10 - Final Conclusions

10.1 Introduction

In Chapter 1 the research question was introduced as follows: “Can a model derived from development economics describe and characterize mid-Holocene livelihoods in the eastern Sahara and elsewhere, in terms of risk, opportunity and sustainability allowing them to be directly compared and contrasted?” This was translated into a set of hypotheses. To address these, the thesis employed an approach pioneered in development economics to assess livelihoods practiced under conditions of risk, opportunity and sustainability in marginal environments of the eastern Sahara during the mid-Holocene. The focus was on the development of a new methodology for maximizing the value of published data rather than addressing problem-oriented questions about Saharan prehistory.

The first three chapters introduced and discussed the Sustainable Rural Livelihood model and how it compared to archaeological theory. Chapter four describes the climatic background and chapter 5 captures the current state of knowledge on risk and uncertainty in dryland environments. The next two chapters introduced the case studies, the SRL template and methodology for data collection with examples. Chapter 8 consists of an abridged form of the Nabta Playa case study. All four case studies were then compared to one another in chapter 9. Finally, this chapter brings together the findings of the thesis.

10.1.1 Assessing the hypotheses

Five hypotheses were introduced in Chapter 1 to test the SRL model. These can now be addressed, together with concerns expressed in the introduction. Observations on the design of the research follow.

A - New approaches to modelling in archaeology, derived from approaches in development economics that exist explicitly to analyze livelihood sustainability, can improve data capture and analysis in archaeology.

The Sustainable Rural Livelihood approach, by combining a descriptive matrix with explanatory variables in a dynamic context of vulnerability, has proved to be a versatile tool for capturing and analysing archaeological data. With modifications for use in archaeology it has provided a useful methodology for discussing livelihood strategies. Where there were considerable gaps in some of the available data, the SRL approach made these clear. This both enabled suggestions for future field research and for flagging where livelihood reconstruction will remain incomplete. The case studies

demonstrated that the SRL approach was a useful tool for translating archaeological data into information about livelihoods and how they were managed.

B - The Sustainable Rural Livelihood (SRL) model provides a new way of bridging between ethnographic and archaeological data in a way that enables archaeologists to maximize the value of sometimes sparse data in marginal dryland environments.

The starting point for investigating risk, opportunity and sustainability in the archaeological record was to use ethnographic data to inform my understanding of modern communities and the approaches they took to minimizing risk and achieving sustainability in economic, social and symbolic aspects of life. This was used as a knowledge base from which to investigate archaeological data in terms of how livelihoods may have been managed. The organization of the model means that the ethnographic record was an important resource for exploring a diverse range of livelihood strategies, external processes and outcomes. The SRL framework did not produce a new way of bridging between archaeological and ethnographic data but it did emphasize the value of ethnographic data for understanding livelihood aspects of the archaeological record as captured in the SRL model.

C - The SRL Model improves comparative studies between contemporary sites by presenting data within the same formal framework of analysis.

The SRL approach was not designed for comparative studies but the formal arrangement of the model suggested that it would work very well and this was confirmed by the comparative study in chapter 9. The difficulties were not with the framework but with the data. This made the more granular aspects of localities difficult to assess and compare. However, at a more holistic level it proved to be a splendid tool for comparative studies, offering the opportunity to pull out specific areas of interest to compare and discuss.

D - Variables involved in decision making that may lead to changes in the archaeological record can be suggested by completing the SRL Model

The SRL approach isolates variables that may have been involved in decision making from the resulting livelihood outcomes. As this was essentially a study of different locales and groups, and the data was mainly in the form of palimpsests, this aspect was not brought out strongly in the case studies. Although the SRL model includes all the assets and variables required for such a study, gaps in archaeological data mean that this aspect of the framework could not be captured. Although this aspect of the investigations was not overwhelmingly successful in many of the case studies, and was discussed in chapter 9 (section 9.2.4.5) there is no reason why it should not be more successful with better datasets.

E - The SRL Model will help to clarify priorities for data collection

The SRL approach makes gaps in the existing evidence transparent and should be able to assist with establishing priorities for data collection if integrated into research planning. In each of the case studies I have highlighted some of the gaps identified, and although in some cases it is clear that the data is simply unavailable and will remain so, in others there are opportunities for revisiting either sites, museum collections or newly published material with a view to extracting more information.

During the planning stages of new fieldwork the SRL approach could be used as a design tool to decide on the direction that fieldwork should take. For ongoing projects it could help with identifying gaps in existing results and inform priorities for future work.

F – The SRL Approach is suitable for answering specific key questions about livelihood management in marginal environments

Two tests were undertaken for addressing specific questions about livelihood management in the four areas used in the case studies. The first test the Key Questions at the end of each case study were deployed to test whether identical problem-orientated questions could be answered using the SRL approach. The second was a comparison of the data in Chapter 9 where the key questions were also compared. In spite of the variable quantity and quality of published data, and inherent problems with the data itself, an inductive approach suggested plausible answers to key questions in all of the case studies. Where questions could not be answered, this usefully highlighted gaps either in the raw data or the published data.

10.1.2 Concerns expressed in the Introduction

It was identified at an early stage that an essential risk with hypotheses A – D was that the archaeological data might be too impoverished to fulfil the requirements of the SRL model, meaning that extrapolation from the data collected would be either difficult or impossible in part or in total. These concerns were justified. First, in eastern Saharan prehistory there is a tendency to produce interim reports and to provide papers proposing ideas on the basis of data that is not available in publications to enable independent assessment. The fragmentary nature of publications was a challenge to any form of descriptive and explanatory model that relies on accessibility of the excavation data. Second, in all areas occupation was mainly in the form of palimpsests, which was far from ideal, deflation having eliminated stratigraphic integrity and any opportunity for discussing subtleties of chronological sequences. The resulting conflation of periods that may have displayed diachronic variation resulted in a broad-brush approach to the complexities of social and economic variability, but was necessary. Some of the data was used to extrapolate in ways that may well be challenged by other researchers. For example, I have interpreted patterns of mobility in the Nabta and other case studies based on only partial information. These inferences may well be negated by later discoveries, and would require considerable alterations in the descriptive Asset Matrix, leading to revisions of the explanatory sections. This type of extrapolation was necessary for investigating the value of the SRL approach, but was sometimes based on limited data meaning that some findings are less than robust. Nevertheless, if the SRL approach can be productive with such impoverished contexts and fragmented publications it suggests that this and similar models may have a broader archaeological value, and have a useful role in handling palimpsests.

With respect to Hypothesis E, although it was expected that research gaps would be identified it was possible that they would not. In fact, various research gaps have been identified, and these were highlighted in the case studies and are discussed in detail in 10.2.2 below.

10.1.3 Observations on the design of the study

Whereas most models are “deliberately stripped down representations of the phenomena out there” (Dasgupta 2007, p.9) the SRL approach enables impoverished data to be used successfully to extrapolate from material remains so that even in such cases, the results are rich and the volume of output considerable. Although this was a positive outcome, each case study was too long to incorporate in the main body of the thesis. The volume of work did not lie merely in familiarization with all the relevant strands of the research together with extracting the data from excavation reports and becoming familiar with the relevant ethnographic data, but in researching and learning how to explore each component of the Asset Matrix. A broad range of topics like religion, ethnicity, exchange, identity, land tenure, cultural transmission, phenomenology, transmission of knowledge and others all required a considerable investment in research. I seriously underestimated the time it would need to acquire the knowledge necessary to complete the matrix, and to complete both descriptive and explanatory aspects of the model. The need to shift constantly between basic natural and physical data and the conceptual worlds of religion and symbol required continual shifting between modes of thinking and the adoption of different analytical skillsets. In producing the four case studies, I blew my word-count spectacularly, leading to problems incorporating the case studies into the thesis. I suggest that it is, realistically, a task for a small team of specialists rather than one person, and that solutions for handling the output would need to be incorporated into a future project design.

It was a concern that by discussing a livelihood within the framework of the Asset Matrix sections the research would not be a realistic representation of livelihoods. The case studies combined different types of approach to produce results that were inductive and speculative rather than deductive. At the same time the SRL approach is essentially empirical in concept. Whilst the data was pushed to its limit to explore both the archaeology and the value of the SRL approach, I believe that each case study explores the data with a thoroughness that provides the basis for a realistic approximation of livelihoods in these areas. Some extrapolations, like suggesting that the Nabta data might represent a heterarchy, are included to demonstrate how the SRL approach can help to develop hypotheses and open up discussions.

This thesis has been focused to a great extent on questions that can be asked of the available data. The palimpsest nature of both the data itself and the fragmentary nature of the publications restricted the questions that could be explored empirically. For the palimpsest character of the material, the descriptive aspect is of considerable value, maximizing the information that can be derived from it, but the explanatory element, whilst vital, was much more difficult to deploy. When I carried out a test case study using an ethnographic study of the Hadendowa Bedouin in the Eastern Desert (Appendix H) I was able to write with some confidence about external variables and outcomes. Trying to infer such variables from the archaeological record available in my case study areas was far more difficult than I had anticipated. A different set of case studies might have brought out the value of the explanatory component of the model more effectively.

Archaeological measurables were sometimes difficult or impossible to suggest for aspects of the Asset Matrix. For this reason the section in the case studies that looks at internal relationships of trust and care was impossible to complete in any of the case studies. A better understanding of the processes that take place and theorizing of them in archaeological terms might improve this component, but it might remain invisible. Similarly, territoriality and land tenure were frustratingly difficult to assess.

The SRL Model was used for comparing geographical areas with overlapping periods in part of the far eastern Sahara. It would have been useful to have included at least one case study that compared two different phases in the same place to see how well the SRL approach deals with change other than abandonment in the archaeological record, enabling a proper exploration of the impact of variables and their outcomes. This would also have contributed to a discussion of the "longue durée" in nomadic pastoralism (Rosen 2008). A comparison of the Dakhleh Bashendi B with the preceding Bashendi A, or the Nabta Ru'at el-Baqar and subsequent Bunat el-Ansam would have enabled the value of the SRL approach to an exploration of diachronic as well as geographic comparisons.

Finally, I had serious doubts about the value of the radar diagram that is used to assess the strength of the livelihood represented by the Asset Matrix, which I considered to be too subjective and simplistic, so although I used it because it is part of the SRL methodology, I also chose to use a second way of assessing the vulnerability and viability of a livelihood, using the method set out by Nelson *et al* (2016). This was time-consuming and produced yet more information that needed to be handled within each case study and in the comparative study.

10.2 Case Study Findings

10.2.1 Eastern Sahara Archaeology

The four case studies demonstrated that in marginal areas local topography and rainfall patterns provided both opportunity and constraint for livestock herders who used multiple scales of mobility and diversified risk management strategies to sustain livelihoods in mid-Holocene Egypt. Groups in all four areas organized themselves in different ways, making choices based on local conditions and connections with other areas. In all the case studies except the Gilf C there is evidence for prestige goods and in all except the Bashendi B there are indications of activities that were religious, ideological or in other ways spiritual, indicating that pragmatic and conceptual approaches to livelihood management were combined to ensure sustainability of both the economy and each group's traditional values and identity. Whilst the palimpsest nature of the data meant that patterns of variability were suppressed, the nature of the environment and the deteriorating climate suggests that all livelihoods were highly flexible and adaptable. The skilled use of multiple topographies is a feature of all of the case studies.

In the early Holocene Nabta Playa and the Gilf Kebir were part of an earlier Sudanese tradition that did not extend as far north as Farafra Oasis (Tassie 2014, p.184; Kuper and Kröpelin 2006; Riemer

and Kindermann 2008, p.621-2; Riemer *et al* 2013). However, by the end of the 5th millennium BC, Dakhleh Nabta and the Badarian were part of a new landscape of shared cultural elements and subsistence strategies based on pastoralism. Dakhleh also shared features with Farafra, Djara and the Faiyum (Riemer 2007a; Riemer *et al* 2013) whilst the Gilf Kebir was part of a separate tradition. At the same time all shared elements with Sudanese cultural features in the same period (Garcea and Hilderband 2009, p.307; Gatto 2002b, 2009; Kuper 1989, p.200; Lange and Nordström 2000; Wengrow *et al* 2014). Thomas's observation that people could pick and choose from bits of a "repertoire" of what became available in Neolithic Britain (Thomas 2003, p.72) also applies in the eastern Sahara. All groups in the case studies had the option of cattle, sheep and/or goat, different patterns of mobility and preferred cultural output, including ceramic treatments and numinous components. Cultural elements are often shared with other areas and rather than being passive, they probably served to enable and reinforce these connections by expressing social congruence. Thomas also emphasises that not every part of the cultural assemblage that was adopted should be considered as meaning the same things to different people (Thomas 2003, p.72), a point also made by MacEachern (1994), and given the large distances involved in the dispersal of cultural similarities throughout the Nile in the mid-5th millennium, cultural similarities in terms of artefactual output and burial tradition must also be considered in terms of the differences between them. In each of the case studies the mixture of individual livelihood management approaches and the shared cultural elements with other areas express the dual importance of group identity and of wider networks of support.

Livelihoods in arid environments must be adaptive and may therefore be highly differentiated (Bollig and Schnegg 2013; Brass 2007) and over the period of the mid-Holocene, it is clear that various livelihoods responded to a variety of opportunities, incorporating the benefits of local geology, geomorphology and existing traditions. The case studies undoubtedly represent only some of a number of livelihood options available in an array of risk management strategies. Perhaps the most important conclusion is that environmental change, even when fairly extreme, does not need to lead to social collapse when a) access to water sources can be secured, b) new options are both available and c) those opportunities are adopted. Mobile pastoralism at long-distance and localized scales was a solution to a problem, and a successful one, via a number of different strategies. As Bell and Walker observe (2005, p.140) the availability of multiple strategies invalidates deterministic approaches to human responses to environmental and other changes. In every one of the desert case studies risks were being handled sustainably until the climate again intervened. The Badarian groups were sufficiently robust to handle whatever climatic fluctuations they encountered and their livelihoods formed the basis for the succeeding Naqada I. In Dakhleh, whilst the Bashendi B inhabitants moved elsewhere, others remained behind to eke out an impoverished existence, represented by the Sheikh Muftah unit.

It seems clear from the comparisons in the previous chapter that the division between Nile valley and desert is somewhat arbitrary in the mid-Holocene. This is demonstrated by the presence of Nile components in the assemblages of mobile populations whose presence is found in the desert but whose assemblages suggested that the Nile was either included in their seasonal round, to facilitate social interactions or as part of a more dispersed network of contacts and connections. It would

probably be better to characterize the vast region of land occupied by Egypt and the Sudan as a continuum of occupation represented by mobile groups who both crossed cultural boundaries and shared cultural traits. At the same time, each of the localities under discussion represents a different way of doing and seeing, with functionally differentiated toolkits, specific world-views, ways of expressing identity and ideology, and different approaches to conceptualizing the landscape.

Wendorf and Schild (1998) proposed that Nabta, with its evidence of social complexity in the form of megalithic constructions, alignments and the stone circle, indicates that African cattle pastoralists had a significant role in the rise of Egyptian civilization. It seems irrefutable that the concentration of populations along the Nile valley was due at least partially to the punctuated arrival of herding households and groups during the drying of the Sahara towards the end of the mid-Holocene. However, the rise of civilization was at least partly dependent upon the Near Eastern cultivars of wheat and barley. The development of Dynastic Egypt was built on a blend of risk management strategies adopted during the mid-Holocene, but its distinctive character emerged only after cereal production had been intensified.

10.2.2 Future research opportunities

Specific archaeological problems were not part of the scope of the thesis but some did emerge during the research into each of the case studies.

Hassan's call for the archaeology of the eastern Sahara to "move toward long-term inter-regional projects" (1986a, p.72) has not yet been fully met, although the excellent research projects inaugurated by the ACACIA group based at the University of Cologne (http://www.uni-koeln.de/inter-fak/sfb389/) are moving in that direction. For over twenty years they have been conducting fieldwork on a transect of 1500km stretching from the north to the south of eastern Sahara, from Egypt to the southern Sudan, using 5000 radiocarbon dates as a chronological database (Kuper 2006; Kuper and Kröpelin 2006). However, there has been little research focused on the relationship between these regions and the archaeology to the west, in Libya and Chad, which might help to understand seasonal movements, inter-regional contacts and long-term migration. The Jebel Uweinat, which may be related to occupation in all these regions, remains a largely untapped resource. There is a real opportunity to take the expert examination of individual areas and tie them into a broader understanding of the desert areas to the west of the mid-Holocene Nile.

Similarly, the relationship between different environmental and topographical niches is being explored, but more emphasis on the plains surrounding focal nodes like the Gilf Kebir and Nabta could potentially improve understanding of how the landscape between nodes of occupation was used to extend resource availability and to clarify routes taken. Small camps, rock art sites, water sources, well worn routes, large settlements and other locales can produce multiscalar patterns of repetition to tie in localized activities with larger regional pursuits (Frachetti 2008b; Hildebrand and Gatto 2012; Honeychurch and Makarewicz 2016, p.349). In 1980 McHugh wrote of his surprise at the discovery of temporary Neolithic encampments in the desert between Kharga Oasis and the Gilf Kebir (McHugh 1980, p.64). Peroschi *et al* (2014) used satellite surveys to assemble a database of 567

sites and 4119 stone structures, a figure that ignored blurred or questionable sites. The plains around Gilf Kebir and Jebel Uweinat has potential to valuably expand research into how landscape was moved through and used (Honoré 2017, p.7; McHugh 1980, p.64; Peroschi and Cambieri 2010, 2011; Peroschi, *et al* 2014).

Although it was difficult to draw any inferences about territoriality and differential access to resources, recent work in rock art research may provide some options (Honoré 2015, 2017; Lenssen-Erz 2012). Rock art is notoriously difficult to use as an archaeological dataset, and although there is distinctive engraved rock art in Dakhleh, I excluded it because it is not yet firmly dated. In the Gilf Kebir and the Jebel Uweinat, however, there are opportunities for developing better insights into the way in which rock art was used to identify groups and territories, and how it related to group movements and territories. Rock art research methodologies are improving, and the rich dataset in the Jebel Uweinat may be a useful testing ground for some of this work.

Scientific techniques applied to skeletal remains of humans and animals have been applied elsewhere to explore information about livestock exchange and seasonal movements, and might lead to some useful insights in Egypt and the Sudan. Strontium isotope analysis has produced some interesting results for exploring seasonality and patterns of mobility in Libya (di Lernia *et al* 2013; Tafuri *et al* 2006). Similar studies would be invaluable in the far eastern Sahara for exploring relationships between areas and patterns of nomadic pastoralism. Honeychurch and Makarewicz (2016, p.350-351) draw attention to advances in geometric morophmetric analysis (GMM) applied to animal skeletons for improving insights into livestock exchange and nitrogen isotope analysis for analyzing the seasonality of fodder consumed by livestock.

The end of the mid-Holocene was associated with the dispersal of groups out of the desert into areas where they could survive. Some of these movements will have been piecemeal and punctuated, others more co-ordinated. Understanding this process would help to understand response to uncertainty and the impact that migratory groups had on areas that were already occupied. Developing a methodology to achieve this with archaeological data would seem to be a priority for understanding both nomadic practices and migratory movement. An unfortunate and unresolvable void of information is represented by the permanent flooding of archaeological landscapes by Lake Nasser. The above-mentioned scientific methods being applied in archaeology could contribute to this.

Further survey and excavation or publication of existing findings may yet address questions about subsistence and livelihood management in most of the case studies. A notable exception is the Badarian, which almost certainly represents a lost opportunity in terms of re-excavating the Brunton and Caton-Thompson sites or extending the areas that they investigated. Land has been swallowed by agriculture, villages and cemeteries, and little of the original archaeological areas survived when Holmes and Friedman were investigating in the 1980s and 1990s (Holmes 1992; Holmes 1993; Holmes and Friedman 1994). It would, however, be of value to investigate wadi systems and low desert with a view to seeing if Badarian herders and hunters used these zones as well as the floodplain to diversify not only livelihood options but geographical scope. In the same spirit, it would

be interesting to see if there was any potential for exploring the west bank, particularly given the presence of the model boats in graves. The Badarian is well represented in museums, with both inorganic and organic materials surviving. It would be of great value to build on the existing research that has been carried out on museum collections to establish a much better understanding of both the materials used and how they were employed. Current PhD research into the Badarian by Maarten Horn is expected to move this research in precisely that direction.

Petrographic research would merit more investment in research. There is a real need for more research into and information about the composition of stone types and their sources. Regional geological databases are not yet available for most of Egypt or the Sudan meaning that sourcing artefacts made from specific materials, even when these materials are correctly identified, is not always straightforward. There have been few attempts to provenance ancient Egyptian material based on the petrography of artefacts (Aston *et al* 2009, p.69). A central online geological database would be invaluable, extending the online resources provided by geologist James Harrell (Harrell *n.d.*). This would enable invaluable research into stone objects that survive in museums from older excavations, applying modern techniques to analyze raw materials in order to pose questions about the importance of material types, the costs of sourcing raw materials and mechanisms by which raw materials are acquired and exchanged.

The economic function of lithic assemblages would benefit considerably from more research (Shea 2013, p.44). Statistical analysis of industries associated with clearly defined livelihoods might assist the evaluation of specific industries in order to understand their function. For example, agricultural settlements with good survival of botanical and faunal remains in the Nile Delta could help to correlate livelihood information with tool assemblages to identify what types of tools consistently occur with which types of livelihoods. This could help to provide livelihood insights at sites when few botanical and faunal remains survive.

One of the issues common to all the case studies was the viability of using palimpsest data to represent livelihoods, already discussed in Chapter 1 (section 1.3.2). There is an ongoing tension between the palimpsest that concatenates all data onto one surface, and the knowledge that variability is concealed in that data (Bailey 1987; Binford 1981; Bradley, P. 1998a; Haselgrove *et al* 1985; Schiffer 1985; Schofield 1991a, 1991b, 1991c; Thomas 1991; Vaquero 2008). Whilst this sort of data is far from ideal, there is plenty of it, and it would seem to be productive to develop more formalized approaches to palimpsest data so that all fieldwork and post-excavation analysis is carried out using similar methodologies to ensure that approaches are consistent and that the value of the resulting inferences is fully understood and recognized. A number of writers acknowledge the value of palimpsests, whilst acknowledging their limitations, and their work may offer opportunities for developing standardized methodologies for collection and analysis in the future (e.g. Allen 1991; Bailey 2007, 2008; Bradley, P. 1998b; Foley 1981a, 1981b; Fanning and Holdaway 2001; Gordon 2006; Hey 1999; Lisk *et al* 1998; Lucas 2005; Schofield 1995; Snashall 2002; Vaquero and Pastó 2001).

A recurring problem has been the level of detail and consistency presented in published material. In eastern Saharan archaeology the field is dominated by interim reports and short discussion papers, many lacking sufficient quantification of data and only includindg few images, which are repeated in later papers. There are few volumes that bring together all the raw data, and those tend to be collections of papers loosely themed around a particular site or area. The Nabta Playa volume that collected together short excavation reports (Wendorf, Schild and Associates 2001) presented very similar types of data in different ways, meaning that they were not directly comparable. In addition, some periods were favoured over others so that in the Gilf Kebir, Nabta Playa and Dakhleh research has tended to focus on the periods prior to and/or following the ones in which I was interested, presumably due to certain unique properties singled them out. Publication of images is sometimes quite poor and is usually insufficient for comparative purposes. The piecemeal approach to archaeological publication means that it is often difficult to assess data in livelihood terms. Using the Internet to develop databases and image banks would be of enormous value, particularly when hosted by well-funded universities, which may have the resources to maintain them. At the same time, now that many universities are publishing PhD research online it would be of considerable value to have a central searchable Boolean index to improve accessibility and maximize the value of such research.

10.3 The limitations and benefits of the SRL Model

10.3.1 Limitations

Sampling

In development economics, researchers using the SRL approach experienced difficulties when a) sampling large number of villages with complex hierarchies, b) were restricted access to certain important sectors of the community and c) experienced limits to funding and the time available to complete and collate interviews (Morse *et al* 2009). Archaeological data is inevitably fragmented and heterogeneous. Fragmentary data is analogous to interviews in ethnography where people may invent answers, say what they think the researcher wants to hear, or become confused. In both ethnographic and archaeological projects, the researcher may misinterpret the data that she or he has assembled due to the sample available or the sampling technique chosen. Sampling inevitably involves compromise, choices that may be criticized later (DFID 2000b, p.189). In archaeology the attempt to recreate all aspects of a livelihood may also be restricted by the sample available and the sampling technique chosen (Hodder 1999, p.52-53; Lucas 2001, p.60-61; Lucas 2012, p.63-66; Trigger 1996, p.402). Examples are the restriction of excavations to test trenches, early excavation techniques that did not collect and publish all available data, and data that is missing due to deflation, decay and weathering. The tendency to produce interim reports rather than published detailed accounts of raw data also limits the ability to carry out successful data mining. These all constrain the ability to apply the SRL approach successfully.

Archaeological indicators

Some aspects of the model were difficult to complete. This was often due to lack of data, which was a problem that was predicted early on in the research. For example important aspects of livelihoods like demographic indicators were simply impossible in the majority of the case studies because of the absence of burial data. A less straightforward problem was that some areas of livelihoods are inherently difficult to explore in archaeology, I suggested some archaeological indicators of all aspects of the SRL Model in Appendix G but where nomadic groups are concerned the ephemeral nature of the livelihood itself, together with the invisibility of some livelihood aspects in the material record causes problems. I would suggest that subjects like land tenure, relationships of care, information exchange and territoriality need more work to consider whether theoretical and methodological approaches and plausible archaeological indicators can be developed, but they may remain intractable.

Measurables and comparisons

As I mentioned in 10.1.3 the radar diagram developed as part of the SRL approach for measuring strengths and weaknesses in livelihoods is particularly problematic. The Forum on Operationalizing Sustainable Livelihoods Approaches reported that in one case project planners perceived the robustness of each asset differently, producing different results (DFID 2000b, Annex II). The radar diagram is particularly weak when apparently contradictory information is included. For example, when land is abundant and ownership is not disputed (which is a positive indicator) but is of very low quality (a negative indicator) this cannot be represented on the radar diagram. More subtly, a high score for one asset might counterbalance a poor score in another. For example, a good social infrastructure could well compensate for a lack of strong subsistence resources. The radar diagram offers no way of reflecting inter-dependence between the assets, giving an excessively simplified view of the strengths and weaknesses of a livelihood. I used a secondary measure to compensate for this but I would suggest that further improvements could be made in this area. Finally, whether on a numerical or alternative scale, establishing a qualitative scale on which to apply measurements like 1-4, present/absent or high/medium/low, has also proved to be difficult because these ways of evaluating information are considerably subjective.

The identification of decisions in the archaeological record was a secondary objective. Although this was attempted it was not a great success and the SRL model might be criticized for failing to address these types of thought process and output. This, however, was a result of the palimpsest nature of the data and in a different archaeological environment should be able to incorporate such details with greater ease. The degree to which such multi-scalar episodes are incorporated into a study is the choice of the archaeologist. Operable at multiple spatial and temporal scales, the SRL model can handle both momentary actions and larger scales of generalization, although this was not always demonstrated in the case studies.

Comparative analysis proved to be a challenge because the data included in excavation and interim reports is not standardized, even within the same research project. Even when using the SRL approach to present data in ways that enables different sites to be compared directly, it is often a

difficult task. In an ideal scenario, archaeological projects should include the same data and present it in the same formats according to agreed standards for publication.

Description and Explanation

In order to populate the model, decisions have to be made about where descriptive data belongs in the matrix, and this is itself a step towards interpretation and explanation. It equates certain materials and objects with certain economic, social and individual concerns. In addition, in this thesis where interpretation has already been attempted in existing publications, for example on linkages between areas, it has been incorporated as part of the task of discovering how dryland livelihoods operate and experience life. A lot of discussion of archaeological indicators and their possible interpretation takes place throughout the Asset Matrix. The result is therefore substantive but not empirical.

One criticism levelled at the SRL approach is that people can appear to be invisible (Morse *et al* 2009, p.14) but as emphasised above, the matrix is a way of gathering data that gives information about people's needs and interests, an attempt to structure the complexity of human livelihoods. In modern contexts one can ask what people value and what their personal goals may be, but in prehistory it is impossible to make assumptions about any values that people hold or hopes they may have, but archaeological discussions of agency are probably the best way to pursue the role and experience of individuals in archaeology. Agency was difficult to locate in the data that I worked with, but the Personal asset category introduced by Hamilton-Peach and Townsley (2004) does allow for explorations of concepts like the phenomenology of individual experience, and it is not the SRL approach that limits an exploration of agency.

The SRL approach was designed as a part of a toolkit to reduce poverty and create sustainable livelihoods in impoverished communities as opposed to wealthier or more asset-rich societies. This made it realistic for applying to prehistoric subsistence societies, but may be more of a challenge to use for complex hierarchical societies that demonstrate extremes in lifestyle, with different levels of access to power, to labour, to desirable products and to economic security (Small 2007, p.31-2) and diverse ways of displaying these contrasts.

Output

The main problem with the descriptive and explanatory approach of the SRL approach is the sheer volume of output. The upside is that the amount of information generated produces unprecedented insight into all aspects of livelihoods. The downsides in archaeology are that 1) acquiring the necessary familiarity with all aspects of archaeological data and modern livelihoods takes up a considerable amount of time, 2) it is time-consuming to convert thematic research and archaeological data into an interpretative scheme, 3) there is extensive repetition due to the fact that the same data may be relevant to several asset categories and occurs several times in the explanatory sections and subsequent analysis and 4) this process produces a staggering amount of information. As development economists discovered (Morse 2009), and as I also discovered, the SRL approach translates into delays and potential costs. The SRL approach is designed to make analysis available to other researchers for discussion as well as to suggest solutions to development problems, but the

value of the output means that publication costs would probably be prohibitive. An alternative would be to publish executive summaries of the findings in print form and make the full output available in the form of a CD-ROM or web pages. Problems here are that electronic media become obsolete, web pages have a nasty habit of changing address or vanishing completely.

Finally, a considerable amount of theoretical and thematic research is required to employ the methodology. A sound and detailed knowledge of ethnographic records for each of the six asset components on the Asset Matrix must be built up in order to use it as a bridge between modern and prehistoric livelihoods. A good understanding of archaeological theory is required in order to get to grips with maximizing the value of the available data. A considerable amount of time was taken to understand the problems with and potentials for palimpsests, and I would suggest that understanding the value of different archaeological datasets would, and should, make up any attempt to use the SRL approach to evaluate data. This is again very time-consuming.

10.3.2 Benefits

As the above points make clear, the Sustainable Rural Livelihood approach is not without its challenges. However, it does have excellent benefits for use as a data handling and analytical tool.

A powerful descriptive and explanatory tool

At its most basic level, the SRL approach is a remarkable tool for bringing together disparate data published in multiple journals and books for the purposes of analysis and discussion. Its focus is on looking at how lives could have been lived, given the constraints and options available. It situates archaeological data within a descriptive and explanatory framework, a powerful tool for addressing all aspects of how people lived, and the types of decision people would have been confronted with on a daily, seasonal and ongoing basis, and why they made the choices they did.

Lucas (2001, p.104) suggests that archaeology needs to “heed the social context of production” in order to move archaeology away from typologies and reconsider categorizations. Even today most survey and excavation reports are organized according to data types and rarely move on to assess the livelihoods that produced them. The SRL model helps to address the problem of older and reductive archaeological approaches that concentrated on categorizing objects as classes and types, decontextualizing and dehumanizing them (Barratt 1994; Ingold 2013; Hodder 1991; Hurcombe 2014; MacFadyen 2010). By re-configuring the data in terms of how human life is organized rather than how excavation results are presented, the data is put to work in a different way, moving towards what the data represents in terms of human activity rather than in terms of archaeological specialisms.

By incorporating explanatory components within the Livelihood Variables, the SRL approach takes the research beyond description. It includes concepts such as risk, opportunity, decision making and external influences into a framework of explanation. The potential assessment of vulnerability and risk in particular provides a mechanism for assessing sustainable different livelihood strategies were and where their weaknesses lay. As Atherton emphasizes (1983, p.98) one of the advantages of this

type of approach is that it can include known components and variables that will act on both known and unknown variables, representing interplay between them. Due to the number of variables included and the emphasis on flexibility, the framework can include evidence which may have an influence on social and economic activities incorporating detailed ecological and climatic data without implying climatic determinism.

Mitchell (2005) emphasizes that frameworks and models can be restrictive when they evade or conceal deficiencies in the archaeological record. The completion of the SRL model, however, enables gaps in either the available data or the research parameters of a project to be clearly identified. By making gaps explicit, the value of the data can be better appreciated and ensures that the value of the output of a given SRL project is fully understood. This might form the basis of future research projects in order to source missing data.

The model was not designed for use in comparative studies but its structure has obvious qualities that favour its use in comparative work in archaeology. John Shea (2013, p.294) observes that whereas narratives focus on patterns of similarity, comparisons focus on differences. The SRL approach effectively enables the two to be combined in both spatial and diachronic comparisons. I used it to compare different places that are contemporary with each other, but it would be particularly useful for diachronic investigations of change, comparing different strata from the same site, or different periods in a given region in order to understand transformations.

The use of the SRL approach has the potential to be far more reflexive than its use here, with the potential to include collaborative working to incorporate new ways of looking at data in experimental exercises in the spirit of those pioneered by Ian Hodder in his excavations at Çatalhöyük (Hodder 1997; http://www.catalhoyuk.com) or Bender *et al* in survey work (Bender *et al* 1997). It can be revisited and modified as new data becomes available or new theoretical approaches are tried on existing datasets. In this sort of working environment it could help to answer Ingold's quest for "transformative" approaches that help to move knowledge forward by basing it in experience (Ingold 2013, p.6-7).

Like any experiment, the output can be subjected to testing. The same procedure can be carried out multiple times against the same set of data, and can be adapted to include newly available data. Where new data becomes available, the model can be re-evaluated and modified to incorporate the new information.

As a supplement to conventional forms of archaeological reporting

Conventional forms of reporting, with emphasis on archaeological specializations rather than human livelihoods will not be replaced by the type of approach taken in this thesis. Rather, it would suggest that it has potential as a) a potential component of research design, b) a component of post-excavation analysis to identify research opportunities for the future, both in the field and in terms of interpretative work and c) a tool to build on valuable excavation reports to produce interpretative narrative dialogues.

As a means of improving qualitative assesments of archeological data

The SRL approach encourages dialogue. Each case study pushes the data to the limit by applying multiple research threads in order to explore every aspect of the data. This produces a rich narrative that is structured to provide the development of dialogue about both the data under discussion, and about descriptive and explanatory approaches in archaeology. Within my case studies, I am certain that there will be disagreement about how I have extrapolated from the data to the interpretation, but I see this as a very positive step to achieving understanding of each of the areas discussed in the case studies. My intention is to make the case studies available online to continue the discussion.

Although quantitative techniques have not been employed in this approach, there is no reason why such analysis should not be incorporated, should the raw data be made available. Such techniques might make the SRL approach more robust.

As a powerful tool for assessing livelhoods

Chapter 5 look at risk and uncertainty in dryland livelhoods, with a view to isolating some of the risk management options that might have been available in the past. It was possible to explore some of the livelihood assets that would have contributed to risk within the asset matrix, but this was brought out most closely in the exploration between the vulnerability context and the assets when the status of each case study was analysed using the radar diagram and the vulnerability assessment tables. This final workstream in each case study provided a holistic understanding of how the various threads explored in the SRL model give an insight into the sustainability of each settlement area, and where its strengths and weaknesses may have resided. In modern development economics this is used in order to determine which areas require more external investment for future sustainability. In archaeology the vulnerability assessment makes it clear which areas would have to receive investment by the community itself to ensure its sustainability or, if that investment could not be made due to conditions beyond internal control. At the end of the mid Holocene the key driver for migration was climatic deterioration, but future publication of field findings may provide some clues as to decisions that were made about the direction of migration and modifications that were made to livelihoods to ensure survival in new areas.

To improve understanding of the livelihood strategies across the eastern Sahara, the SRL approach can be used as a comparative tool, comparing like with like to highlight similarities and differences and build a perspective on how archaeological variations can be accounted for, and what sort of communications networks might have existed. The SRL approach could also be used to effectively compare research from different periods with a view to exploring the relationship between assets, variables and outcomes in considerably more detail. John Shea (2013, p.294) observes that whereas narratives focus on patterns of similarity, comparisons focus on differences. The SRL approach effectively enables the two to be combined. It would, for example, be useful to compare the Bashendi B with the preceding Bashendi A and the Badarian with the subsequent Naqada I.

10.3.3 Verdict

The SRL model was created to provide development economists with a tool to assess the sustainability of modern communities by taking into consideration all influential factors that communities themselves consider intrinsic, as well as those external processes over which they have no control, to suggest ways in which they could improve their viability. Problems experienced by interviewers attempting to discover information from living people include concern the precision of information provided and the difficulty of accessing certain members of the community. In archaeology, interrogating the data is also subject to misunderstandings and a high risk of missing information. In both cases, the findings are an approximation of reality, not a direct empirical representation of it. Having said that, there were a number of key benefits.

It was impressive how using the SRL model as a tool focused attention on aspects of livelihood organization that created a richly informative narrative based on the data itself. It is a powerful tool for bringing together fieldwork findings and connecting them in a way that translates archaeological remains into functional livelihoods.

The SRL model provided an approach that makes the most of published data. As discussed in Chapter 1, section 1.3.2.4, publications do not follow a standardized format and are often difficult to use as sources for researchers. Th situation would be much improved if excavation reports were standardized in terms of the information they provided, and if archaeological missions would comit to regular and comprehensive publication of their work. The excavation records that I was able to access were highly selective in terms of the material published, and very variable in the volume of information and its quality. Even within the same publications, the choices made regarding tabulation of data meant that materials from one site could not be directly tabulated with another. Frequency tables for lithics occur in the combined Nabta reports in Wendforf *et al* (2001), for example, but are not consistent from one report to the next, meaning that statistical tests of significance about the role of certain artefact classes and the choice of certain core types could not be attempted. At least within each archaeological mission, it would be extrememly helpful if mission directors would maximize the information provided and standardize its presentation across all sites. It would be even more helpful if all archaeological missions would agree a standard for publication that would enable future researchers to use published reports attempt interpretation and comparison on national and regional scales, with a view to understanding how individual locales fit into a broader scale of livelihood management. At the moment, the fragmented nature of publication and the preference for publishing interpretative pieces without presenting the raw data that informs those interpretations is extremely unhelpful. Field archaeologists might themselves benefit from using an SRL or similar approach for organzing both their research priorities and their findings for the purposes of publication. In the future, online innovations that enable data sharing and the development of the semantic web might help to make the output of fieldwork available for wider interpretation (e.g. Berners-Lee et al 2001; Peebles 2001).

Even with certain difficulties, my experience of pulling together the case studies argues that the SRL approach is, with caveats, a very useful one, moving on from the raw data made available in

excavation reports to attempt extrapolation and interpretation. It has the potential to be a useful tool for generating discussion. Although it is not a perfect tool, it is highly effective for interpreting archaeological data, where that data is published to sufficiently high standards.

10.4 Conclusions

As discussed above, there are limitations to the Sustainable Rural Livelihood approach, and there were a number of problems implementing it. Although it was impressive to discover how much discussion was possible around sometimes impoverished datasets, the explanatory components of the model would have been much more effectively tested on a richer dataset. I find the emphasis on representing archaeological data in terms of livelihoods particularly useful, but missing data must be acknowledged in order to ensure that the livelihood reconstruction is not misinterpreted. Methods for measuring vulnerability in prehistoric livelihoods need revising, and solutions for handling the volume of output need to be found. My main concern is that the volume of data that it produces renders the SRL approach at best both time-consuming and expensive and at worst impractical. However, at its best, the SRL approach is a very versatile and flexible tool that translates specialist archaeological reports into an interpretative format that combines rich descriptive interpretation with explanatory components. It does not replace traditional archaeological investigation and analysis but builds upon it to create something that is more than the sum of the parts that inform it. The case studies demonstrate to my own satisfaction that this is a realistic goal and that it was worth pursuing, particularly as it makes the most of fragmentary datasets and palimpsests. As with all formal models, the SRL model incorporates flexibility into its design. As new data emerges this can be included and various components and findings re-written in an iterative way that reflects new discoveries and new inferences. The SRL approach performed well with specialist archaeological reports to develop a cohesive understanding of the communities that the raw material represents. It requires immense commitment but I would suggest that the rewards justify the undertaking.