolerant. Sheep (*Ovis aries*) are also common but not on a large-scale as compared to goats. Cattle (*Bos taurus*) share the same pattern as goats, with several new breeds becoming popular. During dry seasons these beasts graze in riverine and wetland areas known as *dambos*

(Jonsson 1998). They store wealth and accorded greater prestige. As a result, they are only killed on special occasions. They are a source of milk, food and fertiliser (in the form of manure). Cattle, goats and sheep are historically known for their contribution to complex societies in southern Africa (see Huffman 2008, Chirikure et al. 2014, Nyamushosho et al. 2018). Chickens (*Gallus gallus*) and guinea fowl (*Numida meleagris*) also offer a significant contribution to many households in this region. Accordingly, these birds are straightforward to manage because they feed themselves; they are affordable, as well as reliable, and are frequently used for ritual sacrifices. Dogs (*Canis familiaris*.) are common in many households in this region, and they play an essential role in livestock herding, hunting and guarding homesteads during the day and night. In other societies, historically, dog meat has been considered a delicacy (Tauxier 1912). However, in this region, eating a dog is regarded as a taboo, and therefore it is discouraged. Donkeys (*Equus asinus*) are traditionally known for their utility as a mode of transport during long-distance trade connections. In this region, unlike other animals, the donkey does not offer any form of subsistence but primarily, donkeys are very important for transport and drawing power, especially for ploughing.



Figure 8. Goats from Selonga Community near the Iron Age site of Mtanye.

3.4. Conclusion

This chapter outlined the relevance of environmental parameters and how resilient are they in promoting adaptability and enhance people's livelihoods. Due to their drought-tolerance, goats and cattle are widely favoured by households in the area. Hence, livestock in the region is regarded as a symbol of wealth, while plants offer food security and enhance people's livelihoods among different households in the area. This is strategic because it helps people to cope up with the challenges of low rainfall and make sure that food is available all year round. Crops and wild plant resources are reduced due to climatic changes. People get help from donors and Non-governmental organisations.

CHAPTER 4: THEORETICAL FRAMEWORK

4.1. Introduction

Understanding the interactions between humans, organisms and the environment is one of the major themes addressed in archaeology, using various models, theories and methods (Pearsall 2015; Van der Veen 2018). In archaeology, studies on interactions between humans, organisms and the environment have gained momentum over the years, with a massive influence from behavioural ecology (Winterhalder and Smith 2000). For instance, Renfrew (2005) talks of the material engagement between humans and things, while Hodder (2011, 2014) also discusses the entanglement between humans and things. They outlined that human-thing dependency can lead to entrapment. For Hodder (2011), things may mean the bones, lithics, plants and other material cultures found in the archaeological record and the environment. Against this background, it is therefore inevitably the principal aim of many recent archaeobotanical researchers, to understand these mutual interactions between humans and plants, as well as the role of these interactions in the cultural development of past human societies (Van der Veen 2018). This study was guided by mutualism theory which is explained fully in the following sections. This chapter 4 explains how humans benefit from interacting with plants using ethnohistorical and archaeological information. It will also explain how plants benefit from humans from an ecological point of view. The chapter will outline the strengths and weaknesses of mutualism theory. Furthermore, the methodological approaches that guided the recovery, and analysis of the data is presented in this section, citing their strengths and weaknesses.

4.2. Mutualism Theory

The term mutualism was first coined by a biologist called Joseph van Benenden in his 1876 book “*Animal Parasites and Messmates*”. The focus in biology was on co-evolutionary processes and in archaeology, the commonly used terms include entanglement, rationality and dependence (Van der Veen 2014; Hodder 2011). The concept of understanding human-plant interactions is broadly taken from the concept of symbiosis which is defined by three terms - *commensalism*, *mutualism* and *parasitism* (Mikula et al. 2018; Wilson 2014; Solomon et al. 2015; Boucher et al., 1982; Rindos 1984; Thompson, 2005). *Commensalism* occurs when one species benefits while the other is not affected and the benefit may be for other purposes besides food (Mikula et al. 2018). *Parasitism* occurs when one species gains at the expense of another, which results in other being

harmed (Wilson 2014; Solomon et al. 2015). On the other side, *Mutualism* refers to “an interaction between two different species that are beneficial to both and can be explained as a (+/+) interaction of species” (Boucher et al. 1982:315). Figure 9 illustrates the symbiosis model and how it works.

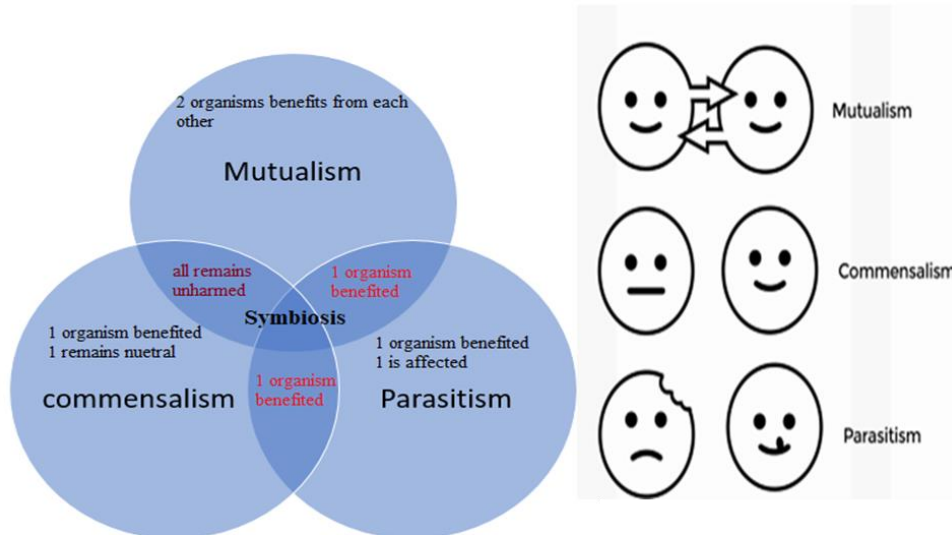


Figure 9. Major branches within Symbiosis model (adapted from www.oceanclassrooms.com, 2014)

Kuzner (2001: 19) refers to mutualism as a product of the co-evolutionary process that develops from the fitness-maximizing behaviour of individuals in interacting species. Likewise, Rindos (1984: 143) defined mutualism as a co-evolutionary approach where there is a symbiotic relationship between species. For instance, Rindos (1984) takes domestication of plants and animals as a co-evolutionary process in which humans, animals and plants benefit as they undergo a process of change. Rindos (1984) further argues that, in the process of domestication, plants diverge from an original gene pool and establish symbiotic protection as well as distribution. Van der Veen (2018: 75) noted that “the best example of human-plant mutualism is shown through the transition to farming and the associated emergence of sedentism, ownership and wealth accumulation.”

For Van der Veen, the interactions between humans and plants in the past brought fundamental changes in plants, society, vegetation and the material world (Van der Veen 2018:75). Hodder (2011) argues that cereals depend on plants for their regeneration and as such humans depended on cereals and cereals on humans through continued intervention, hence the two become co-

entangled. From cereals humans get an increased yield per square area of land cleared, but at the same time got trapped into the clearing, planting, weeding, harvesting, winnowing, pounding, collection and so on (Hodder 2011: 162). However, it is imperative to note that mutualism happens not only between humans and plants but among various organisms.

The best example of human-animal mutual relationship is the one between the honeybird and the Borona people in Ethiopia, Kenya and the Hadza in Tanzania (Isack and Reyer 1989). These people developed a whistle which they use to communicate with the honeybird so that it can show them where the honey bees are located (Isack and Reyer 1989). When the honeybird shows them where the honey is located, these people must leave some honey slices from which the bird will extract the bee eggs and eat bees. Mutualism can happen between animals and plants. For instance, a bee and a flower (Pollan 2001, Thompson 2005); the bee drinks the nectar from the flower, and the flower attaches its pollen to the bee, enhancing the pollination process. Mutualism also happens between animals and animals, for example, Bovines and bacteria, the host is helped during the digestion process, and in turn, the bacteria benefit nutrients from the host (Boucher et al. 1982).

There are a lot of case studies where *Mutualism theory* has managed to influence the thinking of several ecologists, anthropologists, biologists and archaeologists in other parts of the world. Speth (1991) explored the mutualistic food exchange between bison hunters and corn farmers in Plains-Pueblo. Speth (1991) looked at the significant aspects such as intermarriages, seasonal timing, and exchange of protein and carbohydrates between these two groups. The study was examined against the background that there have been no marriage ties between these two groups because the bison hunters were regarded as inferior. However, Speth (1991) found out that the bison hunters had to increase their hunting skills by devoting their time in bison hunting to enhance their status to marry women from the corn farms. Speth also found out that these two groups exchanged meat (proteins) and corn (carbohydrates) and this happens because during winter the foragers had meat obtained from hunting and during spring the farmers had corn obtained from farming. These mutualistic relations were said to have existed for an extended period between these two groups. Renouf (2003) applied this theoretical framework to examine the interaction between two prehistoric Indian and Palaeoeskimo who co-existed on the Island of Newfoundland in Northeastern Canada. Results of the study indicated that the relationship between these two groups was complementary and competitive based on their niche differentiation and overlap.

In Africa, hunter-gatherers and farmers are said to have mutually coexisted, and the interactions between these two groups was a mutually beneficial situation (Denbow 1999; Murphy et al. 2001; Wadley 1996; Mitchell 2003; Kusimba and Kusimba 2005; Lane 2015; Kusimba 2005). Kusimba (2005) examined forager farmer interactions in Eastern and southern Africa using the symbiosis model, where a mutual relationship between hunter-gatherers and farmers existed to such an extent that wild foods were traded with agricultural products. However, there is limited research in southern Africa, explicitly targeting archaeobotanical remains to understand the mutualistic relations between human populations and plants in the past. Using such models allows researchers to understand complex behaviours that existed between humans and plants and how this influenced the development of various societies in the past.

The following section uses ethnohistorical information in the region and elsewhere looking at how humans have benefited from interacting with plants. The data used includes records from historical documents, ethnobotanical studies carried out by other scholars in Zimbabwe and first-hand accounts recorded by the researcher during fieldwork. The aim is to show how far humans have been interacting with plants in the past and present.

4.3. How Humans Benefit from Plants: An Ethnohistorical Context of Plant Use in Southern Africa

Humans have benefited a lot from plants because plants play an integral part in people's daily livelihoods (van der Veen 2014, 2018; Maroyi 2015; Cunningham 1988; Jonsson 1998; Pearsall 2000). People in the past used plants for rituals, food, and domestic uses such as firewood, livestock fodder, building cattle pans, thatching houses, among others (Pearsall 1999; Hastorf 2000; Miller 2000; Fuller 2008; Sievers 2005; Pollan 2001). The hunter-gatherers and the farming communities both benefited from plants, and it is from these relations with plants that domestication and agricultural systems expanded, creating complex societies across the globe (Antonites and Antonites 2014; Kusimba and Kusimba 2005; Kusimba 2005; Mitchell 2003). In the previous chapter, it is indicated that there are various issues which are yet to be studied using archaeobotanical remains. It is also essential to explain it from an ethnohistorical view looking at people benefited from interacting with plants. Results from ethnohistorical studies across southern Africa and other parts of Africa have shown that humans helped from plants in many ways, ranging from economic, social, religious to political.

4.3.1 Food

Humans benefited from plants economically in various ways. Plants both the domesticated and wild, remain a source of food for many people across the world. Looking at the role of crops as food, most ethnographic studies indicated that crops such as sorghum, cowpeas, millets, Bambara groundnuts, pumpkins, squash and many other traditional vegetables contributed immensely as source of food security among various communities in southern Africa and Africa in general (Cunningham 1988; Gomez 1988; Jonsson 1998; Maroyi 2012, 2015; Magbwe and Manyanga 2013; Ndiweni 2015). The nutritional value of these crops is highly recommended, even in modern day societies. Sorghum and millet are used in the daily production of food and beverages. Among the Shona, beer (*doro rerukweza*, *doro rezviyo/ doro remapfunde*) is considered a unique beverage which unites people during events such as *humwee* (cooperatives), rain calling ceremonies (*mukwerere*) and so on.

These crops were also crucial during trade where people could do barter trade, exchanging grains and other resources within their social interactions (Beach 1980). It is recorded in many Shona ethnographies that the one who has more grains is regarded as being wealthy and powerful enough to have subjects or other people to work for them in exchange for grains (Beach 1980; Jonsson 1998). The chief, with his *Zunde ramambo* concept, ended up having subjects pay tribute in the form of grains which were then kept for the next season. It is not only food that is gained from these crops, but also animal fodder, especially after harvesting. They stock and pile the stocks either in big trees or construct what they call in Shona *mutanhuri* or *mutanhu wemajanga*. All these benefits exist as a result of people mutually interacting with plants.

More importantly, people also acquired food from wild plants (Maroyi, 2012). In western Kalahari among the Kung San, Richard Lee conducted a study on the use of the Mongongo fruits and nuts and their contribution to subsistence (Lee 1979). He argued that besides living in a harsh environment, these people managed to thrive on abundant plant resources such as mongongo fruits and nuts. As noted by Robbins and Campbell (1990) the plant resources among the Kung San in the Kalahari constituted about 41% of the diet, and about 28% represented the mongongo nuts (Lee 1979; Robbins and Campbell 1990). For more information on the gathering, processing and consumption of the Mongongo fruits and nuts in the Kalahari Desert (see Parkington 2012; Lee 1973, 1979; Robbins and Campbell 1990). Many wild plants, for instance, *Amarula*, *Grewia*, *Adansonia digitata* (baobab), and many others are documented as they offer a significant

contribution towards food security and sustainability among various Indigenous communities in Africa.

4.3.2. Medicine

Wild plants also provide medicinal benefits for humans besides food. Looking at the history of man since thousands of years ago, plants have been at the forefront in delivering medicines to cure many diseases (Petrovska 2012; Safowora 1996; van Wyk et al. 1996; Iwu 2014). In China, around 5000 BC, over 4000 medicinal plant species were recorded, and there is archival evidence of the use of plants for medicinal purposes around 1600 BC in Syria, Babylon, Hebrews and Egypt (Wang et al. 2007; Derry et al. 1994). Plants were used to cure diseases such as leprosy, skin disorders, respiratory disorders, digestive, urinary, cardiac and many other ailments. For instance, among the Tonga people in Binga, Maroyi (2006) found out that the Moringa tree (*Moringa oleifera* Lam.) is medicinally vital as its bark, leaves, roots and seeds were used to cure diseases such as asthma, gout, rheumatism, and to alleviate toothache, to name a few. This tree is scientifically proven in curing a myriad of conditions (Oliver-Bever 1986; Maroyi 2006). Several trees and plant species have medicinal properties, and this has benefited humans since the prehistoric period.

Plants were not only used to cure sickness; they were also used to instil courage among warriors, for instance, during the 1904 Maji Maji war against German colonial rule (see Manson 1998). One of the leaders who influenced the warriors, Prophet Kinji Kiteli of the Matumbi, ensured that the warriors believed that the magic water prepared by the prophet was going to protect them from German bullets (Manson 1998). Accordingly, the magic water, which was a mixture of water, millet mealie meal and other plant remains was regarded as medicine. Before colonialism, in Africa, people made use of wild herbs, and this was negatively affected by European colonisers' disregard for traditional herbal medicine and their discrediting of African medicinal practices as evil and unscientific (Harvey 1962; Gelfand et al. 1985; Waite 2000). The coming of missionaries ruined the Indigenous Knowledge systems possessed by Africans. However, in other places, the medicinal practices continued unabated. Africanist scholars began to revisit and promote indigenous therapeutic knowledge systems across the continent.

4.3.3. Intoxication

Intoxication is one of the benefits that humans acquire from plants. People have used a myriad of plant species across the world for intoxication, the most popular being: tobacco, cannabis (*mbanje/dagga*) and other aromatic resources that are used during smoking. According to a report by UNODC (2015), globally, about 181million people in the 15-64 age range use cannabis for intoxication. It is one of the commonly used psychoactive substances across the world. For instance, in Binga, intoxication from this substance is frequent (Munikwa 2011; McGregor 2009; Saidi 2013). They use calabash smoking pipes which they call *ncelwa* or *ndombondo* with either tobacco or cannabis (Colson 1971; Hughes 2010; Gambahaya and Muhwati 2010; McGregor 2009; Munikwa 2011; Ncube 2004; Saidi 2013; Siamonga 2012).

It has conventionally debated that smoking was introduced by the Portuguese to southern Africa; therefore, it did not exist before the coming of the Europeans (Clarke 1998). However, Van der Merwe (2005:147) disputes this, arguing that smoking existed way before the European contact because there is evidence that Khoisan people engaged in the smoking of aromatic materials before the coming of the Portuguese and the European connection. This is also supported by Phillipson (1983:308) who found that among the Tswana people, the practice existed before the coming of the Europeans since it was associated with powerfulness and sharpness. Among the BaTonga people, the *ncelwa* or *ndombondo* represents their long cultural and historical smoking practice (Gambahaya and Muhwati 2010; Saidi 2013).

The *ncelwa* is made of squash, a calabash-gourd with a male stem attached to it (see fig 10). The tobacco or cannabis (*mbanje or ganja*) is placed inside the clay male stem and inhaled through a long squash-pipe. The *ncelwa* does not only show evidence of smoking, but it also demonstrates BaTonga women's ingenuity and cultural identity. Using artefactual semiotics Saidi (2013) managed to study the cultural importance of the *ncelwa* in the history of the BaTonga people, hence understanding the connectedness between humans and individual plants in the past is vital because these plants were used for various reasons, portraying different visual and physical meanings. For instance, among the Shona, the calabash-gourd is seen as a vessel or a household utensil that used to performs domestic uses and rituals, but among the BaTonga it is regarded as the *ncelwa* a vital object used for smoking and intoxication. These issues can only be understood

when researchers delve deep into the understanding of the mutual relationships that existed between humans and plants.



Figure 10. Smoking in Binga using calabash smoking pipe. a) Tonga elder smoking from calabash pipe at Binga near Lake Kariba in Zimbabwe. b) The ncelwa and the male clay stem which “holds tobacco or dagga that produce smoke that passes through the calabash filled with water” (photo by <http://thevagabondadventures.com/>)

4.3.4. Construction



Figure 11. Uses of plants for construction

a) round house with postholes (Huffman 2008)

b) thatched bathroom, grain storage, small stand for plates and pots

c) Baobab tree shelter

d) grain bin (Mabgwe and Manyanga 2013)

e) Goats inside the kraal

f) cattle inside the kraal

Figure 11 indicates how humans benefit from interacting with plants by constructing houses and grain storage. Individual plants have excellent qualities for creating a shelter for humans and livestock, as well for building grain storage facilities. Ethnographic studies in southern Africa indicated that most of the Bantu speaking people lived in roundhouses constructed with poles and dagga and thatched with grass (Huffman 1989). MaGonagle (2007) noted that the Ndaui built their roundhouses using wooden poles and grass thatch. Many Portuguese documents and most accounts narrated by missionaries who first arrived in southern Africa indicated the existence of roundhouses across Africa, in Kenya, Mozambique, South Africa and so forth.

Most excavations carried out at many southern African Iron Age sites recorded evidence of roundhouses, sometimes with postholes and thatching grass (Huffman 1989, 2007, 2008). At Great Zimbabwe monument, heritage managers replicated the roundhouses that existed during the Great Zimbabwe period. Currently, some people are now living in urban areas where round houses

made of poles and grass are non-existent. However, such buildings are still a common feature in rural parts of Zimbabwe and across other rural contexts in southern Africa.

Mabgwe and Manyanga (2017) recorded a lot of grain bins that had been constructed using mopane poles and tied with ropes. Ethnographically, MaGonagle (2007) noted that the Ndau grain bins were built of poles and dagga, with straw on the roof, and sometimes the bundles of grass and wooden poles were used to wove grain bins. Apart from the abovementioned structures, the construction of livestock kraals (*matanga* and *zvirugu*) also relied on plant products. It is important to note that humans benefited a lot from plants and to a greater extent, this helped them to cope with challenging daily situations.

Also, the role of plants in providing wood fuel is one of the economic benefits that humans enjoyed to a more considerable extent. Most Iron Age sites in southern Africa contained many samples of charcoal, which probably was used for cooking, warming, and so forth. The fire was used for iron smelting and communication in the form of smoke. Currently, some communities are making a living from selling charcoal and poles. The taboos and rites associated with the selection of such woods were also significant in the past and research towards these issues is limited. Learning from my grandmother's knowledge and stories, I noticed that certain woods should not be used for firewood as they are too smoky and cannot produce proper charcoal for cooking and warming.

4.3.5. Household Utensils and Implements



Figure 12. Household utensils and implements made from plants

(<http://picdeer.com/tag/tswanda>; <http://thevagabondadventures.com/>)

- a) cooking sticks(*mugoti and musika*)
- b)winnowing basket(*rusero*)
- c) Binga girls using mortar and pestel (*duri and mutswi*)
- d) basket (*dengu*)
- e) people singing while standing on a brown mat in the middle (*rupasa/ rukukwe*)
- f) Basket (*tswanda*) with African horned melon (magaka)

Household utensils and implements shown in figure 12 are made from plants and these utensils and tools are very vital to people's daily lives. The selection behaviours attached to these implements and household utensils are poorly researched; hence more research should be done to capture the processes that are involved in the selection of individual trees to make this equipment and implements. In addition, the canoes, the fishing baskets and other equipment were ethnographically documented (see Malanand Owen -Smith 1974; McLaren 1958, Tinley 1964; Larson 1975.) People crafted baskets for wild plant gathering, grain storage and collection, as well as other activities such as winnowing and transportation. The mats (*rupasa/mhasa*) are used for bedding and were even exchanged through barter trade to enhance livelihoods. MacGonagle (2007) recorded that the Ndaу speaking people stored their rapoko in large baskets or huts and processed them using wooden mortar and pestles. He also noted that the residents in Zamchiya among the Ndaу made use of the Musasa tree bark to store grain. In the rural areas' parts of Chivhu and Gutu in Zimbabwe, the Musasa tree bark is also used to make beehive (*mukoko wenyuchi*). The wooden mortar (*duri*) and pestle (*mutswi*) (figure 12) are made from unique trees such as male marula (*mupfura*) which does not produce fruits. The pestle is made up of an individual and strong tree called *Terminalia sericea* (*mususu*). This is the same tree that is used to make cooking sticks, yokes, axe handles and many other wooden utensils. These special household utensils played an essential role in people's daily chores. In Shona culture, the wooden mortar (*duri*) and pestle (*mutswi*) are used at the same time with winnowing baskets (*rusero*) and sometimes grinding stones (*gwiyo*) to perfect the end product, for instance in the processing of peanut butter, pounding of rapoko, sorghum, millets or even maize (which produces *manhuchu / mashazhari*) and other products such as medicine. The utility of plant products for the household includes the making of cooking sticks (*mugoti and musika*), gourd scopes (*mukombe*) mainly used as a special cup during beer-drinking, for example at rain-making ceremonies (*mukwerere*) or any other events such as community cooperatives (*humwe or majangano*). Yokes (*joki*) and many more wooden implements are used to facilitate various duties daily. Sweeping brooms (*mutsvairo*), wooden bench or stool

(*chituro*), and many more are made from plants and their importance in the daily lives of people should not be underestimated. Various utensils and implements were investigated among the Tsonga, Tswana, Zulu and the Herero people (see Palmer and Pitman 1972; Liengme 1981,1983; Junod 1972).

Besides, plants were used to make hunting and fishing implements. According to Liengme (1983:76), most of the hunting and fishing equipment were made from plant material. The fish traps, canoes, fishing lines and sticks, bows, arrows, knobkerries, spears and axe handles were crafted from particular trees. Research into understanding these implements in archaeology is scant, yet they indicate behaviours of human's daily life.

4.3.6. Musical Implements

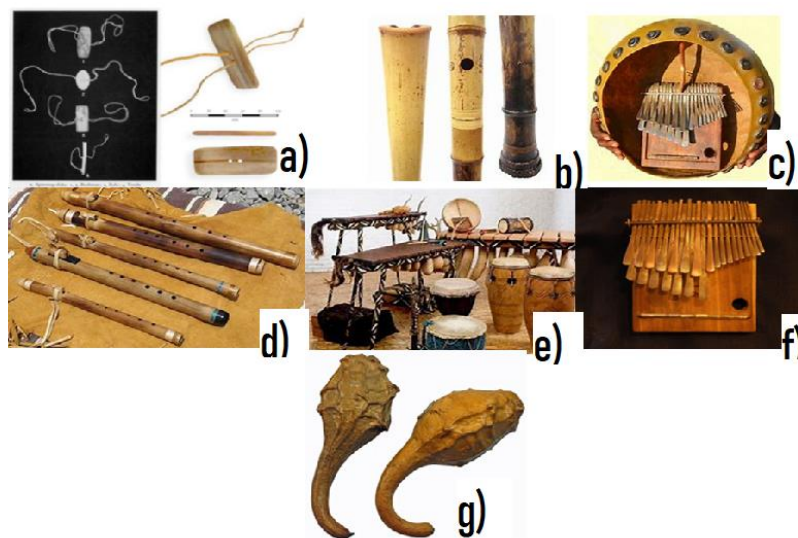


Figure 13. Few examples of Musical Instruments made of plant material

- | | |
|---|---------------------------------------|
| a) KK058 spinning disk and replica (Kumbani et al 2019;Kirby 2013) | e) Drum beat (<i>ngoma/ ingoma</i>) |
| b) Bamboo flute | f) Thumb piano (<i>mbira</i>) |
| c) Thumb piano (<i>mbira</i>) | g) Gourd (<i>hosho</i>) |
| d) Bamboo flute | |

Significant musical implements (Figure 13) are made from particular plants very useful in making musical instruments in the past since music is spiritually essential and widely enjoyed by people (Kirby 2013). According to Kumbani *et al.* (2019: 693), music represents a social and symbolic expression of all human societies. For Kumbani *et al.* (2019) the topic of music in the past is one that is not thoroughly researched in southern Africa, yet there is so much about cognitive and symbolic expressions we can reconstruct from the musical instruments that are in the archaeological record. Kumbani and colleagues recorded vast musical instruments found

ethnographically among the Venda, Zulu and Tswana. These musical instruments include aerophones, idiophones, membranophones and chordophones as well as the bullroarers and spinning disks (see figure 13) and Kumbani et al. (2019). In the Zimbabwean context, music is part of their social life where they enjoy dancing during events such as *humwe*, rainmaking and other gatherings. The type of music in Zimbabwe include *mbende*, *Jerusalem*, *jakwara* and *jiti* and the instruments used include *mbira*, *marimba*, drum beats (*Ngoma*), et cetera. The *mbira* is made up of wood and small metal bars or a traditional material made from a plant called *Leganaria siceraria* (*dende*). This is the same plant used to make gourd scopes for beer drinking (*mukombe*). It is because of the mutual relationship that existed between humans and plants that all the above uses were recognised. It should be noted that with regards to the daily lives of many people in Africa, the music and enjoyment benefit humans resoundingly.

4.3.7. Rituals and Ceremonies

Symbolically, some trees are linked to ancestral spirits, and their benefit to humans is spiritual. Among the southern Shona people, there is a belief that the spirits like to dwell in trees (Wilson 1989). For this reason, Mauch the earliest colonial visitor in 1871, noted down some trees left standing in the fields in Masunda, Chivi area. These trees included the fig tree, marula (*Sclerocarya birrea*), *Parinari curatellifolia* (*muhacha* or *muchakata*) and others. This trend is not peculiar to Masunda; it a common occurrence in many Zimbabwean communities, including the research area under study, which is in Gwanda. Some trees left behind in the fields, possibly for reasons ranging from spiritual, social and economic. For instance, benefits range from manure, shade, fruits, and above all these big trees being used when performing rainmaking ceremonies, rituals and other events such as (*humwe*). In the rural, our elders used to narrate stories where in some cases pots of *rukweza* beer (finger millet) or sorghum will be left under such trees or in forests for the spirits of the land or landowners (*varidzi* or *vadzimu venyika* or *vakuru venzvimbo*). Such trees mentioned earlier on are also considered permanent locations for spirit mediums (Gelfand 1971). Among the Zulu and Xhosa communities, particular trees are used for purification, cleansing and initiation ceremonies (Hutchings 2007). Hutchings (2007) observed four indigenous plants used by the Zulu and the Xhosa communities during purification and burial rites such as *Lippia javanica*, *Ziziphas mucronate*, *Helichrysum* and *Ficus* species. These trees are regarded as “*The trees of Life*” among these two groups based on the roles they play (Hutchings 2007).

Plants were essential in the past with a significant impact in political spheres. As noted by Smith (2016), when food producers and pastoralists began their movements across the continent, they transformed African societies to complex societies as a result of agriculture. They could feed large populations, to control land and to store surplus food that they were able to become powerful to disperse and integrate other small communities. Most ethnographic information among the Shona indicated that those with surplus food had political power and ability to dominate others (Beach 1980). Chiefs had the *Zunde ramambo* to which food was kept for the next season (Beach 1980). In most rural places in Zimbabwe, those with more harvests have the power to control others; hence it is from this connection that plants contributed to the development of many societies. However, be that as it may, one would want to understand how plants mutually benefited from humans. The section below outlines how plants helped from associating with humans in various ecosystems.

4.4. How plants benefit from Humans: An ecological point of view.

According to Van der Veen (2018: 74) people's engagement with plants in the sense of gathering, tending, cultivating, pruning, weeding, harvesting and consumption creates life rhythms where these two organisms are tied together through a mutualistic relationship. However, while anthropologists and archaeologists have managed to point out the role of plants to human populations across the world, there has been a tendency of studying these plants as passive objects (Van der Veen 2014; Pollan 2001). Little, if any factors have been explained from a plant's point of view (Pollan 2001; van der Veen 2014, 2018). *Mutualism theory* helps one to understand plants, not as mere passive objects but as active subjects with complex behaviours that are formed as a result of interacting with human populations. Pollan (2001) defined the historical relationship between people and plants as a co-evolutionary process. The plants that he used include the apple, marijuana, potato and tulip. For Pollan (2001), the beauty, the desire for sweetness, medicine and intoxication, offered by these plants have necessitated their interactions with human thereby enhancing their reproduction and proliferation across different habitats. Our thinking that plants only benefited humans or humans is the ones who domesticated plants are contestable, considering that for plants, it might have become an evolutionary opportunity for them to advance their interests (Pollan 2001: xiv; van der Veen 2018). For Pollan (2001), the relationship between humans and plants should not be underestimated because domestication and cultivation of plants was not only something good humans did for themselves. Inadvertently, this was good for the

plants as well, because, without this artificial selection from the wild, some of them could have gone into extinction.

4.4.1. Dispersal

The dispersal of plant seeds and pollen from one habitat to the other is an example of mutual benefit that plants enjoy as a result of interacting with humans. Plants are not locomotive; hence they need either windy, animals or humans to move them from one region to the other (van der Veen 2014, 2018). Purugganan and Fuller (2010: 171) noted that cultivation and domestication of crops started from 24 regions of both the New and the Old worlds where humans played a more significant role, independently distributing wild food plants and crops across the globe. For Purugganan and Fuller (2010, 2009) the dispersal of seeds from their wild progenitors has managed to transform the hunter-gatherers to sedentary agricultural societies. Thus, domestication as a unique example of a mutualistic relationship that promoted both symbionts, i.e. plants and humans. Hunter-gatherers gained more food from the wild, and a sedentary life wherein agriculture benefited their communities to expand into complex societies. On the other hand, plants were propagated, their yield sizes and morphology increased, and colonisation of the history of humanity achieved.

Meanwhile, Grimillion (1989) discussed the mutualistic relationships between people in the south-eastern United States with the Maypops plant (*Passiflora incarnata L.*). The seed dispersal of the weed plant and subsequent environmental modification by humans were cited as a mutual relationship whereby humans domesticated and consumed this plant, and in return, their propagules were distributed across the anthropogenic habitat created by humans (Yarnell 1987; Grimillion 1989:146). Furthermore, Kuzner (1993) applied mutualism theory in south Central Andes to understand the origins of the domestication of the wild plant called *Chenopodium (C. quinoa)*. The plant is currently grown as a food plant in the region. For Kuzner (1993) the dispersal of this plant from the wild was necessitated by herd animals and herders who transported them to pastoral camps where they managed to grow well in organic corral soils. The herd animals and the herders benefited food from the plants, and in turn, the plants benefited from being transported to pastoral camps where disturbed soils helped them to grow well (Kuzner 1993). It is from these mutualistic relations that conclusions were made that pastoralism played a significant role in the farming of this plant in the Andean landscapes (Kuzner 1993).

In addition to the above, during pre-history, people had gardens and agricultural fields where wild and domesticated plants followed these localities because they offered disturbed fertile soils. Humans unconsciously fertilised their campsites through the discarding of waste or garbage (Kuzner 1993). These manured places attracted plants, and this created a bond between those plants and people. Researchers have explained this relationship using the *camp follower hypothesis* (Anderson, 1952; Sauer, 1952). This hypothesis notes that some plants are typically pioneers or colonising plants that naturally propagate themselves near human habitats (Anderson 1952; Kuzner 1993; Sauer 1952). Crites (1985) used this hypothesis in North America to explain the domestication of cultigens such as *Chenopodium bushiannum*, *Polygonum erectum* and *Helianthus annuum* (Asch and Asch 1985; Crites 1987). This camp follower hypothesis is common in modern societies where plants such as *Cucurbita maxima* (*munhanga/muboora*), *Vigna unguiculate* (*munyemba*), *Gynandropsis gynandra* (*munyevhe/ nyevhe*), *Bidens pilosa* (*mutsine*), *Corchorus olitorius* (*derere*) and other traditional vegetables grow in middens and dumping sites around houses and near gardens where the land is humanly altered (see Maroyi 2015; Jonsson 1998). Van der Veen (2014) referred to these group of weeds as *Synanthropes* because of their close life relationship with humans, indicating that they signify past ecologies, agricultural systems, arable fields and the scales of production. These plants have, for a long time, been considered to be very important in providing food security to many modern communities in Zimbabwe (Ndiweni 2015; Maroyi 2015). Sometimes people do not grow them, but they grow independently, then humans harvest them for consumption and sometimes store them as dried vegetables (*mufushwa*) for the next season when the environment poses challenges to people's livelihoods and threats to the survival of such plants. For Van der Veen (2014: 801) the relationship between humans and these *Synanthropes* signifies that they operate in a mutually constructed ontological realm.

4.4.2. Protection

Protection is one of the benefits that plants gain from mutually interacting with humans. According to Boucher et al. (1982), plants are protected by humans, either from environmental variation or from enemies. Some plants are not favourable in specific environments to the extent that they can go into extinction. Human's irrigation and gardening practices can protect plants from dry climates that may affect their survival. Also, there are a lot of taboos that specific communities attach to plants, which in turn protect these plants from going into extinction. For instance, in African societies, it is not permissible to cut down fruit trees such as *Marula* and *baobab* (Wilson 1989). It is also not permitted for such trees to be cut down for firewood. Furthermore, some remain protected if they are regarded as sacred, therefore unusable. Today

heritage managers are beginning to realise the importance of integrating intangible traditional taboos and norms, towards the sustainable management and preservation of cultural and natural landscapes and woodlands. This is one of the unique benefits that plants enjoyed as a result of their mutual relationship with humans.

4.5. Implications of Mutualism Theory

Mutualism theory is a complementary framework as it co-exists with other methods and techniques from other disciplines such as natural sciences which help researchers to shed light on the relationships between humans and other organisms in the ecosystem (Wilson et al. 2016). This theory provides a nuanced framework for the investigation of reciprocal benefits between humans and plants. Realising its benefits legitimises the study of plant remains in archaeology as it allows for a clear understanding of how humans and relate in an environment. Pollan (2001) has it that, there is a long time belief of treating plants as mere passive objects and humans as active subjects who benefited primarily by domesticating and gathering plants from their niches. However, mutualism theory allows researchers to view plants as active subjects with complex behaviours that impacted human populations, thereby changing their lifestyles from foragers to sedentary lives, as well as complex societies (Pollan 2001; Van der Veen 2014, 2018). Mutualism also helps researchers to engage human-plant interactions from both human and plant points of view, unlike conventionally, where only humans were regarded as the beneficiaries in their interactions with plants. Also, environmental determinism theory has been at the forefront in environmental archaeology, towards explaining the impact of the environment on human beings. However, this mutualism theory goes beyond to investigate how human activity transformed different ecosystems. Mutualism theory accepts that both humans and the environment co-exist, and this mutual relationship triggered changes in social life, human populations, distribution of plant species across the globe, as well as the formation of states, niches and habitats across the world. However, while noting the positive impact of *mutualism* theory in archaeological explanations, there are loopholes contained in this theory. According to Bronstein (2001), mutualism between species is shaped not only by benefits but also costs. Mutualistic interactions between humans and plants can inflict costly damage. For instance, humans may aid the process of seed dispersal, but at the same time, they destroy a significant proportion of these seeds (Vander wall 1994; Bronstein 2001). In this process, humans act as exploiters, which may cause individual trees, crops and grass to go into extinction. However, this is where the concept of resilience and adaption may come in and help humans or plants to survive when any variations or changes threaten their lives. Whenever these mutualistic relationships are not clear to understand, more ethnographic information and

scientific methods and theories can be used to complement the shortfalls of mutualism theory. Besides its weaknesses, this theory contributes to an understanding of human-plant relationships in the past and how these interactions impacted changes in human lifestyles, populations and the complex behaviours of plants.

4.6. Conclusion

In conclusion, human-plant interaction is here viewed as mutualism. The benefits, humans and plants get from each other are fundamental in various ways. Using ethnobotanical, ethnohistorical and ecological information, it is revealed in this chapter that, the symbiotic relationship between humans and plants is mutual. A deep understanding of these interactions outlined that humans relate with plants differently depending on various forces which include the environment, the beliefs, the benefits accrued and amongst others. This theoretical framework indicated that domestication, farming and distribution of plants from one region to the other is facilitated by a mutual relationship between plants and people. It is widely known that agriculture was at the centre of many Iron Age economies. Crops were shared from one region to the other, and this distribution also promoted the reproduction of many plants and finally populated the whole world. We can even begin to think that the development of complex societies from small tribal societies was necessitated by this mutual relationship between people and plants. This theory highlighted that humans could relate with plants not only for diet and subsistence but for many other uses which may include the social, political and religious. This brings us to a point where one can say whether cereals or wild plants, their value to people remains fundamental because the relationship is based on mutual understanding. However, as far as this theory has advantages, it has its weaknesses in its application that needs to be treated with caution.

CHAPTER 5: MATERIALS AND METHODS

5.1. Introduction

Understanding human-plant interactions in the past is achievable if standard methodological approaches are carefully selected. Recent archaeobotanical studies in other parts of the world have made use of advanced methodological approaches to collect and analyse archaeobotanical remains (Hastorf 1999; Miller 2012; Pearsall 2015; Walshaw 2005). However, we still have limited application of proper methods that focus on collecting and analysing archaeobotanical remains from Iron Age contexts in southern Africa. Against this background, the following sections explain in detail the standard techniques used during fieldwork and data analysis. These include desktop and site surveys, standard sampling strategies, mapping, archaeological excavations, ethnobotanical investigations, the use of stereomicroscopes and relevant skills in the laboratory.

5.2. Desktop and site surveys

Literature was consulted, some of which pointed out to the existence and relevance of Mtanye site in the region (Huffman 1972, Huffman 2008). During desktop research, discussions held with researchers who had been for a long time working with many sites in the region. These include Professor Chirikure, Dr Bandama, Dr Mukwende and Robert Nyamushosho. The discussions and the literature produced relevant information with regards to the possible location of the site, the environmental conditions in the region as well as the resources required to commence the fieldwork. Also, the area was inspected using Google Earth and GIS software to have a general understanding of the site's location and the environmental parameters surrounding the site.

We travelled from Cape Town and arrived in Selonga community near the site and proceeded to the possible location of the site based on the information gathered during desktop research. We divided our fieldwork team into groups of three and ground surveys were conducted across the possible site. The fieldwork team covered an area of about 5km² while several artefacts, stone wall terracing, grain bins, hut floors and middens were identified. Other material cultures identified include slag, dolly holes, beads, metal objects, figurines and ceramics. Of importance was the identification of wild fruits trees such as Baobab, Marula, *Grewia sp*, *Lannea schwenfirthii* et cetera.

5.3. Mapping and Excavations



Figure 14. Mtanye site map showing several features identified (Map by Scholfield 2017)

Mapping was conducted using GPS coordinates recorded at each important feature identified during ground-truthing. Four locations mapped were prepared for excavation based on judging their potential to produce potential results. Areas such as middens, house floors, grain bins were chosen because of their potential in bringing better results. Four squares assigned include Mtanye Hill Terrace 1 (S 21°22'59.1" E29°15'12.1"), Mtanye Hill Kraal 1 (S 21°23'00.4" E29°15'12.1"), Site B (S 21°22'59.8" E29°15'10.8") and Western Pot (S 21°22'59.6" E29°15'10.0")

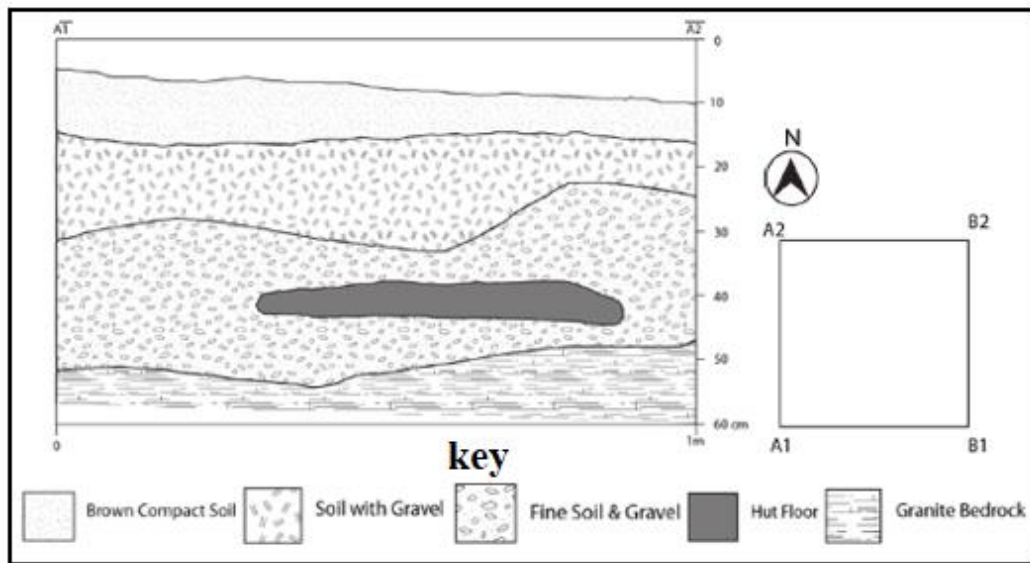


Figure 15. Stratigraphic layers at Mtanye Hill Terrace 1(MHT1)

Mtanye Hill Terrace 1 (Figure 15), was mapped near a terrace where remains of stone walls piled. It was called terrace one because three terraces were found at the site during ground surveys. The trench was dug on top of the hill near a grain bin and measured 1m length x 1m width x 1m depth, with five layers excavated. Soil samples measured 10 litres per layer collected and prepared for flotation. Seeds, charcoal and ceramics were found in this trench. At level 4, a hut floor was also found.

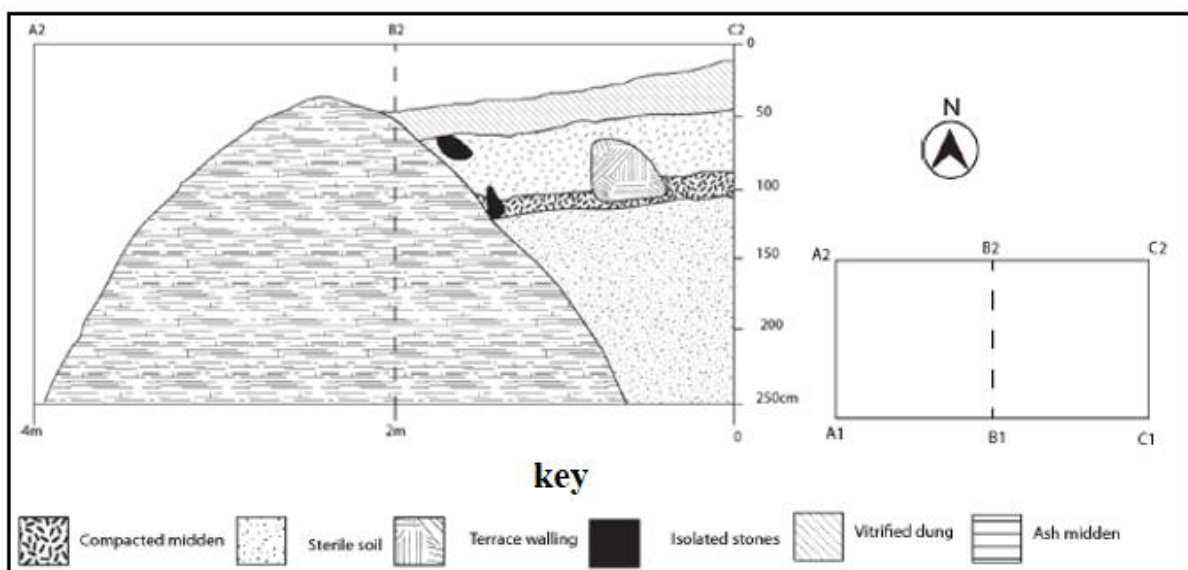


Figure 16. Stratigraphic layers at Mtanye Hill Kraal 1 (MHK1)

Mtanye Hill Kraal 1 (Figure 16), is on the hill where a cattle kraal was found during excavation. It was called kraal one because it was the first to be located on the hill. The trench was measured 2m length x 1m width x 1 m depth. Six layers were recorded at this location. Soil samples measured 10 litres from each stratum was collected and prepared for flotation. More wild and domesticated seeds were marked from this trench with more material culture such as beads, metals, ceramics, and animal bones. Vitrified cow dung and terrace walls were also found at this location.

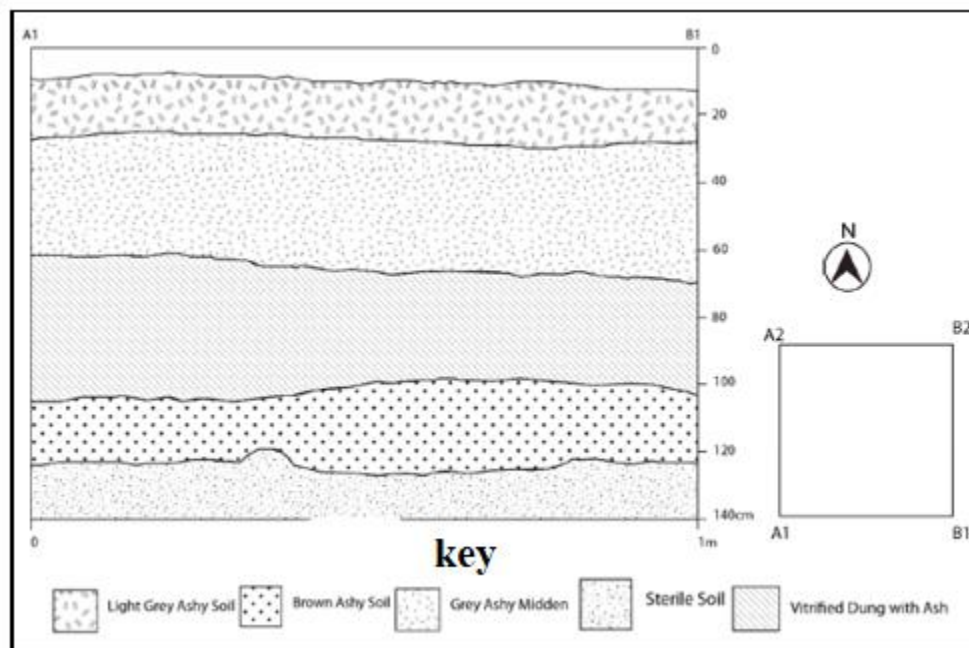


Figure 17. Stratigraphic layers at Mtanye Site B square 1.

Mtanye Site B Square 1 (Figure 17) was mapped at the bottom of the hill. It was called site B because two sites were proposed during ground surveys based on the material culture and other archaeological evidence found during ground surveys which include terraces, grain bins, cattle kraals and several middens in the valley. This trench was an extension of the one previously dug by Huffman in 1972. The square was measured 1m length x 1m width x 1.4m depth. Only five layers were recorded at this trench — the highest concentration of seeds and other material culture found in levels 2,3,4 and 5. Charcoal, pottery, beads and metals were also recovered from this trench.

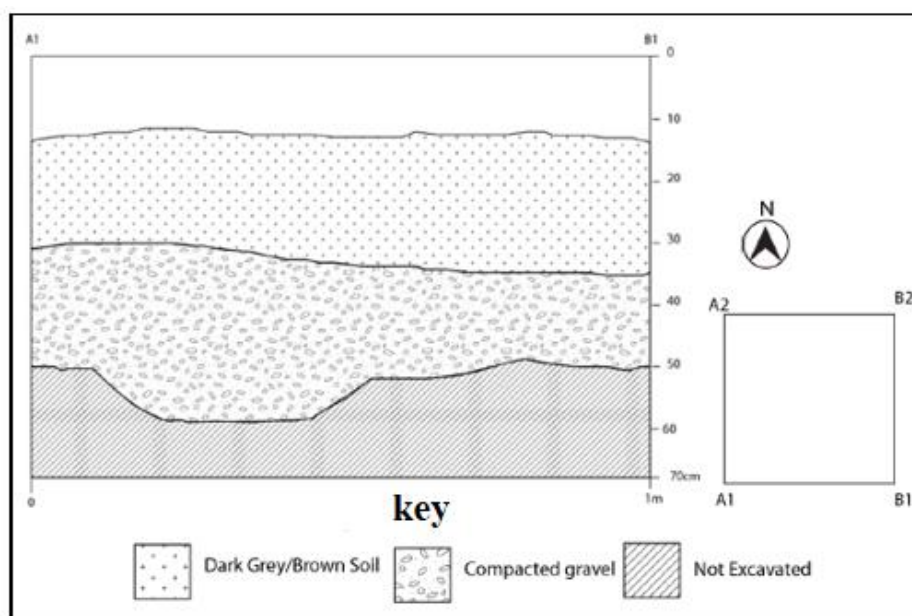


Figure 18. An outline of trench layers at Western Pot

Mtanye Western Pot (figure 18) is on the western side of the Mtanye Hill Kraal 1 and Mtanye Hill Terrace 1. This trench measured 1m length x 1m width x 70 cm depth. It was named Mtanye Western Pot because of the big pot that found at this location. The motive was to see if we could find any grains or residue that may have left inside a ceramic jar. The assumption was that maybe the far was used for storing grains. No grains were recovered from the vessel; but instead bones, charcoal and pottery were identified. Only two layers were excavated at this trench, and soil samples were collected from each segment and prepared for flotation. This trench marked the end of our excavations at the site.

5.4. Sampling Strategies

Flotation soil samples were collected from four trenches guided by different sampling strategies. Various scholars have described a group of sampling strategies that can be used by archaeobotanists during soil sample collection. For instance, *bulk sampling*, *scatter sampling*, *column sampling and blanket sampling* (Lennstrom and Hastorf 1992; Pearsall 2015; Popper and Hastorf 1988; Orton 2000). This research used *blanket sampling*: taking soil samples from each context during excavation because it is difficult to predict which context contains more macro botanical remains (Pearsall 2015: 74). Thus, the *blanket sampling* strategy helps to avoid the weakness of predicting the location where plant remains will occur. It is easy to practice in the field where collections of soil samples become systematic in all contexts even during excavation

(Pearsall 2015: 74). This technique also reduces sample variation, but sometimes it is viable to locate potential locations in which archaeobotanical remains will occur to avoid collecting samples from areas that may yield no results. In addition, following Orton (2000)'s explanation, the *Column sampling* strategy was also used to provide chronological sequence where samples were taken one above the other during the excavation. However, its disadvantage is that samples taken were not representative of the whole deposit. Different sampling techniques can be used in conjunction for full representation of the entire site. In this case, *judgemental sampling* was also implemented in situations where a potential location; for instance, a grain bin was identified. Thus, sometimes these sampling strategies can be used at the same time during excavation, depending on time and resources.

5.4.1. Flotation Process

Flotation method is described in greater detail by Struever (1968) and Pearsall (2015). The flotation method was developed early in the Old-world countries and later in other parts of the world, focusing on small biological materials which were not visible to the human eye during conventional sieving and excavations (Pearsall 2015: 49). This approach in archaeobotany is based on the principle that plant material that is light in weight floats on top of the water and that which is denser sinks at the bottom (Pearsall 2015; Wagner 1988). Plant remains that float on top of the water is called the light fraction and at the bottom are called heavy fraction (Pearsall 2015). The three major types associated with the development of this method include manual flotation (bucket flotation), machine-assisted water pressure and compressed air with frothing agents (Pearsall 2015: 50). In this case, this research used *Bucket flotation* technique, which is light and small to accommodate one person (Pearsall 2015: 53). The method is cost-effective because only a few types of equipment is required. Samples can be agitated by hand, which allows maximum control over samples. This method does not require large volumes of water, especially considering that most archaeological sites are in areas where water is a scarcity. Again, the technique can be helpful, considering that a hand sieve is used to scoop material that floats on top of the water (Pearsall 2015: 53). Be that as it may, the bucket flotation method has its drawbacks. It is slow and physically taxing when dealing with large samples, especially in a larger excavation project. Machine assisted flotation methods or hand pumps recently introduced in other parts of the world can be more effective when dealing with large samples.

5.4.1.1. Floatation Analysis Procedure

a) Equipment required

- Small bucket between 10 to 20 litres
- 1mm kitchen strainer,
- 1mm-2mm small mesh,
- Small squares of cloth for the drying of samples,
- Safety pins, labels, plastic bags,
- Tissue foils, notebook and pencil.

b) Method of material recovery

- The bucket was three quarter filled with water
- Samples were poured into a bucket of water
- These were agitated by a hand
- Substantial fraction sunk at the bottom of the bucket
- Light fraction float on top of the water
- A hand sieve and a kitchen strainer were used to scoop the float light fraction from the bucket.
- A flexible mesh screen was secured with clamps over the mouth of the bucket
- Samples were poured through the compliant mesh screen of a size between 0.50mm-1 mm
- The samples were packed using a cloth awaiting and recorded down

c) Recording of samples

- Details to recorded include sample weight,
- level number,
- trench name and the site name

d) Drying of samples

- All heavy fraction samples collected from the bottom of the bucket were sun-dried and analysed in the field
- Light fraction samples were collected from the top of the bucket and dried slowly for two to three days while hanging them on a string or fish line to avoid exposing them to direct sunlight which may crack the samples.
- A small tag/ note was tied on the cloth with relevant details recorded on it
- After two to three days, samples dried properly and were packed in small plastic bags and labelled carefully.

- A small tag or note was placed inside a plastic bag with the same information as on the plastic bag in case information outside the plastic bag may rub off during transportation.
- To avoid crushing of samples, these were kept in a plastic container box waiting for transportation.

5.4.2. Dry Sieving

Dry sieving is also common in archaeology. This method targets more substantial archaeological remains such as bones, potsherds, beads, metals and many other large assemblages (Pearsall 2015). According to Chiou *et al.* (2013: 38), dry sieving can be useful to get rid of desiccated plant remains when working in dry environments. Working in the Southern Coast of Peru, Chiou *et al.* (2013) used both dry sieving and water flotation. The dual-use of these methods successfully recorded archaeobotanical remains. Chiou *et al.* (2013) stress that flotation and dry sieving methods should help to make sure that consistent results are provided. Pearsall (2000) noted that it is crucial to know the attributes of the soil before selecting the method of recovery. Dry sieving complements bucket flotation during excavation at Mtanye. Standard geological sieve ranging from 6mm, 2mm and 0.50mm were used. Most of the archaeobotanical remains captured during dry sieving include large chunks of charcoal, marula seeds, baobab seeds and other fruit fragments. The disadvantage with this method is that smaller seeds can penetrate and get lost when the sizes of the geological sieves are big. Also, fragile samples can break during dry sieving; hence extra caution is required.

5.4.3. Ethnobotanical Investigations

Surveys conducted in Selonga community to have an understanding and appreciation of the diversity of plants in the area. The information also assisted during the identification and interpretation of archaeobotanical remains from the site. Standard procedures were adopted from the pool of researchers to include: Campbell (2000); Cunningham (1988, 2001); Harris and Muhammed (2003); Liengme (1983); Grandin (1988); Maroyi (2009, 2011, 2012, 2015), Ndoro (2001); Phillips and Gentry (1993); Shava *et al.* (2009) van Wyk and van Wyk (1997) and Voster and Jansen Van Rensburg (2005).

5.4.3.1. Materials Used During the Fieldwork

- Camera
- Voice recorder
- Notebook and pen
- Walking shoes
- Water bottle
- Sun hat
- Newspapers and plastic bags for specimen/ comparative collection
- Pocket knife/blade for cutting specimens

5.4.3.2. Method of Data Recovery and Procedure

- Permission to conduct the study was granted by the chief as well as the local head man.
- Aims and objectives of the study were explained to the participants.
- The researcher was both an observer and a participant. Admittedly, the knowledge I have about some of the uses of plants in Zimbabwe influenced my interpretation of how humans interact with plants in Zimbabwe.
- Ages from 15 to the oldest were interviewed, and these were chosen based on their knowledge on plant use in the area. The data was also produced based on status, i.e. either poor or wealthier, widow or orphans, working or not working considering the resources they have.
- Known good farmers who produce better harvests every year and those who did not have enough resources to produce more yields were interviewed.
- Individuals were consulted one-on-one basis to avoid influences from third parties.
- Unstructured interviews and dialogues with resource users were used, asking questions crops they grow most, the methods they use to improve their yields. They participants were further asked about techniques they use when storing and processing grains after harvests. The research also wanted to know the essential traditional vegetables and nuts they utilise and in which seasons do these traditional vegetables appear most. The study also focused on understanding wild fruits available in the area and how much do they contribute to their daily lives. Besides cereals such as sorghum, millet, cowpies and wild fruits the surveys wanted to investigate other uses of plants beyond diet and subsistence.
- During fieldwork plastic bags and newspapers were used to collect modern samples such as sorghum, millet, rapoko, pumpkins, cowpies, traditional vegetables and wild fruits and

based on their use and importance to the community. The motive was to build a comparative collection to be used during analysis and for future studies.

- According to Pearsall (2015: 109), the comparative collection provides information on the vegetation of the study area, seasonality and diversity of plant resources in the field of study. Pearsall (2015) noted that samples with edible flowers, fruits, roots, leaves and stems should be recorded. Typically, standard plant press with a top and wooden bottom slat reverted together can be used during comparative collection because specimens will be preserved for future use (Pearsall 2015: 109). However, in this case, following standard alternative procedures old newspapers were used to press the voucher specimens and to keep them safe for later use in the laboratory.
- Efforts to compare the samples with Herbarium in Harare were in vain due to time and resources.

5.4.3.3.Limitations of Ethnobotanical Strategy

While a lot of information about human-plant interactions in the area was recorded, limited time and resources did not allow further consultation from various groups of people in the area. Against this background, more research is needed to understand more about the potential uses of these plants in the region as well as how the climate change affects the availability of both crops and wild plants in the area. Also, “despite being useful, it is noted that an uncritical understanding of ethnography is dangerous given the potential to extrapolate a present view onto past” (Chirikure, 2015: 6). This research falls a victim of this weakness where modern plant use was used to help the interpretation of the archaeobotanical context. Carefulness is required when dealing with information from current communities because their relationship with plants is affected by climate change.

5.4.4 Laboratory Procedures

All samples collected during flotation, dry sieving and ethnobotanical investigations were carefully recorded, packed in plastic bags, newspaper press and placed in a plastic container box to avoid crushing of samples. These were transported to the University of Cape Town for further analysis in the laboratory. The following sections explain the procedures undertaken in the laboratory at the University of Cape Town.

5.4.4.1. Sorting

Light flotation samples from the field were sorted and analysed at Bolus Herbarium and Archaeology Materials laboratory at the University of Cape Town. In the laboratory, the first stage was the initial sorting of the light fraction samples obtained from the flotation process. The light fraction samples were classified, weighed and sieved using different geological sieves 1mm-2mm to separate seeds and other irrelevant fragments collected during the flotation process. These were further grouped according to size, shape, and condition of preservation, for instance, charred, carbonised, mineralised or desiccated. Rigorous qualitative and quantitative analytical methods were applied, which include *absolute* counts ($n=262$) and *ubiquity* percentage of species. Absolute counts focused on the raw counts of taxa represented in the assemblage, while ubiquity percentage focused on the presence analysis or frequency of taxa represented in the sample (Popper 1988; Hubbard 1980). For instance, the total number of seeds at Mtanye is 262 so the absolute counts were $n=262$ and if *Grewia* seeds were found five out of ten seeds, its ubiquity was taken as representing 50 % of the total sample. All relevant details about the seeds were recorded in an excel spreadsheet, which included information such as the site name, level number, location name of trenches and method of recovery. These same notes were written on plastic bags containing the seeds.

5.4.4.2. Morphological Analysis

Morphometric analysis is widely used in other disciplines and recently introduced to archaeobotany focusing on the study of seeds, phytoliths, pollen, wood charcoal and starch grains (Portillo et al. 2019: 3). Morphological characteristics such as shape, size, coat texture and colour can be determined using this method (Pearsall 2015; Werker 1997). It is in recent years that morphometric analysis of seeds using video and computer techniques gained momentum in archaeobotany (Pearsall 2015: 141; Portillo et al. 2019: 2). The method uses digital images analysed using computer software (Pearsall 2015). For instance, this research used software called **Olympus Stream Basic Software**. It captures digital seed images at different angles using a highly-powered stereomicroscope called **Olympus S261** and a camera **Olympus Sc30** attached to it. The two, along with a computer connected to **Olympus compact KL1500** produced dimming and adjustable light. While these three devices assigned to a computer, the live video gave an allowance to record, take measurements and twist the seeds in all dimensions using a computer mouse. The dimming and adjustable light allowed the researcher to look closely at seeds and determine finer details such as marks on the outer wall, shape of the seed, size, length and width.

The stream basic computer software can be used to reconstruct the shape of the seed and provide accurate measurements of seed size. Seed measurements can manually be noted down using callipers, but it is fast and more accurate using the morphometric analytical methods. This method is widely used either in archaeology or related disciplines such as ecology, biological sciences and geology. The advantage of this method is that, since the stream basic software can show a live video, it gives control to turn around the seed in all dimensions. You can zoom in and out looking at more delicate details, and it provides accurate measurements of seeds rather than spending time using callipers to measure seed sizes. The disadvantage of using this software is that it requires proper training to be able to use it efficiently.

Studying the shape of the seed is essential as it shows the type of the species and the family as well as genus it belongs. According to Pearsall (2015: 117), some seeds are oblong, grasses are elongated, and their seeds present a lateral or basal- lateral embryo. The process of domestication alters the genetic structure and size of plant species (Pearsall 2015; 136). Domesticated crops can be identified from their wild progenitors based on their genetic differences which include size (Pearsall 2015). In this research, seed sizes were used to differentiate domesticated plants from wild plants. However, Pearsall (2015: 136) stresses that this may be problematic only if the seeds are affected by preservation conditions when size is altered.

Seed colour defines seed maturity and species type (Werker 1997; Van der Veen 2007). However, identifying colour from archaeobotanical remains is problematic because the colour is lost during deposition (Van der Veen 2007). The texture is essential in determining whether the testa is smooth or reticulate, and if reticulate, what pattern is present (Pearsall 2015). The composition may also include attachments and scars, for example, *hilum* presence on the beans or other legumes (Pearsall 2015). Using the **Olympus Stream Basic Software**, seeds were looked at in 2D and 3 D, to see all dimensions. According to Werker (1991) and Murley (1951), the most common shapes include the following in figure 19.

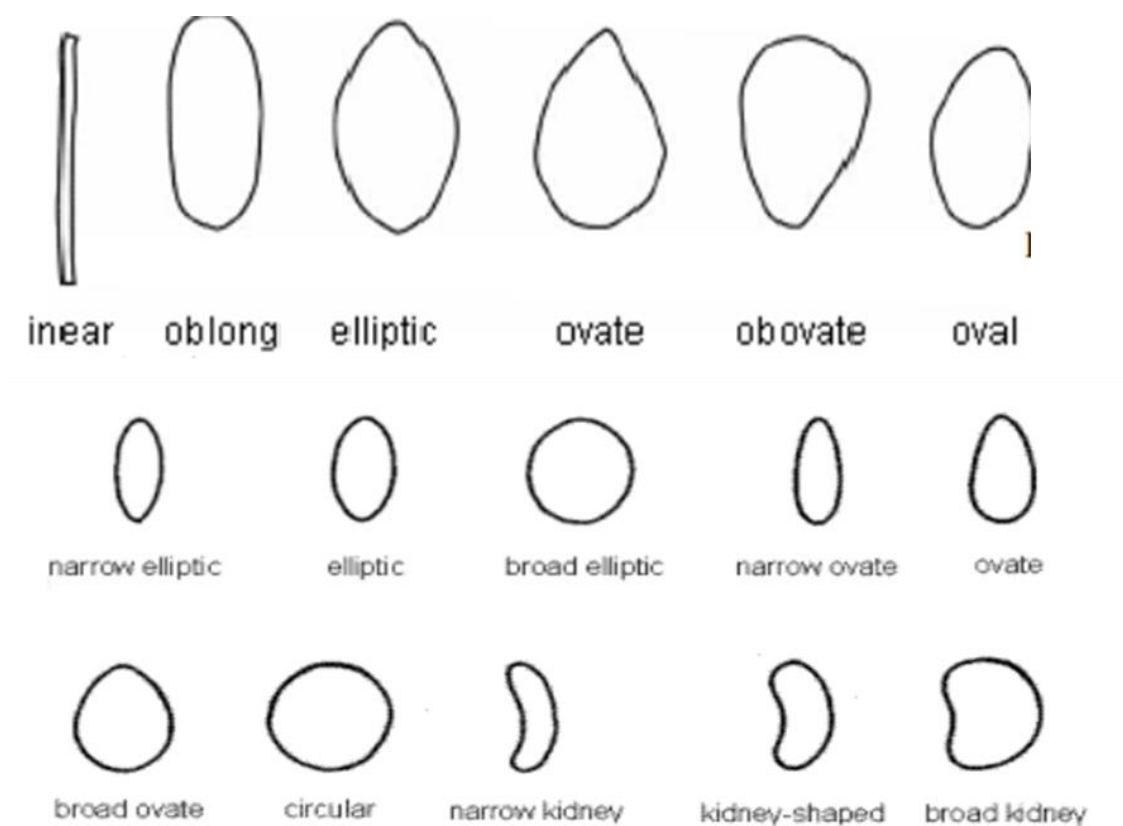
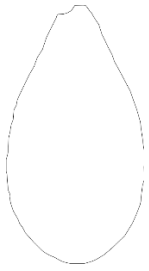


Figure 19. Morphological classification of seed shapes (Murley 1951; van den Heever 2015)

Guided by the related shape names presented in figure 19, this research digitised various seeds recorded from the site, focusing on morphological characteristics identified on seeds. The forthcoming sections discuss details on the shape, texture, and size of seeds from Mtanye

a) Shape

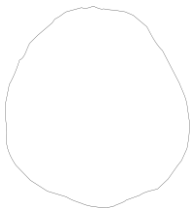
Seeds have different morphological forms (figure 20). These shapes are essential during seed identification, for instance can help to identify seeds from the family, the genus to specific species. Pumpkin seed shape is ovate, *Adansonia digitata* (baobab) seed is kidney-like shape, Amarula seed is broadly ovate, *Lannea schwenifurthii* is kidney or bean-like shape. *Setaria* grass seed produced a cigar shape with an oval shape and fine wave lines on the outer coat while *Grewia* seeds are circular with two halves. *Vigna unguiculata* looks like a bean or kidney-shaped. All these shapes are relevant when identifying seeds. However, in case of shapes are not visible, or seed is not complete, texture can be used to compliment.



a) ovate



b) kidney-shaped



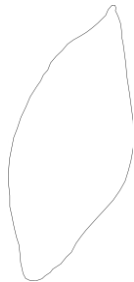
c) broad-ovate



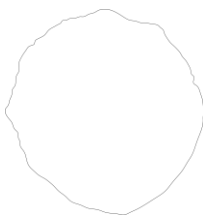
d) kidney-shaped



e) broad-obovate



f) Spiklet-shaped



g) circular



h)

bean-like-shape

Figure 20. Morphological shapes of different seeds from the Iron Age of Mtanye. (Not to scale)

b)Texture

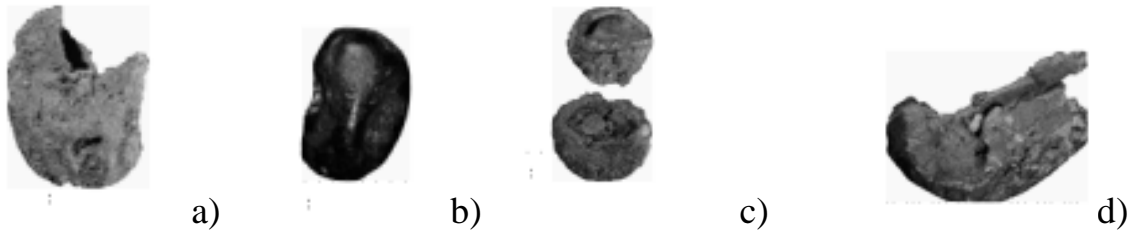


Figure 21. Morphological texture seeds.

Seed texture ranges from smooth to rough and other minute features on the seed coat. Seeds were analysed carefully, looking at distinguishing features such as microscopic hairs, seed morphology, wall texture, and other features marked on seeds. Seed (a) is *Lannea schwenifurthii* which is rough with marks on the out walls. Seed (b) is *vigna unguiculata* (cowpeas) with a smooth surface. Seed (c) is *Grewia* sp which is rough inside and out with fibres that are visible on the outer coat. *Grewia* sp seeds are rounded in shape, brown in colour, about 0.5-1cm in diameter with two halves with some fibre on the outer coat. Seed (d) is *Amarula* (*Sclerocarya birrea*) which is rough inside- out. *Amarula* (*Sclerocarya birrea*) seeds indicated two kernels inside, with an irregular outer layer which makes them survive for thousands of years.

c)Size

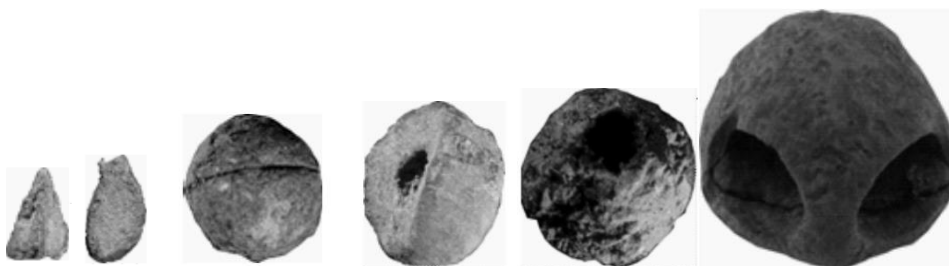


Figure 22. Sizes of seeds recorded from Mtanye Iron Age site.

Seed size (figure 22) is vital in assisting seed identification during the laboratory. Sizes were measured manually using callipers and measuring tools during morphometric analysis. Plants were identified from family to genus and species level, with a small tag placed in little plastic bags carefully labelled. Some who were affected by preservation were marked as unidentifiable species.

5.5. Conclusion

Standard archaeobotanical methods were used during data collection. These methods promoted the recovery of more samples from the site. The rationale of this research was to understand the diversity of plants used by inhabitants who once occupied the Iron Age site of Mtanye. The use of ethnobotanical data collected from different households enhanced the analysis and interpretation of archaeobotanical samples. Comparative plant specimen was obtained from the Selonga community in the same region. The methods used were complementary, and this revealed a lot about people-plant relationships during the ancient past and among the modern-day communities. The combination of bucket flotation and dry sieving methods produced effective results regardless of their limitations. Morphometric analysis of seeds in the laboratory using a suite of macroscopic and microscopic skills aided the identification process. These methods are poorly represented in Zimbabwean archaeological studies. Further use of these and the other recent developments as has been done in other regions will improve the development of archaeobotanical methods in the area under review and in southern Africa in general.

CHAPTER 6: ETHNOBOTANICAL AND ARCHEAObOTANICAL RESULTS

6.1. Introduction

This chapter presents results from ethnobotanical investigations and excavations done at Myante Iron Age site in southwestern Zimbabwe. It is divided into two sections, one that presents the ethnobotanical results from current communities near the site and the other section outline archaeobotanical results from flotation and laboratory analysis. Figures and tables show significant examples of plants from the area and others from the archaeobotanical context. The section ends with a summary and conclusion of the key findings from both the ethnobotanical and archaeobotanical examinations.

6.2. Ethnobotanical Results

Ethnobotanical surveys undertaken have yielded a diversity of wild and domesticated plants utilised in the Selonga community. These surveys give a clue towards understanding human-plant interactions in a semi-arid region and during the period of Mtanye Iron Age site.

6.2.1. Domesticated Plant Resources

Investigations among the modern households reported 25 domesticated species belonging to, 11 families (see table 1). The results include a diversity of crops, legumes, nuts, vegetables, tubers and other particular trees which enhance people's livelihoods in Selonga Community near the Iron Age site of Mtanye. The study mainly focused on the diversity of traditional or indigenous plants with a long history of utilisation rooted in ancient times. However, some of the exotic crops introduced before colonisation and vital to people's livelihoods within this community were noticed. Of the 25 domesticated species reported, the principal crops were *sorghum*, *millet* sp, *Voandzeia subterranea*, *Cucurbita maxima*, *Vigna unguiculate*, *Cucumis metuliferus* and *Zea mays* and amongst others. Exotic vegetables with a long history of use in various communities in Zimbabwe was found in many gardens, for instance, *Brassica napus* and *Tronchunda portugessa*.

Roots and tubers were also part of principal crops in the area though some households did not show interest in these plants. Among the roots and tubers, species such as *Ipomoea batata* (*sweet potato*), *Manihot esculenta* and others are used to replace bread during breakfast. There are a lot of tropically introduced species in the region, which include domesticated fruit trees such as

avocado, pawpaw, mango, apples among others. However, these were not included in the list since they are considered to be traditional to these rural communities.

This research also found out that some plants are treated as tame, but they grow on their own around settlements, small gardens and cattle kraals and mostly appear seasonally within people settlements, for instance, *Manihot esculenta*, *Voandzeia subterranea*, *Cucurbita maxima*, *Vigna unguiculate*, *Cucumis metuliferus*, *leganaria sericea*. These are “*Synanthropes*” which follow fertile soils that are disturbed by humans and intercropped with other plants such as *Zea mays*, pumpkins, beans, cowpies, sorghum, millets and groundnuts. During the investigations, it was found out that most women have more knowledge on how to collect, process and cook these traditional vegetables. Of importance are the procedures that undertaken when picking and preparing the edible leaves of certain traditional vegetables, for instance, when picking up *Cucurbita maxima* (*muboora*) only the new shoots should be chosen. The leaves can get easily soft when applied ashes from maize cob which act as bicarbonate soda.

Farming remains their primary source of livelihoods; however, climate change is becoming a significant threat to people’s livelihoods. Rainfall is no longer consistent at expected periods of the year and farmers in the area indicated that farming is now trying and error. Soil is no longer fertile, and due to poor rains, crops are wilting. People are receiving some little help from donors which is not adequate to achieve food security in the area. Tables 1, 2 and 3 present the diversity of crops and other essential plants from Selonga community which include the legumes, cereals, roots, tubers and traditional vegetables.

Table 1: Diversity of significant cereals, legumes and nuts identified from Selonga community near the Iron Age site of Mtanye.

Family name	Genus/Species name	Indigenous/ local name	English name	Notes
Poaceae	<i>Zea mays</i>	Chibage/Umumbu	Maize	Not indigenous/ rain-fed/
Poaceae	<i>Eleusine coracana</i>	Rukweza/Umphoko	Finger millet	Indigenous/reach in nutrients
Poaceae	<i>Pennisetum glaucum</i>	Mhunga	Pearl millet	Indigenous/ reach in nutrients
Poaceae	<i>Oryza sativa</i>	Mupunga /irayisi	Rice	mainly grown in wetlands/ <i>dambos</i>
Poaceae	<i>Sorghum</i>	Mapfunde/amabele	Sorghum	Indigenous / used for beer
Leguminosae	<i>Vigna unguiculate</i>	Nyemba	Cow peas	Indigenous crop/
Leguminosae	<i>Arachis hypogea</i>	Nzungu/ Amazambane	Groundnuts	Indigenous crop
Cucurbitaceae	<i>Citrullus lanatus</i>	Mavise	Watermelon	Indigenous/fruit/seeds roasted
Cucurbitaceae	<i>Cucumis metuliferus</i>	Magaka	Horned melon	Indigenous fruit
Cucurbitaceae	<i>Cucurbita maxima</i>	Manhanga	Pumpkin /squash	Indigenous vegetable
Leguminosae	<i>Voandzeia subterranea</i>	Nyimo/indlubu	Bambara groundnuts	Indigenous/cooked/can be dried
Poaceae	<i>Sorghum bicolor</i>	Ipwa	Sweet cane	Indigenous/ very sweat

Table 2: Indigenous and exotic vegetable species in Selonga community near Mtanye Iron Age site

Family name	Genus/Species name	Indigenous/ local name	English name	Notes
Leguminosae	<i>Vigna unguiculate</i>	Munyemba/imbida yendumba	Cowpea leaf	Traditional vegetables
Cucurbitaceae	<i>Cucurbita maxima</i>	Muboora	Pumpkin leaf	Traditional vegetables
Cleomaceae	<i>Gynandropsis gynandra</i>	Munyevhe	African spider herb	Traditional vegetables
Asteraceae	<i>Bidens pilosa</i>	Mutsine	Blackjack	Traditions vegetables
Malvaceae	<i>Corchorus olitorius</i>	Derere/idelele	Bush okra	Traditional vegetables
Cucurbitaceae	<i>Citrullus vulgaris</i>	Mushamba/amakhomane	Cow pumpkin leaf	Vegetables/ animal fodder
Brassicaceae	<i>Tronchunda portugessa</i>	Rugare/ikhove	Covo cabbage	Exotic/grown in gardens
Brassicaceae	<i>Brassica napus</i>	Repi	Rape leaf	Exotic/ grown in gardens
Cucurbitaceae	<i>Lagenaria siceraria</i>	mukombe	Calabash/ bottle gourd	Indigenous/gourds as a scoop
Cucurbitaceae	<i>Amaranthus hybridus</i>	mowa	Pigweed	Indigenous/leaves as a relish

Table 3: Roots and tubers from Selonga community near Mtanye Iron Age Site

Family name	Genus/scientific name	Indigenous/ local name	English name	Notes
Euphoebiaceae	<i>Manihot esculenta</i>	Mafarinya	Cassava	Tubes/roots are edible
Convolvulaceae	<i>Ipomoea batata</i>	Mbambaira	Sweet potato	Tubes/roots are edible
Lamiaceae	<i>Coleus esculentus</i>	Tsenza	Vlei tube/Kaffir potato	Tubes/roots are edible
Araceae	<i>Colocasia antiquorum</i>	Madhumbe	Yam/ Elephant Ear	The tubes are edible
Iridaceae	<i>Babiana hypogea</i>	Hwena	Roots	Roots are edible

6.2.2. Wild Plant Resources

The study identified 23 species classified to 19 families and grouped them into edible and non-edible resources. These plant resources include fruits, vegetables, roots, tubers and firewood and others. Most of the plants recorded were traditional or indigenous to the region, and their use is rooted in the past (Maroyi 2015, Jonsson 1998, Campbell 1987). The most valued include marula (*amaganu*), baobab (*Adansonia digitata*), Mopani (*Colophospermum mopane*), *Azanza garckeana*, *Mimusops decorifolia* and amongst others (see table 4). The communities protect these trees because they have so much value attached to them. These plants are chosen based on nutritional value, easiness to process and their taste during consumption. The interviews and observations indicated that the process of eating is diverse because some collect and eat while doing other things in the bush such as firewood collection, mushroom collection, cattle herding, hunting, while some purposefully plan to go out to collect these plant resources with baskets especially those aiming to sell along the main roads and market places. The participants have shown a broad knowledge regarding the uses of these plants, especially women and children, had the most knowledgeable understanding of plant use for different reasons.

On the other hand, men as well took part when it comes to the gathering of plant resources with limited involvement in the selling of these plants along the main road. However, there changes in climate and low rainfall patterns in the area is also affecting the availability of these wild fruits. Informants indicated that they used to get fruits every year close to their settlements and within their fields, but this is no more due to poor rainfall.

Table 4. Diversity of wild indigenous fruits and fruit trees reported from Selonga community during ethnobotanical studies

Family Name	Scientific name	Indigenous /local name	English name	Part used
Olacaceae	<i>Ximenia caffra</i>	Nhengeri	Sour plum	Fruits; roots
Clusiaceae	<i>Garcinia buchanani</i>	Matunduru	Granite mangosteen	Fruits; roots
Flacourtiaceae	<i>Flacourtia Indica</i>	Nhunguru	Governor's plum	Fruits, wood fuel
Lamiaceae	<i>Vitex payos</i>	Tsvubvu	Smelly berry	Fruits, roots, wood fuel
Rhamnaceae	<i>Ziziphus mauritiana</i>	Masawu	Indian plum	Fruits, roots, wood fuel
Rhamnaceae	<i>Berchemia discolor</i>	Nyii	African sweets/bird plum	fruits
Chrysobalanaceae	<i>Parinari curatellifolia</i>	Hacha/muhacha	Mobola plum	Fruits; leave; roots
Apocynaceae	<i>Curissa edulis</i>	Nzambara/mbambara	Simple spinned numnum	Fruits; roots
Malvaceae	<i>Azanza garckeana</i>	Matohwe	Snot -apple	Fruits; roots
Strychnoaceae	<i>Strychnos spinosa</i>	Matamba	Monkey orange	Fruits; roots
Anacardiaceae	<i>Lennea edulis</i>	Tsambatsi	Wild grape	Fruits; roots
Myrtaceae	<i>Syzygium cordatum</i>	Hute/Mukute	Water berry	Fruits; leaves; roots
Cactaceae	<i>Opuntia ficus indica</i>	Madhorofiya	Prickly -pear	Fruits; roots

Caesalpiniodeae/Fabaceae	<i>Pilostigma thonningii</i>	masekesa	Monkey bread	Fruits; leaves; roots
Annonaceae	<i>Annona senegalensis</i>	Maroro	African custard apple	Fruit; roots
Phyllanthaceae	<i>Uapaca kirkiana</i>	Mazhanje	Wild Loquat/sugar plum	Fruits; leaves
Taliaceae	<i>Grewia discolor</i>	Bhubhunu/	Cross berries	Fruit/medicinal/domestic
Anacardiaceae	<i>Lennea schweinfurthii</i>	Gan'acha/ mushamba	False marula	Fruits; leaves; roots
Anacardiaceae	<i>Sclerocarya birrea/caffra</i>	Mafura/mapfura	Marula	Fruits; bark; leaves; roots
Malvaceae	<i>Adansonia digitata</i>	Mauyu	Baobab	Fruits; leaves; roots
Moraceae	<i>Ficus burkei</i>	Musamvi	Common wild fig	Fruits; roots
Rubiaceae	<i>Vangueria infausta</i>	Munzvuru/mpfilwa	Wild medlar	Fruit; wood; leaves
Sapotaceae	<i>Mimusops decorifolia</i>	Muchechete/umbumbu	Red milkwood	Fruit, firewood, medicinal

6.3. Archaeobotanical Results

Four trenches excavated, and a total of 262 carbonised recorded at Mtanye. Charred seeds retrieved through flotation and dry sieving. These were sorted and microscopically examined at the UCT Bolus Herbarium collection and Archaeology Materials Laboratory to determine the family, genus and species represented. Modern samples from the fieldwork also aided in grouping the seeds into identifiable and non-identifiable species (see Table 5). Considering morphological attributes such as shape, seed coat and variation in size, among others, both domesticated and wild plants were identified. Wild plants (91%) were the most represented and domesticated plants (7%) also formed part of the sample, which also included non-identifiable plants (2%).

The most common wild edible species recorded from the trenches were, *Adansonia digitata*, (baobab) *Sclerocarya birrea*, (marula,) *Grewia sp*, *Talinum* and, *Lannea schweinfurthii* (false marula) (see Table 5 and appendix 2). *Lannea schweinfurthii* seeds recorded the highest percentage, with at least (37 %), followed by genus *Grewia* (27%). Seeds belonging to the *Grewia* genus may be *morethwa* berries (*Grewia flava*), common at other sites such as Bosutswe (Denbow *et al.*, 2008). Common crop species identified include *Cucurbita maxima*, *Cucumis metuliferus*, and *Vigna unguiculate*. Along with these, seeds belonging to millet species identified. Also, some seeds were picked from the surface and shovel test pits (see appendix). However, these were not included in table 5 because they were considered not to have a proper context and modern intrusions.

Table 5: Seeds recorded from different trenches at Mtanye Iron Age site

Mtanye Hill Terrace 1				Mtanye Hill Site B			
Family	Genus & species	Level	N0 of Seeds	Family	Genus & species	Level	N0 of Seeds
Cucurbitaceae	<i>Cucumis sp</i>	1	2	Taliaceae	<i>Grewia sp</i>	2	56
Anacardiaceae	<i>Sclerocarya birrea</i>	1	2	Fabaceae	<i>Vigna sp</i>	2	2
Talinaceae	<i>Talinum sp</i>	1	24	Anacardiaceae	<i>L.Schwenifurthii</i>	2	9
Malvaceae	<i>Adansonia digitata</i>	1	1	Cucurbitaceae	<i>Cucurbita sp</i>	2	1
Malvaceae	<i>Sida sp</i>	1	8	-	<i>Unidentified sp</i>	2	2
Taliaceae	<i>Grewia sp</i>	1	4	Malvaceae	<i>Sida sp</i>	2	1
Anacardiaceae	<i>Sclerocarya birrea</i>	2	4	Anacardiaceae	<i>Sclerocarya birrea</i>	2	3
Poaceae	<i>Millet sp.</i>	3	4	Cucurbitaceae	<i>Cucumis sp</i>	3	2
-	<i>unidentified sp.</i>	4	1	Cucurbitaceae	<i>Cucumber</i>	5	2
				Malvaceae	<i>Sida sp</i>	5	1
				Poaceae	<i>Millet sp</i>	5	1
				Taliaceae	<i>Grewia sp</i>	5	1
				Anacardiaceae	<i>L.Schwenifurthii</i>	5	1
Mtanye Hill Kraal 1				Western Pot			
Family	Genus & species	Level	N0 of Seeds	Family	Genus & species	Level	N0 of Seeds
Anacardiaceae	<i>L.schwenifurthia</i>	2	83	-	<i>Unidentified sp.</i>	1	1
Taliaceae	<i>Grewia sp</i>	1	2	Poaceae	<i>Setaria sp</i>	2	1
Malvaceae	<i>Adansonia digitata</i>	1	1				
Anacardiaceae	<i>Sclerocarya birrea</i>	2	5				
Burseraceae	<i>Commiphora sp</i>	2	2				
Anacardiaceae	<i>L.schwenifurthia</i>	2	4				
Fabaceae	<i>Legume sp</i>	2	1				

Taliaceae	<i>Grewia sp</i>	4	9				
Malvaceae	<i>Sida sp</i>	4	7				
Acanthaceae	-	4	10				
-	<i>Unidentified sp.</i>	4	1				

Table 6: Ubiquity Percentage for Mtanye Hill Terrace 1 taxa

Species/Genera	Ubiquity %
<i>Cucumis sp</i>	4
<i>Sclerocarya birrea</i>	12
<i>Talinum sp</i>	48
<i>Adansonia digitata</i>	2
<i>Sida sp</i>	16
<i>Grewia sp</i>	8
<i>Millet sp.</i>	8
<i>Unidentified sp.</i>	2

The most ubiquitous plant species at Mtanye Hill Terrace 1 is *Talinum sp* which takes 48% of the total ratio at this trench. Only 50 seeds recorded and sampled from all cultural layers. The *Talinum* species only appeared at this trench. *Sida* species follow it with 16% and *Sclerocarya birrea* with 12%. These two were also found in other locations that were excavated.

Table 7: Ubiquity Percentage for Mtanye Hill Kraal 1 taxa

Species/Genera	Ubiquity %
<i>L.schwenifurthii</i>	70
<i>Grewia sp</i>	9
<i>Adansonia digitata</i>	1
<i>Sclerocarya birrea</i>	4
<i>Commiphora sp</i>	2
<i>Vigna unguiculata</i>	1
<i>Sida sp</i>	6
<i>Acanthaceae</i>	8
<i>Unidentified sp.</i>	1

The most ubiquitous plant at Mtanye Hill Kraal 1 is *Lannea schwenifurthii* which takes 70% of the total ration at this trench. The seeds of this tree have a hard outer layer that allows it to survive against adverse preservation conditions. This plant appears in 2 trenches excavated on the site. Only four levels were recorded from this trench. Other two species follow it with a better

representation *Grewia* 9% and 8% of seeds identified as belonging to Acanthaceae family. The highest frequency of seeds was recorded from level 2 and 4, respectively.

Table 8: Ubiquity Percentage for Mtanye Hill site B taxa

Genera/ Species	Ubiquity %
<i>L.schwenifurthii</i>	9
Grewia sp	70
<i>Adansonia digitata</i>	1
<i>Sclerocarya birrea</i>	4
Commiphora sp	2
<i>Vigna unguiculata</i>	1
Sida sp	6
Acanthaceae	8
<i>Cucurbita maxima</i>	2
Unidentifiable sp.	1

Thirdly, Mtanye Hill site B, Table 7, The seeds of *Grewia* sp have the highest frequency of 70%, followed by 12% *Lannae schweinfurthii* species. *Grewia* also showed up in all the trenches that were excavated. Other important species include *Sclerocarya birrea* and *cucumber* species. More seeds were found in levels 2, 3 and 5.

At Mtanye Western Pot indicates two levels where seeds were recorded. Only two seeds were recorded from this trench, 1 *Setaria* grass and the other and an unidentified seed. All the seeds marked from Mtanye are presented in table 9.

Table 9. The total number of all archaeobotanical remains recorded from Mtanye Iron Age site.

Family	Genus & Species	N0 of Seeds	Total % frequency
Fabaceae	<i>Vigna unguiculate</i>	4	2
Curcurbitaceae	<i>Cucumis metuliferus,</i>	6	2
Malvaceae	<i>Adansonia digitata</i>	2	1
Burseraceae	<i>Commiphora sp</i>	2	1
Anacardiaceae	<i>Lannae.schwenifurthii</i>	97	37
Poaceae	<i>Millet Sp</i>	5	2
Poaceae	<i>Setaria grass</i>	1	0.4
Anarcadiaceae	<i>Sclerocarya birrea</i>	14	5.3
Acanthaceae.	-	10	4
Curcurbitaceae	<i>Cucurbita maxima/ Lagenaria siceraria</i>	2	1
Taliaceae	<i>Talinum sp</i>	24	9.2
Malvaceae	<i>Sida sp</i>	17	6.5
Taliaceae	<i>Grewia sp</i>	72	27
Non-identifiable	Non-identifiable	5	2

The ubiquity technique showed that some species appeared in almost $\frac{3}{4}$ of the trenches excavated, for examples *Adansonia digitata*, *Sida sp*, *Grewia sp* and *Sclerocarya birrea*, were recorded from three trenches except at Mtanye Western Pot. Some were found in two locations, for example, *Lannea schwenifurthii*, *Commiphora sp*, *Vigna unguiculata* and Acanthaceae were recorded at Mtanye Hill Terrace 1, Mtanye Hill Kraal 1 and Mtanye Hill site B except at Mtanye Western Pot. *Talinum sp*, *Cucurbita maxima*, *Millet sp*. did not appear in two or three of the locations but only a single place. *Talinum sp* 48% and *Millet sp* 8% were both found at Mtanye Hill Terrace 1. *Cucurbita maxima* were found only at Mtanye Hill site B, representing 2% of the total ration. *Lannea schwenifurthii* has the highest frequency of 37 %. Some have



1



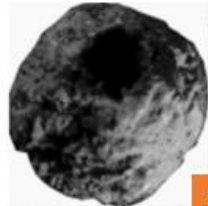
2



3



4



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6



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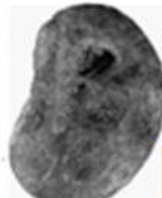
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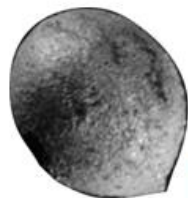
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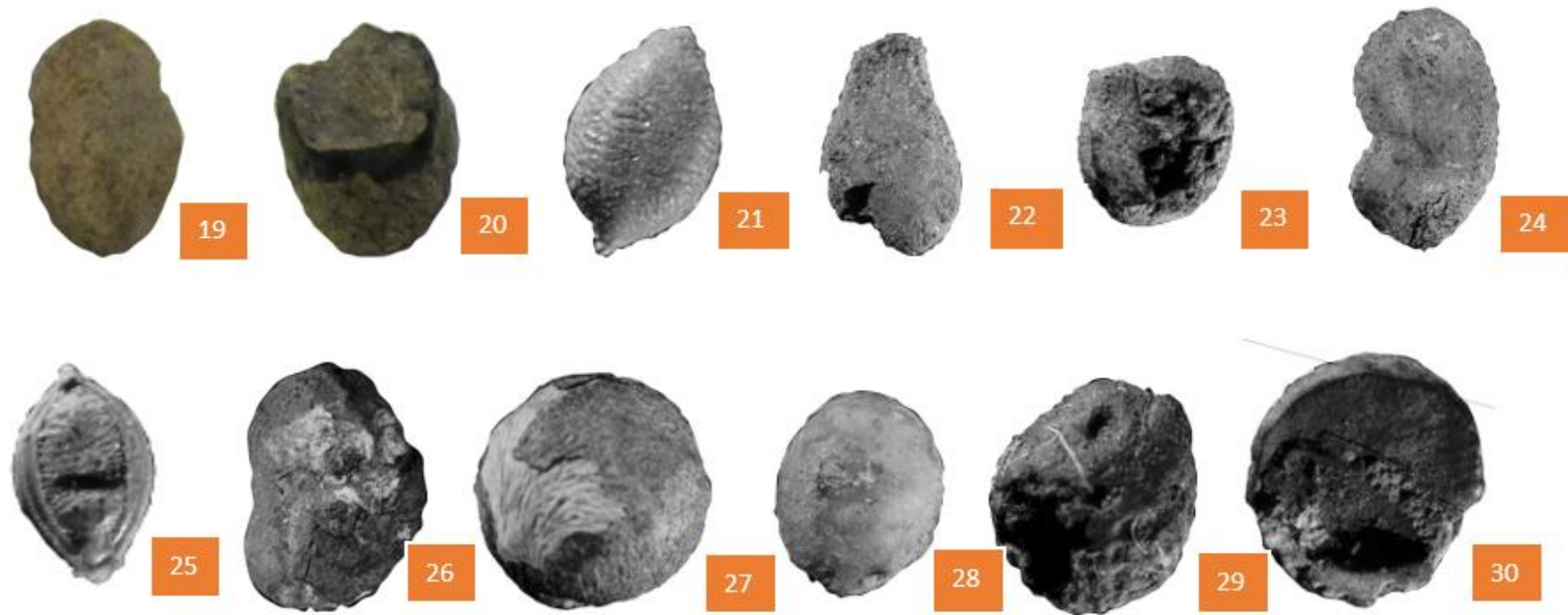


Figure 23. Some archaeobotanical remains recorded from Mtanye Iron Age Site.

- *Grewia* (3,4,5,8,27,28,29,30)
- *Sclerocarya birrea* (6,10)
- *Adansonia digitata* (12)
- *Lannea schwenifurthii* (7,11,24,26)
- *Setaria* grass (21,25)
- *Millet* grass (14,15)
- *Acantheceae* sp (16)
- *Vigna unguiculata* (9)
- *Terminalia sericea* (17)
- *Citrullus lanatus* (2/13)
- *Cucurbita maxima* (2/13,22)
- *Unidentifiable* (18,19,20)
- *Acacia* sp (23)
- *Sida* (1)

higher frequency in other trenches but are low in others, for instance, *Talinum sp* is highly present at Mtanye Hill Terrace 1 while absent in all other locations. All plants that appear in other three areas were assumed to have been frequently accessed by members of the community in the past, or there are other reasons for such a pattern as will be explained in the discussion chapter.

6.4. Charcoal Samples from Mtanye

Charcoal samples were taken from trenches and submitted for radiocarbon dating. Although no further analysis was done on charcoal, a large sample of charcoal was recorded from Mtanye. The charcoal found in association with seeds, ceramics, beads, bones and other material culture. These charcoal samples were taken from MH-T1 level 4, MH-K1 level 2 and 5, MSB bottom levels. The dates produced from these trenches were fascinating, considering the dates previously given by Huffman (2008). The years indicated that the Iron Age site of Mtanye existed from AD 900- 1390 signifying its long-time span in the region. There is a higher probability that this site was contemporary to Mapungubwe. Table 11 illustrate the results from samples of charcoal from Mtanye site.

Site name	Analysis number	C/period	material	Date BP	1-sigma ranges
MH-T1 04	Beta-531755	TK2/MAP	Charcoal	800 +/- 30 BP	1220 - 1290 Cal AD
MH-K1 02	Beta-531756	K2/TK2/MAP	Charcoal	830 +/- 30 BP	1204 - 1284 cal AD
MH-K1 05	Beta-531757	K2/MAP	Charcoal	760 +/- 30 BP	1228 - 1251 cal AD
MH-K1 05	Beta-531757	MAP	Charcoal	760 +/- 30 BP	1260 - 1315 cal AD
MH-K1 05	Beta-531757	MAP	Charcoal	760 +/- 30 BP	1356 - 1382 cal AD
MSB-11	Beta-531758	K2	Charcoal	1080 +/- 30 BP	966 - 1045 cal AD
MSB-11	Beta-531758	K2	Charcoal	1080 +/- 30 BP	900 - 926 cal AD
MSB-11	Beta-531758	K2/TK2	Charcoal	1080 +/- 30 BP	1090 - 1108 cal AD
MSB-11	Beta-531758	K2/TK2	Charcoal	1080 +/- 30 BP	1120 - 1128 cal AD

Table 10: Radiocarbon dates from charcoal found in association with seeds, ceramics, beads and other material culture at Mtanye Iron Age site.

6.5. Grain Bin and Grinding Stone Remnants

During excavations, several remnants of grain bins were identified from the site, indicating that people at Mtanye were very cautious about keeping food for the next season. Similar results at Mtanye were reported by Huffman 1972 where he noticed storage pits and grain bins which he said were used for storing cereal grains, tubers and other wild plants during Mtanye period. Grinding stones were also recorded from the site. Thus, the two were also used as a shred of proxy evidence indicating food storage and processing especially cereal production.



Figure 24: Remnants of grain bins at the Iron Age site of Mtanye

The first trench was dug on top of the Hill at Mtanye Hill terrace¹ near a grain bin assuming that we would get either sorghum or millet grain from the grain bin, but we did not find samples of grains. More grain bins were found in the valley below the hill. However, due to time and resource constraints, more excavations were not performed near these grain bins.

6.6. Summarising Ethnobotanical and Archaeobotanical Results

The presentation of ethnobotanical and archaeobotanical results have yielded more information with regards to the diversity of plant remains utilised by communities in the semi-arid region of south-western Zimbabwe. The motive behind carrying out ethnobotanical studies in this region was guided by various questions that emanated from the archaeobotanical record. Knowing that the archaeobotanical record was silent on its own, ethnobotanical investigations aimed at giving clues when answering questions on what ways did people use plant resources and how they perceived nature. The author also wanted to understand the diversity of plant resources in the region, both domesticated and wild plants to help in identifying species in the archaeobotanical record. Also, the ethnobotanical study was targeted to help understand how the archaeobotanical record is formed; hence the taphonomic processes behind the deposition of plant remains at Mtanye needed to be revealed.

Be that as it may, certain species in the archaeobotanical record resembled those found during ethnobotanical surveys. Among the domesticated plants *Cucurbita maxima* / *Lagenaria siceraria*, *Vigna unguiculate*, *Cucumis metuliferus*, appear in both archaeobotanical and ethnobotanical contexts. Also, wild plants such as *Grewia bicolor*, *Lansea. schwenifurthii*, *Sclerocarya birrea*, *Adansonia digitata*, *Setaria grass*, *Sida sp*, *Commiphora sp*, *Talinum sp* and species that belongs to Acanthaceae family in both contexts. There are many species, both the domesticated and the wild, which were reported during the ethnobotanical study but not present in the archaeobotanical record. For example, most of the traditional and indigenous vegetables, both the wild and domesticated, are absent in the cultural layers. In addition, essential crops such as *sorghum and millet*, *Zea mays*, groundnut and *Voandzeia subterranean* were reported in the ethnobotanical context and not in the archaeobotanical record. The reasons for the appearance and disappearance of these species in the archaeological record may vary ranging from preservation conditions, taphonomic process, and so forth.

6.7. Conclusion

Ethnobotanical and archaeobotanical investigations have yielded consistent data with regards to human-plant interactions in semi-arid regions. While wild plants have the highest frequency, their use may have been extensive at Mtanye Iron Age during this period. Legumes and indigenous vegetables are cultivars while other plants are semi-domesticated as they are in the wild but entrapped in a co-entangled relationship with humans. Most of these plants are *synanthropic*, which are considered indigenous vegetables. They grow in gardens or within settlements where soils are fertile and organic. During interviews with resource users, it was observed out that some households still possess traditional knowledge about the use of wild plants in people's daily lives. While checking on the ubiquity percentage of absence and presence of botanical samples from the four trenches, it was found that some plants appeared in all layers and trenches, showing that all inhabitants may have frequently accessed these. Gathering of plants is an everyday activity which occurs as part of an adaptive strategy for survival in this semi-arid region. The risk of drought and hunger is high, considering that the area receives low rainfall (Rukuni and Eicher 1994). Cattle and goats remain the backbone of people's economies because they are also tolerant of the conditions prevailing in the area.

The presence of storage and processing infrastructure such as grinding stones and grain bins is a clear sign that these people kept food for the next season. Storage infrastructure observed within the Selonga community is different and more advanced as compared to the ones identified in the archaeological record. They are constructed with bricks, timber and thatched with grass.

Furthermore, the results from charcoal have shown different possible dates that are associated with the Iron Age site of Mtanye. The radiocarbon dates indicated that Mtanye Iron age site existed in contemporary with Early farming communities such as K2 and Mapungubwe sites. The place was inhabited from AD 900-1390. This goes far way before the date previously assigned by Huffman (2008). The distribution of archaeobotanical remains at Mtanye has shown that most of the wild plants are frequently available in all cultural layers but mostly in upper layers from AD1250-1390. Domesticated crops are also available in all segments but most commonly in bottom layers.

CHAPTER 7: DISCUSSION AND CONCLUSION

7.1. Introduction

In line with the research questions, aims and objectives, section 7.2 to 8.0 outline the key findings of the study. After delving deep into the analysis of archaeobotanical remains and ethnobotanical surveys from the site, this research has managed to address several themes. The significant issues include possible uses of plants with the highest ubiquity percentage at Mtanye, food security and livelihoods, land use at Mtanye, the social use of plants beyond for diet purposes, seasonality, paleoenvironmental reconstructions and amongst others. This chapter also presents the summary and conclusion of this research. While this study was not exhaustive, much more could be studied in future research.

7.2. Possible Uses of Plants That Appeared Most at Mtanye.

Lannea schwenifurthii has the highest percentage at the site, with 37% of the total ratio of the seeds recorded from Mtanye. It appeared in almost all cultural layers throughout the site. The reasons for the availability of its seeds at Mtanye may signify several reasons. Firstly, it could be because the tree has many economic, cultural, religious and medicinal functions associated with it (Tredgold 1986: 108; Hutchings 1996: 178; Long 2005, Hardwick 2013). For instance, the tree is known to some as the ‘tree of forgetfulness’ and is said to harbour benevolent spirits to protect and to heal people (Long 2005). The plant is used to treat abscesses, fevers, constipation in children, diarrhoea and sores (Hutchings 1996: 178; Hyde et al. 2017; Van Wyk et al. 1997: 164; Venter & Venter 2009: 206). Pregnant women can use the leaves to relieve stomach pain or apply leaf poultices to the abdomen to accelerate childbirth in Eastern Africa (Hutchings 1996: 178). Ethnobotanical investigations from the field found out that its edible fruits are sweet and highly favoured by young boys when they are out herding cattle. Interesting to note is the observation that fencing poles made out of this tree can easily take root and flourish again even if you don’t water them. The tree provide timber while its bark used to make ropes. It could have been another reason why it was found in abundance near human settlements because the tree had many particular uses to this community. The availability of *Lannea schwenifurthii* at Mtanye might be related to good preservation conditions and the hardness of the seeds that are strong enough to survive against natural decompositional processes. On the other hand, edible fruits are also favoured by

birds, monkeys and other small animals. Their presence at Mtanye could be as a result of animals bringing these to the site or other natural processes such as erosion and burrowing.

Wild species such as *Adansonia digitata*, *Sclerocarya birrea*, *Grewia* sp also have better representation at the site. These species naturally have a hard-outer layer which can make them survive in the archaeobotanical records for so long; hence we see them appearing more frequently in all the excavated locations. Their presence at the site can point out to frequent utilisation by people at Mtanye. Ethnobotanical investigations have noted an extensive use of these fruits in the community, for instance, fruits from Baobab are used as porridge, sold along the main road and people making extra income. The fruit, seeds, leaves and the pulp of the baobab trees are known for its nutritional and medicinal value (Van Wyk and Gericke 200). The tree is found across the Mapungubwe landscape and many other areas in the Shashe Limpopo region (Huffman and Woodborne 2016). In the past, at Mtanye it is possible that *Adansonia digitata* (baobab) was central to people's diets and subsistence because similar evidence from contemporary sites in the region have recorded proof of baobab seeds which they concluded that the resources coming from this tree contributed to diet and subsistence of past communities (Huffman 2008; Segobye 1994; Jonsson 1998; Reid and Segobye 200).

The presence of marula (*Sclerocarya birrea*) seeds at Mtanye is also very interesting considering that marula is well known of its use by many early farming communities in the region (Huffman 1974; Reid and Segobye 2000; Segobye 1994). Ethnobotanical studies found out that the marula fruits are very important to people's daily lives. During the surveys, several marula trees were identified in Selonga community, and according to participants, cutting an Amarula tree is considered an offence in the community, and if someone get caught, it attracts a penalty. Marula fruits are eaten fresh fruits or extract the kernels. It was noted that marula fruits can be used for beer brewing. Similar evidence of Amarula beer brewing is available in many Iron Age sites in southern Africa for instance at Mutamba, Steyn and Antonites (2019), found evidence of marula seeds and using ethnographic information they concluded that there was a possibility of Amarula beer brewing at Mutamba. Besides that, I grew up in the Gutu area, Masvingo province my grandmother used to make Amarula beer. It is possible that this tree was essential to the Mtanye people considering that the region was periodically affected by droughts, the fruits and kernels were used to help sustain diets and the livelihoods of these communities. In addition to food and subsistence, Reid and Segobye (2000: 65) in Botswana have noted that the presence of marula is significant evidence of subsistence because the marula seeds can be stored readily and consumed

in times of food scarcity. However, an assessment from the present communities found out that Amarula fruits are eaten both in the months of food scarcity and in good times.

Grewia seeds were also found in abundance at the site. It was available found in almost all locations at Mtanye site. Ethnobotanical investigations have found out that these fruits are mostly eaten by small boys and girls while herding cattle or while coming from school when they are hungry. Sometimes this tree can be used for other purposes ropes, toothbrushes, basket weaving, thatching houses, hut poles, fish traps and amongst others. The tree is also crucial for medicinal uses (Coates Palgrave 2002, Van Wyk and Gericke 2000).

While other plant remains were found at Mtanye Iron age site, the absence of highly valued crops such as *sorghum*, *millet* and other indigenous vegetables at Mtanye does not point to the fact that these were not grown at the site. Reasons for their absence could be linked to methods of processing, preparation, preservation, and consumption. Firstly, the concept of preservation remains the major issue towards the lack of other domesticated species (Pearsall 2015; Hastorf 1999). Domesticated plants such as *sorghum*, *Pearl millet* and indigenous vegetables may not have managed to survive in the archaeobotanical record for so long. This may also explain sampling bias and the locations of trenches that were dug. It is therefore recommended that future studies should organise sampling strategies that strive to excavate as many potential sites as possible.

Thirdly, the absence of major traditional crops such as *Sorghum*, *Pearl millet*, and *finger millet* may fall in line with their method of production, preparation and consumption such as fermentation and grinding (Young and Thompson 2005). Fermentation and grinding obliterate the seeds, and along with other factors affects the presence of these crops (Young and Thompson 2005). Future studies that will explore pollen, phytoliths and starch residue analysis of potsherds would be a welcome development in the archaeobotanical studies of Iron Age farming communities.

7.3. Food Security and Livelihoods

The evidence of storage and processing infrastructure in the form of grinding stones, grain bins and pit structures, as well as a wide range of domesticated and wild plants at Mtanye, can attest to the concept of food production and food security during this period. Huffman (2008) noted that the grain bins and pit storage structures at the site were used to store grains such as sorghum and millet and other wild resources, for instance, tubers and nuts. It is imperative to point out that agriculture was significant to the community at Mtanye, just like many other farming communities in southern Africa. Evidence of grain bins is plenty in many Iron Age sites in southern Africa

(Pwiti 1996; Manyanga 2006; Mabgwe and Manyanga 2013; Chirikure et al. 2013,2014; Nyamushosho et al. 2018; Segobye 1994; Reid and Segobye 2000; van Waarden 2012). This evidence at Mtanye suggested that the people were very cautious about keeping some surplus food for the next season, for instance, Reid and Segobye (2000: 64) noted that marula seeds were stored readily and consumed in times of food scarcity. Mabgwe and Manyanga (2017) found several grain bins at Homba hills, Malumba, Mwenezi and concluded that its evidence of more considerable ingenuity and adaptive mechanisms by these communities who wanted to make sure that towards food is available all the time. Ethnographic surveys found that Amarula seeds (*Sclerocarya birrea*), baobab fruits and nuts, (*Adansonia digitata*), dried mushroom and dried vegetables were carefully preserved and during the time of need. Therefore, evidence of food reserving at Mtanye in the form of grain bins and storage pits was very strategic as they strive to cope up with the prevailing harsh environmental conditions over time.

Besides food storage, there is also evidence of food processing at Mtanye in the form of grinding stones. Ethnobotanical surveys find out grinding stones used for grinding sorghum, millets and other resources. According to Shoemaker et al. (2017: 415), the study of grinding stones in archaeology is an under-discussed component, yet they inform us about food and material processing in the past. Ethnobotanical studies identified that grinding stones were used for grinding cereals, peanut butter, charcoal for decorative purposes, pounding wild plant medicine, pounding vegetative matter and grinding clay used for pottery making. Researchers have indicated that the availability of these grinding stones at archaeological sites means exploitation of cereals and processing of other plants (Camps 1980; McBurney 1967; Robertshaw and Collet 1983; Willcox and Stordeur 2012; Huffman 1996). Similar studies were recorded in West Africa among the Kintampo people where the presence of these grinding stones signified food production (Stahl 1993). Of these Kintampo communities, D'Andrea et al. (2001, 2007) noted that grinding stones were used to process plants, for instance, cowpeas (*Vigna unguiculata*), oil palm tree (*Elaeis guinnensis*). In southern Africa, extensive studies by Huffman (1996, 2004, 2007), Nyamushosho et al. (2018), Manyanga et al. (2000), Manyanga (2006), Pwiti (1996) and Chirikure et al. (2014) recorded grinding stones and flat-hand stones which signify the processing of sorghum and millet.

Further studies have indicated that these grinding stones were also used for Ochre grinding (see Sadr and Fauvelle-Aymar 2006, Walker 2010). Grinding stones present at Mtanye tell us a formerly unknown story about cereal farming, the women who were responsible for grinding, food processing. With regards to the role of women, ethnobotanical studies have observed that women are making use of these grinding stones for various purposes mentioned earlier on. Thus, the

presence of grinding stones at Mtanye gives us information on who was responsible in using these infrastructures, and for what purposes, in this case, women were capable based on the results observed from the present community and elsewhere.

Moreover, the presence of indigenous crops, vegetables, nuts, as well as a variety of wild plants, played a pivotal role in the sustenance of people's livelihoods (Jonsson 1998; Ekblom 2012; Ekblom et al. 2014). These resources provide dietary and nutritional requirements, serve medicinal purposes and contribute as sources of income for present communities (Maroyi 2015; Jonsson 1998; Cunningham 1988). Ethnobotanical studies from the present communities around the site indicated that plant resources are contributing immensely towards food security and livelihoods, whether during drought seasons or in good years. Similar ethnographic studies from Zambezi valley among the Botatwe people (de Luna 2015), the Nhema communal area (Maroyi 2015), Chibuene Mozambique (Ekblom 2012; Ekblom et al. 2014), the Matopos district (Ndiweni 2015) and Tembe Thonga society (Cunningham 1988). The livelihoods of Mtanye people were based on plant resource utilisation, animal resources utilisation and other activities at the site signified by the presence of iron slag smelting, metal objects, beads for trade and exchange.

7.4. Land use at Mtanye

The presence of various staple crops, legumes and vegetables in the same debris is a clear sign that farming was part of the land activity at Mtanye during this period. Although there is limited evidence of cereals such as sorghum and pearl millet the presence of infrastructures such as grain bins, pit storage structures and grinding stones, attest that cereals and other legumes were cultivated locally (Crawford 2003; Neuman 2003). Considering that the area was dry, indigenous vegetables indicated in the results section probably were grown in areas with raised water tables such as dambos (Jonsson 1998) or in gardens (Greenfield et al. 2005; Crawford 2003; Neuman 2003). Further research to locate the gardens can help to give more information.

While using the camp follower hypothesis once used by Anderson (1952) and Sauer (1952), which attest that certain plant species can follow human settlements, this research found out a wide range of synanthropic plants that showed a direct mutual relationship with humans (Van der Veen 2014). Samples of these plants were found in the archaeobotanical record of Mtanye. The researcher found that specific procedures should be followed when harvesting these plants. For instance, women have more knowledge of harvesting indigenous vegetables and how to cook them. A variety of these plants that are of social importance include *Cucurbita maxima* (*munhanga/muboora*), *Vigna unguiculate* (*munyemba*), *Gynandropsis gynandra*

(*munyeve/nyevhe*), *Bidens pilosa* (*mutsine*) and *Corchorus olitorius* (*derere*). These traditional vegetables grow in middens and dumping sites around houses and in gardens where the land is humanly altered (see Maroyi 2015; Jonsson 1998). Van der Veen (2014) refers to these group of weeds as *Synanthropes* because of their close life relationship with humans and also because they signify past ecologies, agricultural systems, arable fields and scales of production. Sometimes people do not grow them, but they grow independently, and humans harvest them for consumption. They are sometimes stored as dried vegetables (*mufushwa*) for the next season when the environment poses challenges to people's livelihoods.

Evidence of these *synanthropic* plants at Mtanye may also attest to gardening practices. Greenfield et al. (2005) in South Africa explored the possibility of garden locations during the Early Iron Age. The availability of open spaces, traditional vegetables such as *Cucurbita maxima*, *gourds/squash*, *Cucumis melo* in connection with the strategic position of Mtanye near the river can suggest that the inhabitants grew different types of plants in their gardens. Evidence of gardens near settlements may be confirmed by the presence of *Acacia* seeds found in the assemblage which could have been used for fencing to protect plants against both, domestic and wild animals (Greenfield et al. 2005; Schapera and Goodwin 1962; Coates Palgrave 2002; Greenfield et al. 2005). *Acacia* is well known ethnographically for its use for fencing gardens in Zimbabwe. Gardens could have been placed in open places near the settlements or close to dambos or rivers for easy access to water (Greenfield et al. 2005). Be that as it may, the presence of *Acacia* seeds might be as a result of other natural factors and not related to the presence of gardening practices at Mtanye. Thus, further research to investigate the presence of gardens at the site is vital

There is also a high possibility that dryland farming methods were in practice considering that cereals were rainfed and tolerant to drought (Nyamushosho et al. 2018). These cereals might have been intercropped with legumes, wild grass, and indigenous vegetables because all these were recorded at Mtanye site. They were found in the same context. Evidence of intercropping can be attested by the presence of weeds or wild grass and other plants (Crawford 2003; Neuman 2003; Jonsson 1998; Huffman 2008). While exploring weed ecology in Egypt at Tell-el-Maskhuta in the Wadi Tumilat (1750-1550BC), Crawford (2003) found out that certain weeds are good indicators of land strategies and evidence of cereal cultivation, for instance, *Setaria* grass and other millet species were found at Mtanye site. de Luna (2016) in her research among the Botatwe of the Tonga tribe in Gwembe Valley, Zambia, recorded the gathering of wild grasses contributing highly to their subsistence system. In west Africa, archaeological studies have indicated that during the Early

and Middle Holocene, foragers and pastoralists utilised wild grasses as food (Neumann 2003, 2018). Neumann emphasises that the combined exploitation of cereals, legumes, wild grass and wild fruits formed the cultural landscape of present-day West Africa. Likewise, several sites in Nigeria, Mali and Senegal produced evidence of wild grasses being gathered and consumed (see Murray, 2005; Gallagher, 1999; McIntosh 1995). Similar results were also found at Mwenezi and Malumba Iron Age sites in Zimbabwe where wild grasses such as *Panicum maximum* and *Sporobolus pyramidalis* were found in association with sorghum and used as possible indicators of good agricultural practices that were undertaken in the past (Manyanga 2006; Jonsson 1998). As noted by Neumann (2005), it is becoming a common feature in most sub-Saharan rural communities that agricultural activities are also combined with the exploitation of wild resources. Thus, there is a possibility that this was happening at Mtanye Iron Age site based on the evidence of cereals, legumes, wild grass and other traditional vegetables which were found in the archaeological context.

Also, the presence of wild grass at Mtanye may be interpreted as fodder for livestock (Crawford 2003; Neumann 2003; Jonsson 1998). This is possible because some wild grass seeds such as *Setaria* grass were found in association with cow dung. Feeding goats and cattle promoted livestock production at Mtanye. Ethnobotanical investigations among the households in Selonga community have confirmed this practice whereby *Setaria* grass and other weeds were used as animal fodder, especially goats and cattle.

There is also evidence of animal bones which include domesticated and wild animals. The livelihoods of people at the Iron Age site of Mtanye were improved by animal resources such as goats, cattle, chicken and wild animals such as Kudu, duiker, rabbit and birds (Huffman 2008; Scholfield 2017). Cattle and goats are most favourable in this area and could have been kept as symbols of wealth and medium of exchange. While the data recorded showed no evidence of sorghum but much evidence of livestock production, it is possible that their land was primarily used for pastoralism as a livelihood strategy in accordance with prevailing semi-arid conditions (Crawford 2003; Nyamushosho et al. 2018). This is confirmed by the fact that southwestern Zimbabwe is in regions 4 and 5 of Zimbabwe that receives low rainfall and ideally suitable for livestock production and wild animal management. It can be noted that crop production was not always ideal due to periodic droughts; hence the risk of failed crop production was higher (Rukuni and Eicher 1994). Therefore, there is no doubt that the people of Mtanye managed to survive due to a combination of economic activities that worked hand in hand for them to cope up with prevailing environmental conditions in the semi-arid region.

7.5. Social Interactions and Networks

The availability of a wide range of plants utilised at the Iron Age site of Mtanye signifies the importance of food in mending social relations (Gummerman 1997). There is an increasing awareness that food in the past maintained social relations and cohesion (Tawuyanago and Mbenene 2010; Hamutyinei and Plagger 1987; Beach 1980, 1983). Explaining the centrality of food sharing among the Shona people, they say “*ukama igaswa hunozadzikiswa nekudya*” (“relationships are on their own never adequate, they are only made adequate by people sharing food”) (Tawuyanago and Mbenene 2010; Hamutyinei and Plagger 1987). Whenever people come together to discuss issues or to celebrate events, food is the priority which they make sure is available; hence food brings people together.

Beach (1983) talks about the importance of cereal grain crops as a staple food and their role in promoting social relations among the Shona people. As noted by Tawuyanago and Mbenene (2010), in Shona culture, people who produce more food and share with others earn greater respect in society. Food brings people together, either during cooperative or non-cooperative events. In many rural communities in Zimbabwe, sorghum or millet beer brings people together during funeral commemorations (*nhamo, magadziro or kurova guva*) and cooperative activities such as *humwe, nhimbe or jakwara* (Beach 1983; Tawuyanago and Mbenene 2010). Similar results during ethnographic surveys revealed that food played an essential role in promoting social cohesion among the Selonga community near Mtanye. There is a possibility that people at Mtanye considered food as a critical item that cemented relations.

Food sharing with other contemporaries could have been possible during the period of Mtanye. In Selonga community near Mtanye, people are selling plant resources in urban markets, along main roads and on street corners, to make a living. In the past, people shared these resources among households, villages and other societies through barter trade and connections (Jonsson 1998; Maroyi 2015; Cunningham 1988, Campbell 2000; Gomez 1988). It was not only gold, beads, ivory, metals and other precious materials that were shared among farming communities; grains and wild resources were also exchanged (Jonsson 1998). Jonsson (1998), noted that there is evidence of grain exchange in Portuguese documents which indicate that there was an exchange of grain and vegetables between households, communities and societies. Knowing that southwestern Zimbabwe is a semi-arid region, the risk of crop failure could have been evident as a result of periodic droughts. On the other hand, one would suggest that, if their neighbouring

compatriots were located in less arid zones, with more grain yields during dry seasons, for instance in Mapungubwe, Mapela and Manhanzve, sharing could have been an option which would have prolonged their survival at Mtanye. If not sharing, raiding or stealing from other people's fields could have been another option.

While on this issue, sharing and exchange could have occurred between farmers and hunter-gathers, for instance exchanging medicine, wild foods, grains, wild game meat et cetera, helped them to survive in the semi-arid region (Thorp 1996; Kusimba and Kusimba 2005). Thorp (1996) supported this by indicating that there were barter interactions between hunter-gatherers and farming communities around 15th century AD in the region. Additionally, people in rural areas walked long distances in search of grain and wild resources such as mushrooms, fruits, and so on. In this regard, their survival in a semi-arid region could have been made possible owing to relations of sharing with other hunter-gatherer communities in the area.

7.6. Plants and the Social Context

Archaeobotanical remains are now used to answer social issues (Antonites and Antonites, 2014). There is a current shift from a mere study of subsistence and diets to an understanding of the social context of food (Palmer and van der Veen 2002; Twiss 2002, 2012; Gummerman 1997). Studies on social and symbolic meanings of plants are gaining space in archaeobotany, against the previous era where plant remains were not treated as part of the material culture. Recent studies in archaeobotany present the argument that the relationship of these archaeobotanical remains to other types of material culture is significant as collection, processing, consumption and deposition are socially and culturally defined (Palmer and Veen 2002). Twiss (2012:361-362) noted that "people pass through a series of stages in their interaction with food; they gather, cultivate, domesticate, raise, trade and discard". The processes involved in gathering, processing, consumption and to discard very important to consider and as expressed by Twiss (2012:362), this whole process is analogous to the *chaine operatoires* concept where social acts are involved in the step-by-step production, use, and eventual disposal.

The taboos and rites that are associated with dealing with individual plants need to be considered in this interpretation. Different trees from Mtanye are not allowed to be cut or used for firewood. Cutting of trees such as *marula* (*Sclerocarya birrea*), Baobab (*Adansonia digitata*) and Monkey orange (*strychnos coccoloides*) is not allowed because they are offered economic and social roles for the whole community. Some trees are left standing between and outside settlements and in

some cases inside the fields. Symbolically, some trees are linked to ancestral spirits, and their benefit to humans is spiritual. Among the southern Shona people, there is a belief that the spirits like to dwell in trees (Wilson 1989). For this reason, Mauch the earliest colonial visitor in 1871 noted that big trees were often left standing in the fields in Masunda, Chivi area. These trees included the fig tree and marula (*Sclerocarya birrea*). This trend was not peculiar to Masunda; it was the norm in many communities, including the research area under study where some trees are left behind in the fields possibly for varying spiritual, social and economic reasons.

Trees such as *Parinari curatellifolia* (*muhacha* or *muchakata*) are considered permanent locations for spirit mediums (Gelfand 1971). Among the Zulu and Xhosa communities, individual trees are used for purification, cleansing and initiation ceremonies (Hutchings 2007). Hutchings (2007) observed four indigenous plants used by the Zulu and the Xhosa during purification and burial rites such as *Lippia javanica*, *Ziziphus mucronata*, *Helichrysum* and *Ficus* species. While efforts to document the evidence of rituals and their symbolic significance was in vain due to time and resource constraints, generalised information from participants indicated that various trees are used to perform rituals and ceremonies. It is common among the Kalanga, Zezuru, Ndau and even the Ndebele that plants are considered significant in performing rituals and ceremonies. Humans socially relate with these plants for a myriad of reasons, some of which are contained within the rubric of social practice which encompasses the religious and cosmological beliefs and practices (Van Derwarker et al. 2015).

Archaeobotanical remains, and infrastructure at Mtanye allow for a discussion on gender and the division of labour. Issues of processing, storage and consumption are found in recent developments in archaeobotany which show an appreciation of gender and division of labour (Hastorf 1991; Joyce 1993, 1992). The role of women in planting, gathering, processing, storing and cooking is vital (see Antonites and Antonites 2014; White 2010). Evidence of grinding stones and grain bins opens a window into the past and in the understanding of gender issues (Antonites and Antonites 2014). Ethnographic information in conjunction with other sources of material culture has managed to explain the importance of space, which includes the dichotomy of left/right, front/back, public or private, men/women and many other opposites (Antonites and Antonites 2014: 229; Huffman 1996). The presence of grinding stones and grain bins within the settlements signifies the roles played by women towards food processing and food security.

Also, food can be used to define status. For instance, Gummerman (1997) noted that elites or commoners receive foods that define their status. Using archaeobotanical remains combined with other isotopic studies in the Maya, White (2010) found out that the “Maya women exercised agency and power in the religious domain by controlling food”. White (2010) also indicated gender differences in food consumption among the elite as she found out that men consumed more carnivorous diets as opposed to women who consumed essential foods such as maize and marine/reef resources. The issue of status was, however, not clear at Mtanye. Instead, after using ethnohistorical, ethnobotanical and archaeological investigations to scrutinise these divisions, it was found out that women are actively involved in gardening, weeding, gathering, preparing and cooking (Maroyi, 2015; Ndiweni 2015; Jonsson, 1998; Cunningham 1988; Murimbika, 2006; Liengme 1983; Van Wyk 2002). Men were also actively involved in activities such as hunting, governing, farming, mining and other jobs that require a workforce. This could have been the case in the past at Mtanye, where men participated in long-distance trade, Iron production, hunting and governing, while women performed duties such as gardening, weeding, gathering, cooking and so forth (Murimbika 2006; Huffman 1996; Chirikure et al. 2014; Manyanga 2006; Jonsson 1998). However, besides this boundary, this study also found that men and women played important roles through the principle of complementarity. This is because, even though they may have played separate roles, their contributions were equally significant for the development of complex societies in the past. Widows performed the same duties performed by men, and when a man did not have a wife but had kids, he would perform the same responsibilities as women.

7.7. Seasonality and Paleoenvironments

Mtanye, Iron Age site, is in semi-arid regions 4 and 5 of Zimbabwe (Huffman 2015; Vincent and Thomas 1960). The ethnobotanical survey confirmed that the area is semi-arid, with little rainfall. The archaeobotanical remains have shown that several plants in the area are associated with dry environments, for instance, *marula*, *baobab*, *Grewia* and *Acacia*, are related to semi-arid regions. Wild plant resources were recorded in all layers, but the frequency increases in the upper layers. Two explanations are possible to this pattern. This may mean that climate was changing gradually from around AD 900 to the end of Mtanye AD 1390s and this triggered drought around the later days of Mtanye which reduced crop cultivation. The drought may be the reason why crops were not fairly represented at Mtanye. Smith (2005), argues for Climate change that affected the agropastoral sustainability in the Shashe/Limpopo River Basin from AD 900. Holmgren and Oberg (2006) also support this by arguing that there was climate change in southern and eastern Africa during the past millennium that implicated societal development. According to Holmgren and

Oberg (2006), climate changes in semi-arid areas caused changes in water sources and implicated ecological and socio-economical processes. In Mozambique at Chibuene Eklbom et al. (2014) managed to identify four phases that highlighted that there was climate change from AD 900- AD 19000. Effects of climate change were also observed during ethnobotanical research in Selonga community. Climate change is now a significant effect on people's livelihoods, with limited harvests and lack of proper grazing lands. The environment is no longer conducive enough for proper crop cultivations due to poor rainfall. During interviews, people indicated that farming is now trying and error because they are no longer sure if the rain will come or not.

The other explanation about more wild plants on the upper layers of Mtanye is that these plants could have been self-introduced to the site or introduced by animals or erosion. Thus, they might be modern intrusions; however, more micro botanical research that is combined with other proxies can give us a clear picture of resource utilisation and at Mtanye Iron Age site.

Seasonality can be inferred at Mtanye based on the availability of specific plant resources that were found at Mtanye. Ethnobotanical surveys observed that it is during the period of scarcity that more wild plants are utilised around October and November as well as February and March. During this period, people have little or no food in their coffers. Wild plants at Mtanye were collected during periods of scarcity and less in good times.

7.8. Mutualism at Mtanye: Domesticated and Wild Plant Resources in the Past.

“The plants we formerly identified as wild have as many requirements of interaction, work, labour organisation, negotiation and familial networks as ones that people grow. We might also ask, did people in the past separate this role of plants based on whether or not they were gathered or cultivars?” (Korstanje 2017;120).

This section explains how the concept of mutualism observed at Mtanye based on the relationship that people had with both domesticated crops and wild plants. The questions here are that do people in the past choose which plants do they want most between domesticated or wild ?. Can we continue to use this boundary based on resource utilisation or the two groups of plants have equal roles depending on which purpose are they saving ?. The archaeobotanical results from the Iron Age site of Mtanye revealed a combination of domesticated and wild species. Similarly, ethnobotanical studies have noted the extensive use of both domesticated and wild plant resources by present communities. The availability of wild plants in all cultural layers and the highest

frequency leaves one with no doubt that these resources were part of the livelihood systems and were vital at Mtanye. However, studies on the history of farming communities in Africa, southern Africa and Zimbabwe tend to direct too much attention to domesticated crops such as Sorghum, Pearl millet, finger millet and cowpeas (Phillipson 2005; Hall 1983; Huffman 1996; Manyanga 2006, Mabgwe and Manyanga 2013; Pwiti 1996; Huffman 2008). It appears as if the domesticates are only ones that indicate human-plant interactions and sustainable livelihoods in the past.

As noted by Jonsson (1998), the conceptual distinction between wild and domesticated plants is too much. Korstanje (2017) goes further to point out that we do not know if people in the past called them domesticated or wild plants. Wild plant gathering is always regarded as a part-time activity for women and children, food for the poor, and as famine foods used during the drought period (Maroyi 2015; Ndiweni 2015). It appears as if people waited for the drought to appear first before they embarked on the gathering and collection of plants in the wild. This interpretation only looks at wild plants as only relevant for food. However, this research observed that wild plant species recorded, have strong social, political, economic, religious and ideological values attached to them all year round. These values may include nutrition, medicinal, ethical use such as rituals, initiation and ceremonies, domestic purposes for firewood, construction of cattle and goat kraals, fencing and so forth (Maroyi, 2013; Korstanje, 2017; Cunningham, 1988; Cheikhoussef and Maroyi, 2017; de Luna 2016).

Besides, the role of wild plants in providing a critical component to the subsistence systems of both, hunter-gatherers and farming communities, has been a subject of investigation in archaeology and other disciplines (Whitney 2018; Chavailier et al. 2014; Harris and Hillman 2014). According to Antonites and Antonites (2014), the studies of the relative importance of wild plants in southern Africa remains poorly understood. For Antonites and Antonites (2014), both wild and crop plants consumed in the past and their processing and storage is visible in the archaeological record.

Of great importance what this research observed during ethnobotanical surveys. This research noticed that there are so much labour and organisation invested in the process of gathering, preparation, storage and consumption of these wild plant species. There is need to understand the *chaine operatoires* involved during human-plant mutualism, ranging from decision making, selection, collecting, gathering, cultivation, processing, storage, consumption and deposition (Twiss 2012: 362). The more considerable variability of wild plant species recorded from Mtanye such as *marula*, *Terminalia sp*, *Mopane*, *Grewia sp*, *Commiphora sp*, *Adansonia digitata* (*Baobab*)

and others are located between the range of 0.5 to 3 kilometres away from the site and collected from a distance. Thatching grass species such as *Setaria* grass and other fodder species were found at Mtanye, but these are mostly found in wetlands and along rivers and *dambos* (Jonsson 1998). This research suggested that this pattern defines an additional amount of effort, a special kind of labour invested in the process of gathering wild plant species. In this regard, their presence in the archaeobotanical record of Mtanye indicates an enormous contribution towards people's livelihoods in the semi-arid region. This research has it that, people in the past treated wild plant procurement and their use thereof, with the same more exceptional inventiveness as they did for domesticated crops. The domestication process started from the wild, and it is from the wild that these domesticates were modified, managed and increased in yield size, as well as dispersed across habitats by humans and animals. Thus, the emphasis should not be on demarcating the words "Wild" or "Domesticates", but it is about the reasons behind human-plant mutuality. The reasons range from nutrition, subsistence, food security, livelihoods, medicinal, beauty, intoxication, music, construction to rituals, among others.

7.9. Gathering and Farming Interactions

The dichotomy that the Bantu migration displaced and integrated the farming communities in east and southern Africa is familiar in archaeological interpretations. Some scholars pointed out that these groups of people arrived in southern Africa with a package of Iron, pottery, livestock and crops (Pwiti 1996; Huffman 1996, 2007). This interpretation gives evidence that cereals and legumes are products that were brought by this movement from east to southern Africa. This is probably the reason why there has been more emphasis on domesticated crops and not on wild plants in most literature in southern Africa. Hunter-gatherers existed in both east and southern Africa before the coming of the Bantu speaking people, and their use of wild plants is also known. Though scholars are aware of that little is known about their contribution to the development of complex societies through interaction with the farming communities.

The concept of continuity and change between hunter-gatherers and Iron Age farmers remain debatable in the archaeology of southern Africa and elsewhere (Mitchell 2009; Denbow 1984, 1990, 1999; Denbow & Wilmsen 1986; Wilmsen & Denbow 1990; Jonsson 1998; Walker 1995). The use of wild plants is widely noted as a significant economic activity of the hunter-gatherer communities, and as we approach the Iron Age period, it is said that farmers concentrated more on farming than gathering wild plants (Huffman 1996, 2007; Smith 2005). Focus on the studies of the Iron Age communities in southern Africa is targeted at crop production, metal, ceramic and

livestock production, as well as trade connections (Huffman 1996; Denbow 1990; Pwiti 1996; Manyanga 2006; Mabgwe and Manyanga 2017). However, results obtained from Mtanye Iron Age site indicated a higher frequency in the use of wild plants.

The availability of wild resources found in abundance at Mtanye, which include both the plant and animal resources, indicated that hunting and gathering continued during the Iron Age, not as a hobby but as an effective mechanism to cope up with drought stress and shocks. While wild plants and wild animal resources constituted the highest frequency at Mtanye this trend may signify that the gathering of wild resources was never replaced by crop cultivation; hunting and gathering remained a full-time activity to maintain food security and enhance people's livelihoods. Based on the availability of both the domesticated crops and wild plants in all cultural layers, this research supported that people in the past would not wait for the drought to come for them to engage themselves in the gathering of plant resources fully. The collection of plants remained consistent, whether during drought seasons or in good years. Therefore, it is difficult to pinpoint which plants were utilised only by hunter-gatherers or by farmers

Jonsson (1998) and Walker (1995) indicated continuity and change in the diversity of plants that were utilised by farmers and hunter-gatherers based on the differences in plant use. Gathering of wild plants as a full-time activity has previously been used to define identity whether they are foragers or farmers (Lombard 2013; Smith et al. 1991; Marlowe 2005). However, looking at the current use of plants by both groups, there are little differences in the use of wild plants because these plants were used most likely for the same reasons. According to Chirikure (2019), social identity is never defined based on subsistence strategies because food ecosystems are about nutrition, food security and social networks.

Eloquent studies were undertaken by de Luna (2016) in the Gwembe valley among the Botatwe people in Zambia, where she noticed the dynamics between food collection and food production. She stated that “innovation and adaptation helped the people to thrive in their changing social and environmental conditions” were wild plant collection, hunting, fishing and crop cultivation influenced their economic, political and social lives throughout three millennia (de Luna 2016). In this study, people and plants are mutually connected; they find each other and create long-term relationships, whether in good or bad times.

8.0. Summary

The section below summarises this project, illustrating the key points and outcomes that indicate findings relating to research questions, aims and objectives of this project. It outlines what this research has achieved and the shortfalls that need to be addressed in future studies.

Table:11: Summary of key findings concerning research questions, aims and objectives of the project.

Research questions	Outcomes
<ul style="list-style-type: none"> • What was the diversity of plants utilised by past farming communities in the semi-arid region of southwestern Zimbabwe? 	<p>The diversity includes the domesticated and wild plants. The crops include the cereals, legumes, vegetables and nuts. The wild include the fruits, tubers, other trees with particular uses such as firewood, construction. The most ubiquitous plants include the <i>Lannea schweinfurthii</i>, <i>Sclerocarya birrea</i> (marula), <i>Adansonia digitata</i> (Baobab) Grewia.</p>
<ul style="list-style-type: none"> • How did humans at Mtanye treat the domestication of crops and gathering of wild plants as compared to other economic activities? • Do people in the past favour domesticated plants most that wild plants? 	<p>Domestication and gathering were treated with more considerable ingenuity, just like other economic sectors. The evidence is the presence of storage and processing infrastructure such as grain bins, storage pits and grinding stones as well as the availability of archaeobotanical found in association with other material culture.</p> <p>Domesticated, and wild were used for different purposes. Their use could have been based on how the community were utilising them</p> <p>The highest percentage of wild plants at Mtanye shows that they were essential to people's livelihoods.</p> <p>Their use was treated the same, as indicated by current use of plants in the region where</p>

	<p>both wild and domesticated complement each other.</p> <p>However, more can be articulated using a combination of micro-skills such as the analysis of residue, phytoliths, pollen, sediments and isotopes.</p>
<ul style="list-style-type: none"> • What was the role played by plants in the past? 	<p>Based on ethnobotanical and archaeobotanical information, this research observed that plants were very significant as they offered the social, economic, religious as well as political roles. Plants were not only used for diet and subsistence but other uses which include construction, firewood, medicinal, intoxication, rituals et cetera. This brings to an important observation that wild plants should be somewhat studied in the archaeology of southern Africa and move away from the tendency of putting more emphasis on cereals that were brought by the Early Bantu speakers.</p>
<ul style="list-style-type: none"> • How did people and plants interact in the past? 	<p>The interaction was mutual. Humans benefited, oxygen, food, other domestic benefits (see chapter 4).</p> <p>Plants benefited through dispersal, protection, reproduction, changing of ecosystems</p>
<ul style="list-style-type: none"> • What is the difference between the plants utilised by the present communities around Mtanye Iron Age Site and the ones in the archaeobotanical record? 	<p>The difference is very slight. Most of the plants found in the modern-day are similar to the ones in the archaeobotanical record. The absence of these plants in the archaeobotanical context maybe as a result of preservation conditions, for instance,</p>

	vegetables and other essential cereals are not present. The environment did not change the present dryland, and semi-arid conditions existed from the past.
Aims and objectives	Outcomes
<ul style="list-style-type: none"> To investigate the plant economy of Mtanye Iron Age site 	<p>This goal was achieved successfully. This research has collected a large sample of archaeobotanical remains from the site. The plant economy at the Iron Age site of Mtanye involved both the tame and the wild plants. The wild had the highest ubiquity percentage. Plants at Mtanye were vital in daily livelihoods considering that the area was a semi-arid region; the risk of crop failure was higher. These people could have treated the plant economy with more exceptional inventiveness, just like other activities such as livestock production, trade, and so forth. Plant economy could have been one of their mainstays during Mtanye period.</p>
<ul style="list-style-type: none"> To identify the diversity of plants in the archaeobotanical record of Mtanye Iron Age site. 	<p>This was reasonably achieved. The major problem with this was the preservation and lack of other micro botanical skills such as residue analysis, phytoliths and pollen analysis as well as isotope analysis. Some trees were not identified because further charcoal analysis from the site was not possible due to time and resources. There is a need to combine both the macro and microanalytical skills to extract more information about the diversity of plants represented. Again, sampling techniques</p>

	must also be improved to get a holistic understanding of the site.
<ul style="list-style-type: none"> • To identify the diversity of plants used by the present communities in southwestern Zimbabwe, particularly communities around Mtanye Iron Age site. 	This goal was achieved successfully. A list of crops and wild plants was documented and also used as a comparative collection. There are also exotic crops and fruit plants introduced in the area after the period of Mtanye, such as maize, avocado, apple et cetera. These are not present in the archaeobotanical record. However, there is a need for more ethnobotanical surveys in the area to document more medicinal and other plants with various uses.
<ul style="list-style-type: none"> • To investigate the mutual relationship between humans and plants in the semi-arid region of south-western Zimbabwe 	The achievement of this goal was fair. There was a colossal relationship observed between people Mtanye, and plants found. Evidence of crop domestication, gathering, storage and processing is a clear testimony that there was a mutual relationship between humans and the environment. The interaction goes beyond diet and subsistence to other social, economic and religious purposes.

8.1 Conclusion

In conclusion, this research argues that both crops and wild plants were vital to human's daily lives during the Iron Age period. Previously, in many pieces of research in southern Africa cereals such as sorghum, millet and other crops such as cowpies, squash brought by the Bantu attracted more attention as compared to the contribution of wild plants such as fruits, and other wild trees used for other purposes. This research noted that wild plants too formed an essential part of peoples' livelihoods at Mtanye either in good or bad times. The gradual increase of wild plant use from bottom to upper cultural layers at Mtanye shows that wild plants were extensively used during the later days of Mtanye probably to cope up with prevailing environmental conditions. It also indicates that the environment during the last days of Mtanye poses serious threats to crop production and food security. Therefore, wild plants may have been used to mitigate crop failure.

The picture shown by a gradual increase of wild plant use at Mtanye attests to a dry and drought environment which is more similar to modern day semi-arid environment in the area. The use of wild plants in the region is extensive although it seems to be getting worse due to further climatic changes. This research has also noted that particular plants during the period of Mtanye were not only utilised as for diet and subsistence but were also chosen based on their unique qualities ranging from medicinal, rituals, construction, implements, fodder and amongst others. Above all, plants were treated with more considerable ingenuity just like other economic activities such as trade, iron smelting, mining because so much labour is invested in the farming, gathering, processing and consumption of these plants. Such ingenuity and flexibility along with other sectors of the economy may likely have been underpinned in their ability to survive in the semi-arid region of southwestern Zimbabwe.

It is against this background that while using the mutualism theory, this research reiterates that human-plant interaction contributed to the development of human populations, their behaviours, livelihoods and the transformation of plant ecosystems. This theoretical framework enabled the researcher to investigate assumptions relating to domesticated and wild plants utilised by people in the past. It argues that understanding human-plant interactions in the past should be viewed from both the human and plants' point of view and this will allow one to deduce the reasons behind the utilisation of specific plants by people in the past. This symbiotic relationship should enable researchers to study plants, not only as mere remains of low archaeological visibility or as indicators of diet and subsistence but as indicators of social, economic, religious and political significance.

8.2. Future Research

Archaeobotanical research in southern Africa needs an expansion to all sites that are poorly researched. There is a need for studies that revisit the origins of agriculture in southern Africa, from an archaeobotanical perspective because agriculture was essential to Iron Age communities, but limited data infer this from few sites. Complex societies and civilisations flourished all over Africa as a result of humans taming the natural environment, however, what we know about the origins of this phenomenon called agriculture is based on little knowledge recorded from a few sites. Much credit is given to the coming of the Bantu, ignoring local contributions to the origins of agriculture in southern Africa. The origins of agriculture in southern Africa are primarily attributed to the migration of the Bantu speaking people (Smith 2005; Huffman 2007; Pwiti 1996; Mitchell 2000). The Bantu speakers are said to have introduced the practice of cultivation and

domestication to southern African hunter-gatherers. They migrated from west Africa with their package of iron, crop production, ceramics and sedentary life (Huffman 1996, 2007). Some scholars go further to argue that, as these people arrived in eastern and southern parts of Africa, they assimilated, integrated and dispersed the hunter-gatherers who for a long time had been the inhabitants of these areas (Huffman 1996, 2007; Phillipson 2005). This model undermines local innovation and technological advancement and makes it appear as if cultivation and domestication arrived with the Bantu in southern Africa. The most worrying problem of this limited approach is that the evidence used for this interpretation was recorded from few and dispersed Early Iron Age sites across southern Africa. This scant information is used to represent the whole of southern Africa. The history of African civilisation requires a multidimensional approach using adequate information from all sources so that we can begin to document and appraise the contributions of local innovations the development of complexity.

More importantly, archaeobotanical research in southern Africa is in its infancy; hence there is need to legitimise and assimilate these studies in the archaeology of farming communities in southern Africa (Antonites and Antonites 2014). The is need to use of multidisciplinary methods in Archaeology to integrate material culture such as ceramics, bones, lithics, metals as well as plant remains. Microanalytical methods such as isotopes, residue analysis, pollen and phytoliths should be integrated to produce more essential data. More ethnobotanical studies that investigate the diversity of plants in the past are vital, primarily documenting the traditional knowledge of plant use that is deteriorating. It would be exciting in the future to record more names of plants and their uses. It is also imperative to build capacity in archaeobotanical research as we as organising a proper comparative collection from each region with different environmental parameters that can be used to analyse seeds from archaeological sites. Last but not least, the is need for training more archaeological students on how to identify archaeobotanical remains from many archaeological sites.

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8.4. Appendix

Appendix 1: Wild Indigenous edible plants from Selonga Community

Indigenous wild fruits				
Scientific name	Indigenous /local name	English name	Family Name	Part used
<i>Ximenia caffra</i>	Nhengeri	Sour plum	<i>Olacaceae</i>	Fruits; roots
<i>Garcinia buchanani</i>	Matunduru	Granite mangosteen	<i>Clusiaceae</i>	Fruits; roots
<i>Flacourtia Indica</i>	Nhunguru	Governor's plum	<i>Flacourtiaceae</i>	Fruits
<i>Vitex payos</i>	Tsvubvu	Smelly berry	<i>Lamiaceae</i>	Fruits
<i>Ziziphus mauritiana</i>	Masawu	Indian plum	<i>Rhamnaceae</i>	Fruits; roots
<i>Berchemia discolor</i>	Nyii	African sweets/bird plum	<i>Rhamnaceae</i>	fruit
<i>Parinari curatellifolia</i>	Hacha/muhacha	Mobola plum	<i>Chrysobalanaceae</i>	Fruits; leave; roots
<i>Curissa edulis</i>	Nzambara/mbambara	Simple spinned numnum	<i>Apocynaceae</i>	Fruits; roots
<i>Azanza garckeana</i>	Matohwe	Snot -apple	<i>Malvaceae</i>	Fruits; roots
<i>Strychnos spinosa</i>	Matamba	Monkey orange	<i>Strychnoaceae</i>	Fruits; roots
<i>Lennea edulis</i>	Tsambatsi	Wild grape	<i>Anacardiaceae</i>	Fruits; roots
<i>Syzygium cordatum</i>	Hute/Mukute	Water berry	<i>Myrtaceae</i>	Fruits; leaves; roots
<i>Opuntia ficus indica</i>	Madhorofiya	Prickly -pear	<i>Cactaceae</i>	Fruits; roots
<i>Pilostigma thonningii</i>	masekesa	Monkey bread	<i>Caesalpinioideae/Fabaceae</i>	Fruits; leaves; roots

<i>Annona senegalensis</i>	Maroro	African custard apple	<i>Annonaceae</i>	Fruit; roots
<i>Uapaca kirkiana</i>	Mazhanje	Wild Loquat/sugar plum	<i>Phyllanthaceae</i>	Fruits; leaves
<i>Grewia discolor</i>	Bhubhunu/	Cross berries	<i>Taliaceae</i>	Fruit/medicinal/domestic
<i>Lennea schweinfurthii</i>	Gan'acha/ mushamba	False marula	<i>Anacardiaceae</i>	Fruits; leaves; roots
<i>Sclerocarya birrea/caffra</i>	Mafura/mapfura	Marula	<i>Anacardiaceae</i>	Fruits; bark; leaves; roots
<i>Adansonia digitata</i>	Mauyu	Baobab	<i>Malvaceae</i>	Fruits; leaves; roots
<i>Ficus burkei</i>	Musamvi	Common wild fig	<i>Moraceae</i>	Fruits; roots
<i>Vangueria infausta</i>	<i>Munzviri/mpfilwa</i>	Wild medlar	<i>Rubiaceae</i>	Fruit; wood; leaves
<i>Mimusops decorifolia</i>	<i>Muchechete/umbumbu</i>	Red milkwood	<i>Sapotaceae</i>	Fruit, firewood, medicinal

Appendix 2: Diversity of significant cereals, legumes and nuts identified from Selonga community near the Iron Age site of Mtanye.

Family name	Genus/Species name	Indigenous/ local name	English name	Notes
Poaceae	<i>Zea mays</i>	Chibage/Umumbu	Maize	Not indigenous/ rain-fed/
Poaceae	<i>Eleusine coracana</i>	Rukweza/Umphoko	Finger millet	Indigenous/reach in nutrients
Poaceae	<i>Pennisetum glaucum</i>	Mhunga	Pearl millet	Indigenous/ reach in nutrients
Poaceae	<i>Oryza sativa</i>	Mupunga /irayisi	Rice	mainly grown in wetlands/ dambos
Poaceae	<i>Sorghum</i>	Mapfunde/amabele	Sorghum	Indigenous / used for beer
Leguminosae	<i>Vigna unguiculate</i>	Nyemba	Cow peas	Indigenous crop/
Leguminosae	<i>Arachis hypogea</i>	Nzungu/ Amazambane	Groundnuts	Indigenous crop
Cucurbitaceae	<i>Citrullus lanatus</i>	Mavise	Watermelon	Indigenous/fruit/seeds roasted
Cucurbitaceae	<i>Cucumis metuliferus</i>	Magaka	Horned melon	Indigenous fruit
Cucurbitaceae	<i>Cucurbita maxima</i>	Manhanga	Pumpkin /squash	Indigenous vegetable
Leguminosae	<i>Voandzeia subterranea</i>	Nyimo/indlubu	Bambara groundnuts	Indigenous/cooked/can be dried
Poaceae	<i>Sorghum bicolor</i>	Ipwa	Sweet cane	Indigenous/ very sweat

Appendix 3: Indigenous and exotic vegetable species in Selonga community near Mtanye Iron Age site

Family name	Genus/Species name	Indigenous/ local name	English name	Notes
Leguminosae	<i>Vigna unguiculate</i>	Munyemba/imbida yendumba	Cowpea leaf	Traditional vegetables
Cucurbitaceae	<i>Cucurbita maxima</i>	Muboora	Pumpkin leaf	Traditional vegetables
Cleomaceae	<i>Gynandropsis gynandra</i>	Munyevhe	African spider herb	Traditional vegetables
Asteraceae	<i>Bidens pilosa</i>	Mutsine	Blackjack	Traditions vegetables
Malvaceae	<i>Corchorus olitorius</i>	Derere/idelele	Bush okra	Traditional vegetables
Cucurbitaceae	<i>Citrullus vulgaris</i>	Mushamba/amakhomane	Cow pumpkin leaf	Vegetables/ animal fodder
Brassicaceae	<i>Tronchunda portugessa</i>	Rugare/ikhove	Covo cabbage	Exotic/grown in gardens
Brassicaceae	<i>Brassica napus</i>	Repi	Rape leaf	Exotic/ grown in gardens
Cucurbitaceae	<i>Lagenaria siceraria</i>	mukombe	Calabash/ bottle gourd	Indigenous/gourds as a scoop
Cucurbitaceae	<i>Amaranthus hybridus</i>	mowa	Pigweed	Indigenous/leaves as a relish

Appendix 4: Roots and tubers from Selonga community near Mtanye Iron Age Site

Family name	Genus/scientific name	Indigenous/ local name	English name	Notes
Euphoebiaceae	<i>Manihot esculenta</i>	Mafarinya	Cassava	Tubes/roots are edible
Convolvulaceae	<i>Ipomoea batata</i>	Mbambaira	Sweet potato	Tubes/roots are edible
Lamiaceae	<i>Coleus esculentus</i>	Tsenza	Vlei tube/Kaffir potato	Tubes/roots are edible
Araceae	<i>Colocasia antiquorum</i>	Madhumbé	Yam/ Elephant Ear	The tubes are edible
Iridaceae	<i>Babiana hypogea</i>	Hwena	Roots	Roots are edible

Appendix 5: Seeds recorded from four trenches excavated at Mtanye Iron Age site

Mtanye Hill Terrace 1				Mtanye Hill Site B			
Family	Genus & species	Level	N0 of Seeds	Family	Genus & species	Level	N0 of Seeds
Cucurbitaceae	<i>Cucumis sp</i>	1	2	Taliaceae	<i>Grewia sp</i>	2	56
Anacardiaceae	<i>Sclerocarya birrea</i>	1	2	Fabaceae	<i>Vigna sp</i>	2	2
Talinaceae	<i>Talinum sp</i>	1	24	Anacardiaceae	<i>L.Schwenifurthii</i>	2	9
Malvaceae	<i>Adansonia digitata</i>	1	1	Cucurbitaceae	<i>Cucurbita sp</i>	2	1
Malvaceae	<i>Sida sp</i>	1	8	-	<i>Unidentified sp</i>	2	2
Taliaceae	<i>Grewia sp</i>	1	4	Malvaceae	<i>Sida sp</i>	2	1
Anacardiaceae	<i>Sclerocarya birrea</i>	2	4	Anacardiaceae	<i>Sclerocarya birrea</i>	2	3
Poaceae	<i>Millet sp.</i>	3	4	Cucurbitaceae	<i>Cucumis sp</i>	3	2
-	<i>unidentified sp.</i>	4	1	Cucurbitaceae	<i>Cucumber</i>	5	2
				Malvaceae	<i>Sida sp</i>	5	1
				Poaceae	<i>Millet sp</i>	5	1
				Taliaceae	<i>Grewia sp</i>	5	1
				Anacardiaceae	<i>L.Schwenifurthii</i>	5	1
Mtanye Hill Kraal 1				Western Pot			
Family	Genus & species	Level	N0 of Seeds	Family	Genus & species	Level	N0 of Seeds
Anacardiaceae	<i>L.schwenifurthia</i>	2	83	-	<i>Unidentified sp.</i>	1	1
Taliaceae	<i>Grewia sp</i>	1	2	Poaceae	<i>Setaria sp</i>	2	1
Malvaceae	<i>Adansonia digitata</i>	1	1				
Anacardiaceae	<i>Sclerocarya birrea</i>	2	5				
Burseraceae	<i>Commiphora sp</i>	2	2				
Anacardiaceae	<i>L.schwenifurthia</i>	2	4				

Fabaceae	<i>Legume sp</i>	2	1				
Taliaceae	<i>Grewia sp</i>	4	9				
Malvaceae	<i>Sida sp</i>	4	7				
Acanthaceae	-	4	10				
	<i>Unidentified sp.</i>	4	1				

Appendix 6: Radiocarbon dates from charcoal found in association with seeds, ceramics, beads and other material culture at Mtanye Iron Age site.

Site name	Analysis number	C/period	material	Date BP	1-sigma ranges
MH-T1 04	Beta-531755	TK2/MAP	Charcoal	800 +/- 30 BP	1220 - 1290 Cal AD
MH-K1 02	Beta- 531756	K2/TK2/MAP	Charcoal	830 +/- 30 BP	1204 - 1284 cal AD
MH-K1 05	Beta- 531757	K2/MAP	Charcoal	760 +/- 30 BP	1228 - 1251 cal AD
MH-K1 05	Beta- 531757	MAP	Charcoal	760 +/- 30 BP	1260 - 1315 cal AD
MH-K1 05	Beta- 531757	MAP	Charcoal	760 +/- 30 BP	1356 - 1382 cal AD
MSB-11	Beta- 531758	K2	Charcoal	1080 +/- 30 BP	966 - 1045 cal AD
MSB-11	Beta- 531758	K2	Charcoal	1080 +/- 30 BP	900 - 926 cal AD
MSB-11	Beta- 531758	K2/TK2	Charcoal	1080 +/- 30 BP	1090 - 1108 cal AD
MSB-11	Beta- 531758	K2/TK2	Charcoal	1080 +/- 30 BP	1120 - 1128 cal AD

**MH-T1 04 refers to Mtanye Hill terrace 1 Level 04 *MH-K1 refers to Mtanye Hill Kraal 1 Level 02, 05 *MSB refers to Mtanye Site B Level 11 *C/period refers to cultural period * K2 refers to the Early Iron Age cultural period in southern Africa. *TK2 refers to Transitional K2 cultural period in south Africa *MAP refers to Mapungubwe period*

Appendix 7: Total number of all archaeobotanical remains recorded from Mtanye Iron Age site

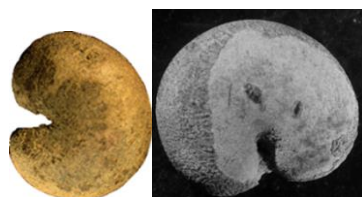
Family	Genus & Species	No of Seeds	Total % frequency
Fabaceae	<i>Vigna unguiculate</i>	4	2
Curcubitaceae	<i>Cucumis metuliferus,</i>	6	2
Malvaceae	<i>Adansonia digitata</i>	2	1
Burseraceae	<i>Commiphora sp</i>	2	1
Anacardiaceae	<i>Lannaeschwenifurthii</i>	97	37
Poaceae	<i>Millet Sp</i>	5	2
Poaceae	<i>Setaria grass</i>	1	0.4
Anarcadiaceae	<i>Sclerocarya birrea</i>	14	5.3
Acanthaceae.	-	10	4
Curcubitaceae	<i>Cucurbita maxima/ Lagenaria siceraria</i>	2	1
Taliaceae	<i>Talinum sp</i>	24	9.2
Malvaceae	<i>Sida sp</i>	17	6.5
Taliaceae	<i>Grewia sp</i>	72	27
Non-identifiable	Non-identifiable	5	2

Appendix 8. Seed images

Sclerocarya birrea



Adansonia digitata





Cucurbita sp



Lanea.schwenifurthii



Adansonia digitata shell fragments

