EARLY NEOLITHIC INTRA SETTLEMENT SOCIAL ORGANIZATION: A RELATIONAL DATABASE APPROACH TO FOENI-SALAŞ (SW ROMANIA)

By:

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A thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements for the degree of

Master of Arts

Department of Anthropology

University of Manitoba

Winnipeg, MB

Date Submitted

April 28, 2006

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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EARLY NEOLITHIC INTRA SETTLEMENT SOCIAL ORGANIZATION: A RELATIONAL DATABASE APPROACH TO FOENI-SALAS (SW ROMANIA)

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A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of

Manitoba in partial fulfillment of the requirement of the degree

OF

MASTER OF ARTS

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Abstract

The organizational structure of Early Neolithic communities in southeastern Europe has been an issue of archaeological debate for many years. In general, it is assumed that each structure represents a separate conjugal family unit. However, in recent years, it has been suggested otherwise. The archaeological data from the settlement at Foeni-Salaş (Romania) are used to determine the nature of households in an Early Neolithic settlement. Five pit houses were excavated surrounding a larger pit house. Was each structure a household? Or was the site a single household? This thesis analyzes the archaeological data from the Early Neolithic settlement at Foeni-Salaş to determine whether it was occupied by a single extended family unit or multiple conjugal families. Five pit houses were excavated surrounding a larger pit house. A complete household may or may be composed by one or more houses. The problem is to distinguish between households as production units, rather than houses. Therefore the idea of household equilibrium or Chayanov's concept of 'on farm equilibrium' was used as a conceptual basis for investigating and identifying potential households archaeologically. Two polar household models at either end of a continuum were used to test hypotheses concerning the nature of household settlement patterns: single extended family unit or multiple conjugal families. Identification of households in the archaeological data was premised on the association of architectural structures and the artefacts within them that might indicate production activities. The database from the site was queried for artefacts from the various pit houses and tested with chi-squares and Cramer's V to identify combinations of houses that might have formed household units through the repetition of production activities. The term 'nodes of production' was used to refer to the interpretations of total production activities reflecting the central focus of household (workgroup) social boundaries. The use of a relational database approach proved profitable because it corrected problems that occurred with previous analyses of the site that were based on individual spreadsheets. It enabled a more effective and efficient data modification, storage, query, retrieval and analysis. Through the combination of anthropological knowledge concerning household economy in small-scale societies and the use of simple statistical methods, such as chi-squares and Cramer's V, to measure the data for more informed interpretations of artefact relationships, results indicate that the settlement at Foeni-Salaş (Romania) was occupied by two extended family units.

Acknowledgements

I would like to thank all my committee members for dedicating their time to reading and providing feedback to me during the course of writing this thesis. Their skills and knowledge helped me to think through my ideas and identify problem areas with my work. Dr. Leung, your questions always kept me thinking and trying to stay one step ahead. You forced me to recognize problem areas before I even got to them. Dr. Chodkiewicz, your knowledge of anthropology and criticism helped me to recognize theoretical problems and archaeological myths. I am grateful for your insight and guidance. Dr. Greenfield, thank you for allowing me the opportunity to analyze the data for this site, believing in my abilities as a graduate student and devoting time to my thesis when you could have been spending those hours with your family or on other research projects. Your dedication to graduate students and to graduate research is invaluable to the Department of Anthropology at the University of Manitoba. I am grateful to have had the opportunity to work with you on this project and hope that I have been able to provide you with useful research. I look forward to working with you on future projects. I hope I can continue to develop insights the way each of my committee members have developed insight through their own work and research in academia.

I would like to acknowledge the help and support of both the past and present staff at Faculty of Graduate Studies. They provided me with the opportunity to complete my degree and overcome other obstacles along the way. The willingness to make time for students and provide them with opportunities to resolve problems is a testament to the dedication of their office.

Thanks must be extended to Dr. Louis Allaire. Prior to the start of my work on this thesis you were like an advisor to me. Our conversations about culture were stimulating and filled the gap in my graduate studies I found was missing. The privilege to assist you in Caribbean archaeology was an invaluable experience. I gained more knowledge in those few short weeks of fieldwork than a full credit course. You taught me about culture and always fascinated me with your knowledge. Thank you for your mentorship and dialogue.

The importance of family can not be measured nor expressed in a way that is truly adequate. With words that can never measure up to them, I want to thank my parents for their unstinting support throughout my long academic education. Without their support and belief in me, I would not have been able to complete this thesis. I could not be a more fortunate son. Thank you for your help in so many ways. To my sister, you have always been a role model in life and education that I knew I could never imitate. All these years of education have kept me away from the family and made me feel as though I have not been the supportive brother and son I should have been. Sorella mia, I will always look up to you. To my brother-in-law, you have always looked out for me the way a big brother would. I am glad that you are part of our family. "Nel mezzo del cammin di nostra vita mi ritrovai per una selva oscura,"[1] Bella Mia, if there is anything good that has come out of this long journey for me it was meeting you and sharing a mutual love of interests. I would be lost without you. Ti amo stella mia, luce nel cielo.

[1] Dante Alighieri *Inferno,* Canto I.1-2.

Chapter 1: Introduction

I. Introduction

The nature of the social organization of early farming villages (i.e. Early Neolithic) in southeastern Europe has long eluded archaeologists. A number of hypotheses have been proposed through the years, ranging from settlements being occupied by a series of independent households to more communal modes of production (where resources are shared). For example, Greenfield has proposed that contemporary structures in these communities represent the domiciles of a single extended family household (e.g. Bogucki 2000; Chapman 1988, 1989, 1990; Greenfield and Jongsma n.d.; Jongsma 1997; Jongsma and Greenfield 2001; Tringham 1971, 2000; cf. Sahlins 1972). Research in neighbouring regions (e.g. Central Europe) often describes settlements in terms of separate (or economically independent) households (Bogucki 1988; Milisauskas 2002). If this is the case, then it would seem logical that the intervening region (the Balkans) would have a social organization that would be organized around independent households. Yet, recent literature has argued to the contrary. Most of this literature, however, has relied upon little data to support such contentions (e.g. Greenfield and Jongsma n.d.).

Previous analysis have analyzed the Early Neolithic settlement at Foeni-Salaş with single dimensional data e.g. on a single data type (e.g. Greenfield and Jongsma n.d.; Jongsma 1997; Jongsma and Greenfield 2001; Jezik 1998). More recent attempts to analyze pit house activities for this settlement used spreadsheets (eg. Senior 2004). However, this attempt provided inaccurate summaries of NISP counts due to the increased difficulty of this file type to query, organize and correct inconsistencies in the data. This thesis attempts to test these hypotheses using a relational database approach that will allow the incorporation of several types of data to be mined for information and analyzed as a whole.

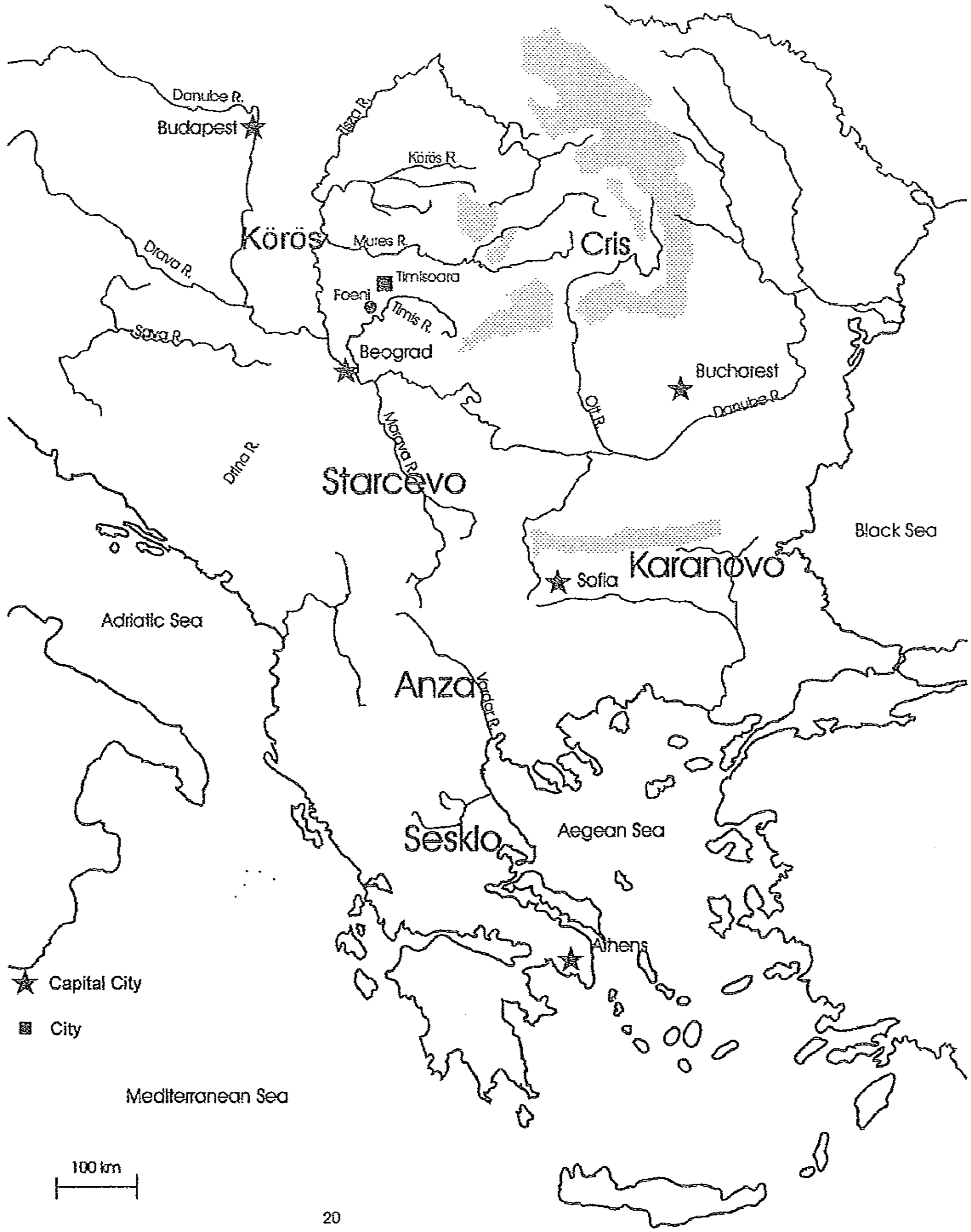

Figure i: Geographical location of Foeni-Salaş, Romania (Source: Haskel Greenfield)

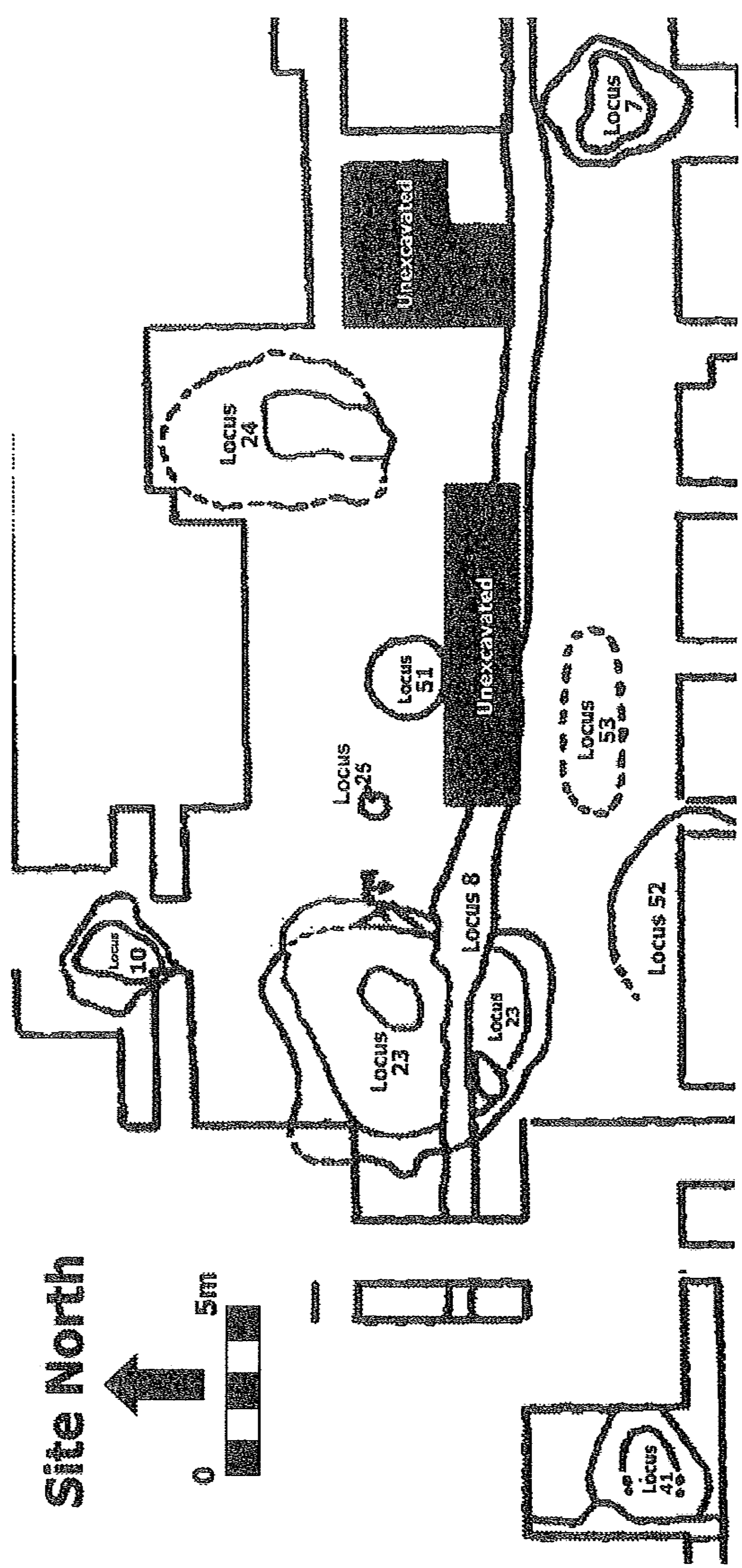

Figure ii: Early Neolithic loci at Foeni-Salas, SW Romania (Source: Jongsma 1997)

The analysis will be carried out by importing all the available archaeological data from the Early Neolithic site of Foeni-Salaş (Romania). It will attempt to utilize a relational database structure to achieve more effective data-mining abilities of gathered information and find meaningful patterns of relationships. It is hoped that higher level analysis of the archaeological data from Foeni-Salaş can be accomplished to better understand the socio-economic organizational patterning of this community in the Early Neolithic.

II. Hypotheses

Different types of social organizations will often yield different archaeological patterns (Binford 1962, 1965; Childe 1958; Flannery 1972, 1976; Willey 1953, 1956). Extended family households usually have more than a single physical structure (e.g. houses) to allow a pooling of resources (Stanish 1989: 11). In contrast, conjugal (nuclear) households would occupy a comparatively limited amount of space, have a single or few architectural elements, and limit their pooling of economic resources outside of the household to enhance its internal cohesion creating a social and economic boundary from other households (Hodder 1990: 48-52; Sahlins 1972: 94-95). Therefore, if the archaeological patterns indicate that all of the activity areas in a settlement show redundancy between structures (houses), this would indicate the presence of conjugal (nuclear) style households. In other words, each structure is occupied by a separate domestic unit. The null hypothesis would be that if there is little evidence for redundancy between structures in a small community, this would indicate a more communal mode of production (and extended family structure).

III. Methods and nature of archaeological data

Archaeology is the recovery and analysis of material remains of behaviour (Binford 1962, 1964; Hunter-Anderson 1977). Patterns of human behaviour are complex and cannot be represented by a single data source, such as pottery. Behaviour is manifested in multidimensional contexts, material remains and abstract concepts: structural, organizational, social, cultural, and political (Athens 1977; Hodder 1991; Tainter 1977: 327-329; Vierra and Taylor 1977). In order to understand past human behaviour, it is important to use as many types of data as possible. A more holistic and accurate approximation of past behaviour would result. The methodological approach used in this thesis, therefore, falls within the realm of multidimensional data analysis. It will attempt to use the structure and contexts of many different visible archaeological patterns and material remains in conjunction with anthropological knowledge concerning the domestic mode of production to understand abstract aspects of socio-culture and economic organization at Foeni-Salaş.

A. Nature of archaeological data

There are many problems with the nature of archaeological data that often makes research difficult. The objective and subjective nature of archaeological data has been discussed at length by proponents of empirical and relativist concepts (Binford 1987; Caldwell 1959; Gibbon 1989; Hodder 1982, 1984, 1985, 1991; Shanks and Tilley 1992). Archaeological excavation and the data cannot be recovered in a controlled laboratory environment, like most scientific research. There are many factors that will affect the type of data that can be recovered from one archaeological site in comparison to another site (Myres 1923; Clarke 1939; Ascher 1961). Excavated data can often be incomplete or data sets maybe extremely small for regular types of statistical analysis. Also, for any given type of object the desired observations may not be possible leaving gaps in the total data record. These gaps often lead to further decreases in the available data that can be used for analysis (Fagan 2003: 122-123, 133-140).

Due to the variation in geographical locations and geological formations of archaeological sites, there is substantial variation in excavation and recording techniques. The type of excavation and recording techniques chosen are influenced by research goals and design (Fagan 2000: 189-209, 2003: 123-135). The collection and recording techniques may not be the same, where data types or categories are defined differently. Thus, in combining archaeological data from different sites or site types in a region the researcher may have difficulty matching data sets directly (Fagan 2003: 125-140).

Finally, the classification and recording of artefacts are often subjectively determined. While most types of artefacts can be agreed upon, there are some types that may not be as clearly categorized. Often a researcher may want to combine data and create different categories, while preserving the original data format and typology.

All of these aspects to the collection and analysis of archaeological data are time consuming for a researcher to deal with if they wanted to compare or combine data. The creation of a database would involve an initial degree of time and effort to set up, but would facilitate future research once all of the data tables have been organized and related. Logical categories of data can be established to combine incompatible datasets for more thorough analysis without changing the original data and analysis performed. Once the database is established, data can be queried and mined for information easily (Adamski and Finnegan 2002: AC 1.06-1.07).

As with any research problem it is important to design or structure techniques so that you are able to address the questions that you are trying to answer. This is also the case for a database management system. A database has to be designed with the desired function(s) and uses in mind (Adamski and Finnegan 2002: AC 2.02-2.03).

B. Structure of archaeological databases

All the archaeological data from Foeni-Salaş is currently recorded in spreadsheets. While spreadsheets are an easy tool for creating catalogue tables and performing data entry of material culture on a Personal Computer (PC), they are not capable of more sophisticated types of data-mining and analysis. Data recorded in spreadsheets are generally restricted to uni-dimensional analyses. Spreadsheet applications typically create flat files. Spreadsheet programmes become slower in searching and analysis as a database becomes larger. Querying extremely large amounts of data in a spreadsheet application will often cause the programme to crash risking file corruption and data loss.

Databases are commonly used for daily operation and research, by academic and commercial institutions. They are designed to store large amounts of information from a variety of types of fields from astronomy to zoology. Databases are used to maintain records, data integrity, security, to provide multi-user access over networks (both internets and intranets), to create informative or meaningful categories of data, and to bring large amounts of separate data together into one dataset (Garcia-Molina et al.2002: 1).

Archaeologists rarely build or amalgamate large databases of collective information from their field of archaeological research and analysis. This is unfortunate, as the collection of data from various local regions often remains isolated or fragmented across research institutions. A larger synthesis of data from sites in a region could allow for more thorough data-mining possibilities and potentially reveal information about past cultures or social organization that have largely eluded archaeologists.

Archaeology covers a wide field of different types of data. A characteristic practice with most archaeological investigations is that specific types of data are often analyzed in isolation of other types of data. The problem that archaeologists have faced in data analysis is devising methodological techniques that would allow them to combine or incorporate different types of data in their analysis for a multi-dimensional approach. Database management systems have been designed specifically for the purpose of allowing people to be able to access and analyze information in a more flexible manner (Adamski and Finnegan 2002: AC 1.06-1.07).

The concept of database management systems arose from the need to be able to store, access and modify data more readily or conveniently (Garcia-Molina et al.2002: 2-4). A database management system is composed of four main elements,

a. *Schema* or a logical data structure: defined by using a Data Definition Language (DDL),
b. *Query* (question) and change (update) the data: using a query language (DQL) or Database Manipulation Language (DML),
c. *Storage and security* of large amounts of data over a long period of time.
d. *Control of access* to the data by many different users over a network simultaneously and preventing accidental data corruption (Garcia-Molina et al.2002: 2).

The design of each of these components contributes to or affects how the data is managed and accessed (Adamski and Finnegan 2002: AC 2.02-2.03).

The creation of a database, with several different types of archaeological data combined, and the use of a database management system to manage it, has many advantages. The use of a database management system over simple file storage structures allows for the ability to query the total database (all types of data that have been collected) for information using a query language or a data-manipulation language (DML) (Garcia-Molina et al.2002). This is what allows an individual to access records or data more completely and effectively than with a regular file system of isolated datasets. With a query language you can query the data or mine the data for information.

The database management system also allows users to create new databases and logical schema out of data with a data-definition language. This may alleviate some of the difficulties faced by archaeologists in the variable nature of the collection and recording techniques of other archaeologists. Logical schema can be devised to categorize data types for easier identification and inclusion in analysis.

It is the database management system that allows for efficient extraction and retrieval of desired data for investigation. Relational databases are an efficient and useful type of database structure for fairly large datasets (Adamski and Finnegan 2002: AC 1.07). Unlike other academic disciplines archaeology has been slow to use relational databases for storage, retrieval and analysis of data from archaeological sites.

This thesis suggests that the use of a relational database would greatly improve the quality of archaeological research. Primarily, a relational database would be beneficial for data mining and analysis of archaeological data. However, there are further advantages to using a relational database to store archaeological data. A relational database can provide data integrity, multi-user access, security: who has access to the data and in what capacity (i.e. read only, specific read/write capability, full access), faster search capability with large amounts of data, incorporation of multiple databases, creation of logical schema (as not all data is collected, categorized or entered in a similar manner) and the preservation of original data format prior to integration with a larger database and construction of logical schema (Adamski and Finnegan 2002: AC 1.06-1.07).

C. Techniques

There are various types of techniques (or models) to organize and manage database systems: hierarchical, network and relational models (Garcia-Molina et al.2002). Each of these techniques incorporates a structure to organizing and managing data. A brief overview will highlight the way that they are organized and the influence that these models have on retrieving data.

First, it is important to define the basic sets of data structures that databases employ. Basic sets of data structures are 'records' and 'fields'. Fields are single items of information. They refer to a specific type of information such as a name, social security number, birth date, etc. (Parsaye et al. 1989: 38). Information recorded in a field must conform to the type specified in that particular defined 'field'. In a social security field, a social security number would be entered. Thus fields are specific 'types' of information.

Records are a collection of 'fields' or types of information. A person's record would include a collection of fields or types such as: first name, last name, social security number, date of birth, age, telephone number, etc. The type of information stored in fields would be numeric, alpha-numeric, date-sensitive and multi-level tables. Numeric field would store data that could be used for mathematical calculations, alpha-numeric would be used to store descriptive information, date-sensitive fields would used to work with calendar timelines and tables would store predefined set of global values that would be alpha numeric in nature. A physical record is the basic unit of data storage at the file level. It would be composed of either one or more of the field types described above. An example of a record is a row in a spreadsheet. A logical record is also a collection of fields. However, the values in the logical record are dependant on one or more physical records. In other words, a logical record could not exist without a physical record (Garcia-Molina et al.2002).

1. Hierarchical Model

A hierarchical model is based on a tree or branching organization of records. The top of the tree is the root node of the hierarchy with branches or nodes splitting off from it. Nodes are linked up and down the branches of the tree but not across or between branches. The basic type of operation is the tree search, where the nodes of the tree will be searched for conditions that meet the query that is given. Hierarchical databases are not flexible due to the 'tree' structure or organization of records. If you are not in the proper 'tree branch', your search will not produce the information that you are looking for. An example of a hierarchical data structure is an organizational chart (Garcia-Molina et al.2002).

2. Network Model

The network model uses pointers to add flexibility to the hierarchical model. A network is a collection of nodes that are linked together. Links can be assigned specific meanings. There can be a number of paths between any two of the nodes, which are not constrained to a link from a higher to a lower node branch as it is in the hierarchical model. This creates more flexibility to the database than a hierarchical model. However, with large datasets searches can take a long time to produce the records that you desire. An example of a network is a PC local area network (Garcia-Molina et al.2002).

3. Relational Model

A relational database consists of a set of tables. Each table contains rows and columns where data values are stored. The table itself is called a relation. Each table is given a name to identify the relations that it compiles. Each row in a table represents a set of related values or 'attributes'. Thus a row forms a relationship between a set of values that describe a single object. The columns in the tables are the place where the 'attributes' or fields: name, social security number, age, department, etc. (Garcia-Molina et al.2002).

One of the advantages with a relational database is that a user can query the database using a programming language and not have to be concerned with the storage structure of the data (Garcia-Molina et al.2002: 4). Originally a database search was dependent on where you were doing your search from in the structure in regards to a hierarchical structure or the way that the database links were setup with regard to the network model. Relational databases search capabilities are more extensive and flexible allowing the user to create tables of related information. Furthermore, with large volumes of data a relational database is faster and more efficient (Adamski and Finnegan 2002: AC 1.06-1.07).

D. Technology

Since the invention of the microprocessor and development of the microcomputer, many academic disciplines have taken advantage of the low cost, speed and processing abilities of this tool by devising ways of inputting, managing and running analysis of data. While some archaeologists have attempted different methods of archaeological data management and analysis using computers, databases were limited in their search and retrieval capabilities and application interfaces were not user friendly. Considering that most archaeologists have a limited knowledge of databases both at the user level and at the data design and management level, common use of previous types of user interfaces and database systems did not spread throughout the discipline.

The development in graphical user interfaces (GUI) for operating systems and applications has popularized the use of microprocessing systems making them more user friendly. The microprocessor has become a common business, research and household item as a result of GUI's. Even in archaeology, microprocessing computers are commonly used to run spreadsheet and Geographic Information System (GIS) applications for research and analysis (Fagan 2003: 114-116). However both application types are limited in their data mining and analysis capabilities.

For this research Microsoft Access will be selected for analysis and comparison of the archaeological data: Microsoft Access is relatively inexpensive and is included in the Microsoft Office application suite, which is most commonly purchased by Microsoft Windows users. Access is a flexible application that allows for a relatively fast design and implementation of a relational database. Microsoft Access is also compatible with and allows for a migration toward Microsoft SQL; a more expensive and robust software package with greater security features and more stability. By using MS Access, the future expansion and development of the database will be easier (Microsoft® Office Online).

E. Problems with other supposed spatial analytical database systems

Geographic Information Systems (GIS) are being employed for spatial analysis on archaeological sites to solve research questions. Current GIS software programmes employ both traditional hierarchical and relational structures to organize their data. ArcView, a GIS software developed by ESRI inc., has been advertised as a relational based information system and initially was believed to be the answer to this problem. However, ArcView does not seem capable of performing more sophisticated analysis to answer archaeological research questions. Therefore, it is difficult to analyze or access certain types of archaeological information using GIS software from spreadsheets. These programmes are not relational database management systems.

It has commonly been argued that this problem can be solved by using a relational database. However, there has been no methodological attempt to show the benefits of using a relational database over traditional data management systems and thus it is not clear whether this shift will solve certain research problems for archaeologists. The goal of this thesis is to further our understanding of the socio-economic organization of the Early Neolithic communities in southeastern Europe by testing whether the community was occupied by a single extended family unit or multiple conjugal (nuclear) families through the incorporation of a true relational database management system (RDBMS) of archaeological site data. It is hoped this attempt will help determine whether a RDBMS approach can achieve higher-level analysis previously unobtainable with the combined use of individual spreadsheets and GIS software.

IV. Data

The site of Foeni-Salaş was chosen for this analysis because of the nature of the recovered data. Foeni-Salaş is a short term, single phase, and small Early Neolithic settlement site in southeastern Europe (Greenfield and Draşovean 1994; Greenfield and Jongsma n.d.; Jezik 1998; Jongsma 1997; Jongsma and Greenfield 2001: 185; Kuijt 1994). It dates to c. 5450-5250 BC, calibrated. The site comprised five large pit houses, surrounded a larger centrally located pit house. It also includes storage pits and 2-3 recognizable surface activity areas. The analysis of daub remains from the site verified the use of the large pits as pit-house dwellings and indicated the spatial distribution of all structures. It further identified activity areas and structures within these household dwellings (Jongsma 1997; Jongsma and Greenfield 2001). While, the analysis of daub remains at this site was an important contribution to the understanding of the function of structures and the identification of activity areas, the analysis would benefit from the incorporation of other archaeological data such as: lithic, ceramic, faunal, shell and carbonized remains. The combination of all of these data sources should yield a more comprehensive picture of the distribution of activities, and hopefully a fuller understanding of the community's social organization.

V. Why this site

It is one of the few sites in the regional where the data were collected in a quantified framework. For example, the maps have been digitized into ArcView. The other major data categories that have already been quantitatively analyzed include the fauna, bone tools, botanical remains, architectural daub, weights, figurines, and lithics. The three dimensional context of each was recorded as well. Only the ceramics were never fully analyzed because it was the role of the Romanian contingent. These data were never analyzed by them, nor released for others to analyse, and hence are not recoverable. Frequencies of ceramics by time period only are available for each part of the site.

Currently the other datasets are stored in separate spreadsheets. All of these data will be imported into a relational database management system for analysis. In a relational database, all of these different types of information will be stored together in a manner that is easily accessed. This will allow for the search and analysis of meaningful patterning to the total identifiable, recovered data from Foeni-Salaş

Several additional benefits are obvious with a relational database management system approach to the data. First, it allows for better preservation of data integrity. Second, it will also allow the data from the spreadsheets to be ultimately linked with the digitized maps of each data category. Third, security features can also be set up to allow differing levels of access for individual users. The data can be made available in its entirety or only parts of it can be accessed using password security assigned by an administrator. The administrator of the database will be able to provide read only or full access to the information. Fourth, allow quick and easy access to common information within the site; Fifth, it will provide one common GUI interface with a standard set of query tools; Sixth, it will allow additional data from other sites to be incorporated for a global analysis of multiple sites; and finally, it will allow the data to be more accessible over a local area network or the internet

VI. Conclusions

The ultimate goal of this thesis is to test hypotheses concerning the nature of intra-settlement organization in Early Neolithic villages in southeastern Europe. If activity or resource areas are less frequent in the settlement, then resources were pooled and utilized through a community or kinship based economic organization. If, there are redundant types of activity areas and more abundance of these similar types of activity or resource areas, then the society was based on household economies. These will have different archaeological manifestations.

With the use of a relational database management system, a more thorough analysis of archaeological information from Foeni-Salaş can be performed to answer high-level research questions. The analysis of a combined dataset with the complete array of archaeological material that was excavated, identified and recorded from this site will allow for more systematic analysis of archaeological patterning of material culture. The result will be an increased understanding of the socio-economic organization of this Early Neolithic community in southeastern Europe, one that has eluded archaeologists, thus far.

In general, relational database management systems can allow archaeologists to preserve original data which had been individually collected and recorded from sites while incorporating it with other archaeological, geological or geographical data with or between regions. Building a larger knowledge base or database can allow for greater visibility of trends and patterns at either a local or regional level of investigation within or between time periods.

Chapter 2: Behaviour and archaeological correlates

> Economy: an ancient Greek word 'oikonomia' which translates as "household management" (Oxford Dictionary 1987: 232).

I. Introduction

The ancient Greeks used the term oikonomia when talking about managing households. It is not a coincidence that 'economy' in small-scale societies revolved around households and the management of household production (Sahlins 1972: 41-148). 'Economy' of use value small-scale societies is different from the exchange value market systems of western societies (Wolf 1997: 75-100). In Western societies, economy is generally not conceptualized as a way of providing essential needs; i.e. functioning as a use value system as opposed to the production of commodities for exchange value (Bodley 1996: 51-53; Sahlins 1972: 2-5).

The prime economic goal of small-scale societies is the production of livelihood or subsistence; thus termed use value. Productive forces and the behavioural patterns of a society contribute to overall cultural adaptations to subsistence economy (Ross 1978: 2-16; Durrenberger and Tannenbaum 1992: 77-85). Although global comparisons of different societies show different adaptations and resolutions to economic situations, there is one fundamental or universal constraint. All human groups or societies are ultimately forced to satisfy basic human needs in order to produce and reproduce physically and culturally (Harris 2001: 51-52).

The processual school of archaeological thought, often referred to as the *New Archaeology*, emphasized the concept that archaeological materials and their spatial organization in the ground were the result of cultural behaviour, activities or social processes. It claimed that the goal of archaeology was to explain cultural change. Processual archaeology approached cultural behaviour as dynamic systems that change and adapt over time in response to environmental conditions (Flannery 1968, 1976). It also recommended a cautious use of ethnographic information in understanding and explaining archaeological patterning (Binford 1962, 1965, 1978; Flannery 1983). Processual archaeology is criticized for mainly relying on external environmental factors to explain change (Trigger 1989) and that it neglected the internal socio-cultural dynamics of societies, the social negotiation of people and material culture (Hodder 1981, 1982b, 1991).

Materialist or neo-Marxist approaches to archaeological problems have attempted to address the issue of change from a dialectical perspective (Tilley 1984, 1989; Shanks and Tilley 1987). Materialist approaches and interpretations of Marxian concepts vary. Generally, Marxist explanations focus on modes of production to understand social and economic changes in societies but neglect ecological processes (Tilley 1984, 1989; Shanks and Tilley 1987; Wolf 1997: 75-100); Marvin Harris is one exception to this general trend (Harris 2001: 85-88). Depending on the nature of the problem being investigated researchers focus on certain concepts over others; such as, negotiation of social relations, hegemony (domination and resistance), explanations of change and social structures. However, the main approach is to investigate the infrastructure ('modes of production') or active production and reproduction of culture to understand the structure (social and political), and if possible superstructure (ideological, religious, astronomical, mythological) of past peoples; and their change over time (Klejn 1970: 297; Kristiansen 1984).

Without written records (in many cases) or the ability to observe or interview past societies, archaeology is limited to studying the material remains that have survived form the daily activities of human behaviour. Difficulty arises in defining or delineating an 'archaeological culture'[2] as a cultural group or society solely on the basis of stylistic differentiation. However, it is not necessary to determine or define a cultural group in order to study a human population (Harris 2001: 46-47).

Marvin Harris (2001: 47) argues, the starting point of socio-cultural analysis is the existence of a human population located in time and space. The point of departure for this thesis is the attempt to understand the socio-economic processes by which the Early Neolithic settlement at Foeni-Salaş, southwest Romania organized and adapted themselves to produce and reproduce their way of life.

Archaeological limitations to emic[3] episteme or knowledge of past cultures or settlements can present problems to deriving etic[4] explanations of them (Harris 2001: 32-45). However, it is not always necessary to have an emic understanding when observing infrastructures ('modes of production') and socio-political structures (Harris 2001: 32).

A. Household Management

In small-scale societies, economic production is a *process* instituted by domestic groups, organized in the form of families and extended families (Sahlins 1972: 76). Economy (household management) is closely related to social organization in hunter-gatherer and "tribal" societies. A criticism of Sahlins discussion on the domestic mode of production in anthropology is that he does not contrast small-scale societies with more rigid hierarchical societies such as feudal or ancient city-state systems. His work seems to implicitly contrast small-scale societies and large-scale capitalist economies, without a discussion of complex

[2] A group of artefacts found in the same time period and grouped together to define a characteristic style.
[3] Emic refers to the perspective of the culture or people that are being studied (Harris 2001: 32-45)
[4] Etic refers to the perspective of the scientific observer or researcher; it relates to information that is theoretically meaningful (Harris 2001: 32-45)

pre-industrial societies such as feudal Europe (compare Sahlins 1972: 2-9 and Wolf 1997: 75-100).

The socio-cultural organization of a society or community has a major influence on the economic process (Durrenberger and Tannenbaum 1992). In kin-based societies, kinship serves as a primary organizing feature for production modes called domestic groups (Sahlins 1972). Anthropological literature refers to economic organization in kin-based societies as the domestic mode of production. Social relations and the division of labour are essentially the foundation of the economic process in small-scale societies. By understanding the social relations of production, we may be able to reconstruct the socio-economic process at Foeni-Salaş.

B. Conceptual model of settlement types

I propose a conceptual model that defines two extreme hypothetical settlement pattern architectural patterns. At one extreme end of the model is a community based on a single extended family unit. The settlement pattern for this type of community would comprise one complete household pattern having highly specialized structures or areas where highly specialized activities took place. This would mean that only one type of specialized area or structure would exist for a given activity. For explanation purposes, let us assume that only three activities were carried out at this settlement: cooking, sleeping and carving. Hypothetically, in a community based on a single extended family unit there would be one cooking area, one sleeping area and one carving area for the whole settlement.

On the other extreme end of the model is a community based on multiple conjugal families. Architecturally, the settlement pattern for this type of community would have no differentiation in structures between households. This type of community would show a pattern where there is repetition of similar activities areas across the settlement. Each conjugal family would have its own complete set of activity areas that were similar to the other families in the community. Using the previous simplistic example of three activity types, a hypothetical community with five conjugal families would have a total of five cooking areas, five sleeping areas and five carving areas.

This model is extremely simplistic. It is meant as a conceptual guide to visualizing two extreme forms of small-scale society social organization. The model's simplicity is problematic. It does not account for socio-cultural practices. For example, a social practice could involve one sleeping area for parents and one for children; thus one household would contain a total of two sleeping areas. Another hypothetical example could be that all men in the community gather in one area to carve together. This apparent weakness or lack of complexity in the model can also be its strength. Any deviations or oddities from the two basic patterns in the model can be used as markers for potential indicators of socio-cultural practices or for avenues of further investigation. In either case deviations from the model demarcate socio-cultural characteristics of a community (whether we understand their implications or not).

II. Domestic Mode of Production

Technological innovation is a method by which modern western societies attempt to achieve progress and sometimes use it as a measure of a society's stage of development. For example, the hi-tech industry is perceived to be a measure of a society's economic advancement. These prevalent underlying ideological tenets of Western societies and modern capital markets create the perception that technology is a limiting factor of the development or evolution of human economies. We structure our economy around the *technical limits of* *production* (Sahlins 1972: 48). This concept has often been implicitly applied to explanations of archaeological data for small-scale societies (Trigger 1990: 289-297, 368, 394, 403).

However, the socio-cultural organization of non-industrial small-scale societies is *not* structured around the technical limits of production. This means that the social structure is not organized for the purposes of maximizing the productive output of a group, as in modern capital-market economies. Instead, the socio-cultural organization has been shown to, "impede the development of productive means" of a village or society (Sahlins 1972: 48) as will be explained further on.

In small-scale societies, economic production is affected by various social and political processes. According to Sahlins (1972: 53), social relations between groups, the process of production, and the political morphology influence the effectiveness of a society's economic system. Sahlins (1972: 41-99) identifies several elements of the domestic mode of production. They are: A. the identification of the domestic group with family types of relations and division of labour; B. the relation between humans and technology; C. production for livelihood; D. property; E. pooling; F. anarchy/dispersion; and, G. contradictions.

A. Identification of domestic group with family

The domestic group is an integrated group based on daily patterns of cohabitation, commensality and cooperation (Sahlins 1972: 77). In a small-scale society, a domestic group is defined as a family system made up of households. A domestic group is not only limited to families but can also include people of a certain age class (Sahlins 1972: 77). Therefore, a domestic work-group can be made up of one or more families but can also include non-family members.

The household is a family system, but can be either a conjugal family or an extended family (Sahlins 1972: 77). Families can be a specific lineage not just a conjugal family unit (Sahlins 1972: 77). For the purposes of this thesis the household will be considered the basis of an economic work group for the domestic mode of production.

The social relations within a household involve divisions of labour that create and recreate the general economic form of a society. This domestic mode of production varies in composition from society to society. The primary internal relations of the division of labour are between husband and wife; and between parents and children, but can extend to include kinship or lineage relations.

Production can be organized in many diverse social forms, sometimes even wider than the household level (Sahlins 1977: 78). For example, some families may collaborate with a family of another household. Some projects may be undertaken by lineages or village communities (Sahlins 1972: 78). Workgroups can also involve individuals of the same age class (Sahlins 1972: 77-78).

The household makes up a type of small economy. This is a flexible group based on the conjugal family which can be expanded beyond this small unit to a type of extended family depending on the size and complexity of work / production required to be done (Sahlins 1972: 78). A family is at a minimum comprised of a husband and wife. This unit, a married male and female, comprises the basic general economic form of most societies; the, sexual division of labour (Sahlins 1972: 79).

B. Relation between humans and technology

According to Sahlins (1972: 81) in the greater scheme of human history, labour was more significant than tools. The technological aspects of human groups did not dictate the socio-economic forms of production. While it is recognized that different and new technologies do influence socio-cultural elements of a group (Ross 1978; Scott 1985), they are not primary influential forces. In small-scale societies people are the most malleable and the most important factor in the human-tool relationship (Sahlins 1972: 82).

C. Production for livelihood

Although there are extremely significant differences in production output between households within a village, there is very little difference in production between villages (Sahlins 1972: 69-74). This fact is critical to understanding the importance of households and the redistribution of resources among members of the society. It also, helps to understand how the socio-cultural structure of a society plays a more important organizing factor in small-scale economies than maximizing productive output of contemporary technological means.

D. Property

Usually, the household in tribal societies is not the exclusive owner of its productive resources, such as, farmlands, pastures, hunting and fishing territories. Households retain their primary relation to productive resources through group or community membership of larger groups (Sahlins 1972: 93).

Generally, in situations where land is not owned exclusively or divided among members of a community, domestic groups have unlimited access to productive resources. In situations where land is allotted, domestic groups have claim to an 'appropriate' share (Sahlins 1972: 93).

Although a family, as a member of a proprietary group or community, can directly or independently exploit a culturally appropriate share of the social resources for its own support; the rights to property owned by chiefs, lineages or clans are mediated by the domestic groups. Property, is a right to things through a hold on persons, rather than the bourgeois system where control over production or things is a hold on people (Sahlins 1972: 92-93).

Is this vision of property relevant for the Early Neolithic of Europe? While this is often the case in situations where groups have long lived on the land, the situation in the Early Neolithic of southeast Europe is different. There are two schools of thought concerning the nature of Early Neolithic social groups. One school (the more common) views these as pioneer groups, who are colonizing the land for agricultural purposes for the first time. The second school sees the early agricultural communities as descended (at least in part) from indigenous Mesolithic hunter-gatherers (Greenfield 1993; Tringham 2000). The sense of ownership is different between the two, but neither would see households as the owners of land. Land is allocated on a use basis and the territory belongs to the group.

E. Pooling

Group work or collective work may exist in a domestic mode of production. Their presence does not necessarily mean that a society or settlement uses a communal mode of production. The structure of the domestic mode of production,

> "anticipates no social or material relations between households except that they are alike... Nor is any higher cause entertained by the household's access to productive resources, or again by the economic priorities codified in domestic pooling" (Sahlins 1972: 95).

It is important to note that all parties recognize the need for this group or community membership, as well as the importance of the social mediation of resource control.

F. Anarchy and Dispersion

Small-scale societies do not operate at maximum productivity, thus, the intensification of labour resides in the relations of production, the political pressures that can be put on the household economy (Sahlins 1972: 82). The goal is either to get people to perform more work or to get more people working.

> "Chayanov's Rule: Intensity of labour in a system of domestic production for use varies inversely with the relative working capacity of the producing unit" (Sahlins 1972: 91). Thus, "Productive intensity is inversely related to productive capacity" (Sahlins 1972: 91).

However, the domestic mode of production (DMP) is intrinsically an anti-surplus system (Sahlins 1972: 82). The primary goal of the DMP is to satisfy the needs of the household economy (Sahlins 1972: 82).

The higher importance to satisfy the primary needs of the household for its continued success and viability prevents the system from developing. Production for livelihood is where households perform some sort of labour in order to directly or indirectly, i.e. through exchange, obtain use value related to subsistence; not to accumulate profit (Sahlins 1972: 83). Production does not continue once the amount of subsistence for livelihood has been assured for a given length of time. The household is not organized for surplus, production halts once livelihood is reached (Sahlins 1972: 86). This organizational characteristic creates a resistance to change or development of the system.

In summary, the domestic mode of production is characterized by a small labour force differentiated by sex, simple technology, and finite production objectives (Sahlins 1972: 87).

G. Contradictions

While domestic groups may participate in co-operative work with other groups, this collective cooperation does not compromise the autonomy of the household or its economic purpose. The management of labour-power or the prevalence of domestic objectives by individual groups is not affected through the social activities of collective work (Sahlins 1972: 78). Thus, if two individual groups are working together, each household manages its own labour force and keeps its own group interests as its primary goal. The co-operative work with the other group is the means to achieving the household's personal interests. For example, two corporations may work together on a project, however each company still maintains control over its own employees; and, each company still looks out for its own corporate (group) interests which they are trying to obtain through the joint collaborated effort. Another example of co-operative work among separate households is barn raising. When it is time to raise the roof of the barn other families in the vicinity are invited to come and help. As a form of reciprocity, the household that is raising the barn feeds the members of the assisting families.

Another aspect of social relations between individuals or corporate groups involves social surpluses. Participation in social ceremony (i.e. public display) requires an individual or group to exchange labour, goods or money to allow the event(s) to take place. Wolf (1966: 7-9) refers to 'funds' for these types of exchanges as a ceremonial fund which allows an individual or household to gain or maintain good social relations with other individuals or groups in the society by participating in ceremony. Participation in producing the event through labour or other exchange method does not compromise the economic autonomy of individual household unit(s). Social or economic needs of the society are provided through the exchange of labour, goods or money from the household's ceremonial fund and in return, the household or individual gains good social relations in the society.

Sahlins (1972: 94-95) outlines the differences between the concepts of pooling resources vs. reciprocity. The premise for 'pooling' resources or 'redistribution' is based on collective action / social relations within a particular group. Sahlins refers to this as a "within relation". Reciprocity is defined as social relations that transpire between individuals or groups; or as Sahlins indicates as "between relation, the action and reaction of two parties" (Sahlins 1972: 188).

Pooling is the complement of social unity; whereas, reciprocity is social duality. Pooling stipulates a social center where goods meet and then are allocated. It also indicates a social boundary, within which persons (or subgroups) are cooperatively related (Sahlins 1972: 94-95).

Reciprocity stipulates two distinct social-economic interests, either between individuals or between groups. Reciprocity is where the flow of materials 'suggests' assistance or mutual benefit, yet the fact that each party is part of a distinct social group or subgroup is clear (Sahlins 1972: 188-9)

> "The everyday, workaday variety of redistribution is familial pooling of food. The principle suggested by it is that products of collective effort in provisioning are pooled, especially the cooperation entail division of labour. Stated so, the rule applies not only to householding but to higher level cooperation as well, to groups larger than households that develop about some task of procurement..." (Sahlins 1972: 189).

Ethnographically it has been noted that a large percentage of domestic groups in a village-level economy fail to produce enough food to sustain their own livelihood (or produce surplus to meet their own needs in a small-scale society). Sahlins suggests that this phenomenon reinforces the socio-cultural organization and distribution systems of a society (Sahlins 1972: 69). Households by themselves are not capable of managing the 'economy'.

Almost every family living solely by its own means, sooner or later, realizes it does not have the means to live (Sahlins 1972: 101).

The process of production is contradictory. Domestic control becomes an impediment to development of the productive means. This impediment to production is reduced or countered by the social processes that exist between the household economy and the society at large; or, rather the domestic system and the greater institutions in which it is inscribed. Kinship, chieftainship, ritual, reciprocity and other socio-cultural practices, are economic counter forces (Sahlins 1972: 101).

III. Archaeological correlate of domestic mode of production

Understanding the socio-economic level of an archaeological site requires the identification of social structure and productive organization of a village. Wilk and Rathje (1982) stressed the importance of households as essential elements in reconstructing past societies. "Social groups articulate directly with economic and ecological processes," at the household level (Wilk and Rathje 1982: 618). We must attempt to identify the system of household relations and economic group relations within the settlement. Archaeological reconstruction of the domestic mode of production can only be made through an understanding of the architectural structures and spaces of the society or village first.

Based on the assumption that the economic goal in small-scale societies outlined previously is to satisfy the needs of the household both practically (providing individuals with essential necessities) and culturally (meeting socio-political, ideological and ritual values/requirements – such as ceremony funds, reciprocity, gifts, etc) then each household's total range of activities within a village or society should contain roughly similar manifestations of productive activities. Depending on the size of the household the amount of production required to satisfy its needs will vary. However, similar activity patterns should be present, in general, between larger and smaller households as each household aims to meet its own economic needs within that society's socio-political, ideological and ceremonial belief system. Thus, several houses that make up one household unit would contain a similar range of activities combined when compared to another household that might be made up of one house. It should be noted that there are many other factors that affect increased or decreased production requirements, such as access to resources, ratio of workers to consumers, ritual expenses, etc. (Durrenberger and Tannenbaum 1992: 76). These must be taken into account when conducting more detailed archaeological analysis or modern ethnographic study. For this thesis, a simplified concept for identifying a household unit will suffice.

Durrenberger and Tannenbaum (1992) illustrate the usefulness of explaining underlying structural differences between two seemingly similar social groups using Chayanov's concept of 'on-farm balance' or household equilibrium. According to Durrenberger and Tannenbaum (1992: 76) household equilibrium is the theoretical point at which household production ceases; where, the amount of value gained from production of a product negates the inclination to work any further. For the purpose of this thesis and limited by current archaeological data of Foeni-Salaş, the focus on identifying households archaeologically will be determined on the theoretical assumption that the totality of architectural structures and activities related to production for a given household would meet household equilibrium; and would be similarly manifested in the combined architectural structures and activity areas of other households in the village or society. When artefact categories of loci are compared the loci with statistically similar sets of values should suggest each of these houses were probably part of different households; as they would indicate a repetition in both architectural and production activity that help a household achieve equilibrium.

By identifying a system of various structures and activity areas that would have been part of the total household production economy it may be possible to recreate the 'superstructure' of the settlement at Foeni-Salaş and understand whether the domestic mode of production was organized as conjugal or extended kin-based units.

A. Conjugal Settlement Architecture

Given the social processes involved in the domestic mode of production, a range of archaeological patterns can be manifested. These are described below in terms of ideal models. Real-world examples may vary to a greater or lesser degree.

The simplest example of a domestic mode of production would be a conjugal family. Archaeologically, this would involve what has been defined as the Household Cluster (Flannery 1976). This type of socio-economic unit is organized architecturally to include the structures necessary for reproduction and production, i.e. cooking area, sleeping area, corral or animal pens, other types of craft production (stone, metal or pottery) areas. It would manifest itself as a single large or several small structures with different activity or structural areas for each activity.

A village characterized by the domestic mode of production would contain the repetition of many structures with similar patterns. The architectural and activity area pattern would seem to be redundant, where similar structures or activity areas would be evidenced again and again across a settlement. The model predicts that the higher the rate or degree of redundancy, the closer the resemblance to the conjugal family unit of production. A good example is from modern day suburban dwellings, which are organized linearly along a street, with extreme repetition of all activity areas within each structure.

Generally, conjugal households would be of small to moderate size. Structures that belong to a family are usually in close proximity to each other. For example, a modern conjugal household in the suburbs may include the main dwelling, a structure to park a car from the elements, a shed for tools, gardening equipment or other storage purposes and a fence to delineate property boundaries. Conjugal households would also have small or moderate sized activity areas, such as cooking areas and sleeping areas.

B. Extended Settlement Architecture

Archaeologists are able to determine the degree of cooperation, centralization and segmentation of production in communes from the size and configuration of buildings (Spencer-Wood 1999: 175). In a communal mode of production, the family is less important than the unit of production. Several family units would share or use single large areas to reproduce socio-cultural and economic activities. These can be described or referred to as public activity spaces. For example, one large public cooking and eating area would exist for all the households in the community.

The most ideal or extreme model of a settlement with social relations of production based on extended kin-based units would involve similar types of architectural structures or activity areas for all aspects of daily and economic activities i.e. one cooking area for the whole community, one sleeping area, one corral or animal pen and single areas for craft production (stone, metal or pottery). Hence a model for this type of extended settlement architecture would be expected to result in the pattern of an ideal communal mode of production; it would have less repetition of functionally different activity areas and architectural elements.

The lesser the frequency in the repetition of a structural or activity area across a settlement then the closer the architectural pattern of that settlement is to the extreme model of an extended family unit of production. Larger single types of structures or activity areas that do not occur repeatedly across a settlement would suggest more public or group use. One large cooking area in a settlement would be a communal area used by all the settlement inhabitants.

The measure of the social degree of centralization can also be modeled on a continuum based on the number of cooperative tasks performed in single large buildings versus the number of cooperative tasks in separate buildings. Cooperation may be indicated by different types of artefacts lost or discarded in or near buildings. Most communes segregated cooperative tasks into different buildings to some extent (Spencer-Wood 1999: 175). This would be similar in pattern to the extended settlement architecture model proposed in this thesis.

IV. Conclusion

The production of economy in small-scale societies is a process. The economic process is structured by the society or settlement's social relations and division of labour. The archaeological patterns that result from human behaviour of production would manifest itself through activity/production areas (stone and metal working, carpentry, pottery workshops) household structures (including cooking areas, sleeping areas, common areas, and livestock areas), public places, etc.

Kinship, social relations and marriage relations are the main potential bases from which workgroups are organized in small-scale societies. We must assume that in small settlements each individual has his/her own motives for being a part of the community. These could be due to kinship, marriage or some other type of binding affiliation. Regardless of the means by which these groups were affiliated it must be assumed these individuals believed they would be more able to take care of their needs by being a part of that community rather than in another community or on their own. This belief could have been in regards to access to resources through group or kin affiliation.

Affiliation and group access to resources necessitate co-operation and sharing of resources to a greater or lesser extent depending on a series of complex socio-cultural elements, such as ownership claims to resources if any, social ranking or affiliation, negotiation of social contracts, etc. Most societies recognize the benefits that can be gained through group labour although this does not necessitate or assume that working in groups to facilitate tasks will be practiced. Individual labour or group labour is subject to socio-cultural values and beliefs that influence understanding about specific tasks. For example, it may be socially appropriate that an individual help one's brother-in-law or cousin with renovations around the house (e.g. according to traditional first generation Italian-Canadian cultural beliefs and values), but it is not required.

Houses are socially and culturally meaningful places where individuals or groups of individuals (families, extended families, non-related but affiliated families) temporarily reside. Often social behaviours or gatherings will be hosted in houses. 'Households' are composed of residents from houses (not necessarily all individuals from a house) that form a workgroup for specified tasks; and consequently form the basic units for production.

A linear model consisting of conjugal households on one end of a continuum and extended family mode of production on the other end would be the measure by which this settlement can be determined to have employed one type of family based organizational unit or another.

The center of this continuum would suggest an even mix of both conjugal and extended family units of social organization.

Patterns of socio-economic behaviour and the identification of household units exist in the archaeological record. It is the goal of this thesis to find and understand the socio-economic infrastructure of the settlement of Foeni-Salaş in the early Neolithic, SW Romania. From the analysis of the material culture found within pit houses at Foeni-Salaş patterns of social behaviours become apparent and are thought to represent household activities. Pit houses at Foeni-Salaş were thus assumed to be spheres of activity that could potentially reveal socio-cultural patterns and provide greater understanding of this Early Neolithic settlement's social organization.

Chapter 3: Methods and nature of relational databases in archaeology

I. Archaeological data sets

A single archaeological site has the potential to provide several different artefact types. Archaeological data sets can include materials and descriptive information relating to their properties and observations. The range of material types and descriptive elements can include: lithics (stone tools), ceramics (pottery), faunal (skeletal animal remains), metals, phytoliths (minute particles of silica from pants), pollen, seeds, parasites, human skeletal remains, textiles, architecture, soil features, stratigraphy, geology, environment, coprolites, chemical residues, DNA, and so on (Fagan and DeCorse 2001, Peregrine 2001). Archaeologists need to record this diversity of material types and their properties (field values) to be able to perform analysis.

Such diverse types of data for an individual site create logistical problems with data recording. The categories of information that describe one type of material i.e., faunal remains, would not be sufficient to describe pottery artefacts or stone figurines. Each type of material (or artefact category: lithic, faunal, ceramic, etc.) has different descriptive fields/information required to explain it. A data table designed for lithic data would not be adequate to describe faunal data. Thus, different artefact types require structurally different tables to describe them.

As different categories of data are recorded in separate and structurally different tables, problems arise in traditional types of analysis. For example, all pottery would be recorded in a spreadsheet table designed for pottery; all lithic artefacts would be recorded in a spreadsheet table designed specifically for stone tools; faunal materials would be recorded in tables designed to describe bone material, etc. because the types of variables used to describe each entity (type of artefact: pottery, lithic, faunal, floral, textile, etc.) are different given the specific type of material recorded (clay, stone, bone, plant, cloth, respectively). Often, in archaeology, each type of artefact medium is analyzed individually, without integration of the other artefact types.

The common element of all archaeological data on a site is the provenance of artefacts. This is the primary and most important field data. Provenance allows the archaeologist to reconstruct the excavated site. Provenance is the recorded spatial (2-dimensionally) and temporal (stratigraphic) position of artefacts. It assists archaeologists in determining the socio-cultural behaviour of the extant inhabitants and how that behaviour has changed over time. The nature of archaeological data as it is situated both across a site and within a stratigraphic level is three-dimensional. This is also important to the integration of the data within a relational database.

II. History of Databases and Archaeology

Early attempts at creating databases in archaeology used hierarchical relationship systems (Chenhall 1981). These database management systems were originally catalogue and inventory systems designed for museums (Scholtz 1976; Wilcock 1981) and were referred to as 'data banks' or 'information retrieval systems' (Gaines 1981).

Archaeological remains are a non-renewable resource. Once a site has been excavated valuable contextual information about the site is destroyed. Unfortunately this is a reality of archaeological research process. Therefore it is important to record as much information as possible so that future research on the data could be possible (Fagan 2003: 133-134)

In the late nineteen-seventies and early nineteen-eighties, archaeologists called for information systems that could retrieve recorded data about archaeological sites for reporting on the types of archaeological projects performed, planning research projects (Canouts 1977;

Rieger 1981; Schiffer and Gumerman 1977) and prediction: site location, site types, artefact densities, etc (Rieger 1981; Scholtz and Million 1981). By this time database management systems were capable of retrieving information for statistical analysis (e.g. seriation, cluster analysis, multidimensional scaling) and graphics (e.g. maps, plans, diagrams) were possible (Wilcock 1981); yet they were not commonly used by archaeologists (Chenhall 1981).

It was only in the nineteen-eighties that micro-computer systems became economical and had higher processing capacities. The volume of archaeological data to be processed previously required large computer systems (mainframes) that required approximately 200 square feet of floor space (Chenhall 1981), and were very costly. At this point, archaeology begins to take advantage of the technology on a much larger scale than previously.

Prior to the nineteen-eighties, commercially available database programmes with friendly, graphical, (non-technical) user interfaces such as Microsoft Access, Oracle or FoxPro did not exist. Theses archaeological database were often designed and programmed from the ground up using programming languages such as BASIC, FORTRAN and COBOL. In some cases it took years to design and programme the database (cf. Rieger 1981).

Some archaeological researchers spent considerable efforts developing computerized databases. Most notable in Canada was the CHIN system, which was mostly for curatorial and not analytical purposes. Other notable databases were the Southwestern Anthropological Research Group (SARG), the Automated Management of Archaeological Survey Data in Arkansas (AMASDA), the ORACLE project by the Glenn Black Laboratory of Archaeology at Indiana University, AZSITE and the Koster Project (Brown, Clayton, Wendt and Werner 1981; Limp and Cook 1981; Plog 1981). These databases were designed for both analytical and curatorial goals. Analytically, they employed databases to produce maps and statistical analysis of information.

Generally, these database projects began for the purpose of storing and retrieving information of, either, a specific geographic area, an archaeological culture area or a specific archaeological site. For example, SARG originally started as a project to collect all ceramic data from American southwest archaeological sites. The research group grew in size. The growing number of researchers with interests beyond ceramic investigations wanted the data types they studied in to be included in SARG. Thus, SARG developed into a database for all archaeological data of that particular geographic area (Plog 1981).

The Automated Management of Archaeological Survey Data in Arkansas (AMASDA) was a collaborative project by the University of Arkansas Museum and the Arkansas Archaeological Survey (Scholtz and Million 1981). This information retrieval system used a database management system called GRIPHOS (*General Retrieval and Information Processor for Humanities Oriented Studies*). The purpose of the system was to provide: 1) an archaeological site inventory file, 2) a land use file and 3) a project file (Scholtz and Million 1981).

ORACLE was a customized 'information retrieval system' developed at the Glenn. A. Black Laboratory of Archaeology with the Department of Computer Science, Indiana University (Limp and Cook 1981). It began in 1975 and went on-line in 1977. By 1979 the database contained records for 4000 different archaeological sites. The database was organized as a 'cross-linked hierarchy'. Information was retrieved using a programme called QUERY SYSTEM. This allowed archaeologists to search for data and provided them with a report of data that fit the categories they requested.

The Arizona State Museum created the AZSITE database to maintain a file of archaeological site survey records (Rieger 1981). The project planning began in 1970 and by 1976 the museum staff began data entry on the system. This database did not include artefact collection inventories, bibliographic information or photographic collections. These data types were stored in separate files to be integrated at a later date. AZSITE used a database management system developed by the Smithsonian Institution called SELGEM (SELf-GEnerating Master). SELGEM's capabilities included file maintenance, updating, retrieval, multiple sorting, indexing, limited summation capabilities and report production.

The Koster project was unusual for its time in archaeological research (Brown, Clayton, Wendt and Werner 1981). It was a multidisciplinary, collaborative approach designed specifically for the investigation of the Archaic Period cultural and ecological change at the Koster archaeological site (9000 B.P. – 1200 A.D.), north of St. Louis, Illinois (Brown and Struever 1973). The two main goals of the file system were to refine stratigraphy and to isolate gross activity areas in each archaeological component (Brown, Clayton, Wendt and Werner 1981). The database application was needed to bridge the gap between data processing, management and analysis.

III. Utility of Relational Databases for Archaeological Data

The main purpose of a relational database is to integrate a variety of data types and data sets to interact seamlessly (McPherron and Dibble 2002). Different tables with different data types can be related to each other and can be queried. Patterns or associations between objects and variables in different tables can be found and collected in new tables without disturbing or changing the original separate data tables. The original data can be left intact and appended or updated for future use. Data integrity will be maintained and original data can be left unchanged so that future researchers can go back to the original datasets, either individually or all datasets as a whole (Adamski and Finnegan 2002: AC 3.02-3.41, AC 11.13).

RDBMS allows for the collection and storage of larger amounts of information than simple spreadsheets. Even though all the information will be stored together, users can still query the RDBMS on specific types of data to narrow their focus on certain materials or data. Larger amounts of data in files, slows processing time making queries and report generating times longer. However, many RDBMS systems often counter these problems with indexing tables, which can speed up record searches for large data sets (Adamski and Finnegan 2002: AC 8.39-8.43).

With the added three-dimensional characteristic feature of archaeological, time depth, a relational database would allow researchers to query all data tables for certain materials at a point in time; or, all materials at a certain point in time; or, all materials from only two time periods, etc., for further analysis. Therefore, a relational database management system (RDBMS) would allow for greater querying and analysis capacity across data types, rather than focusing on individual data tables/ artefact types separately and attempting to integrate or interpret individual conclusions.

Archaeological recording techniques are inherently compatible and easy to integrate into a relational database. The table structures and recording methods are conducive to a relational design.

IV. Chi-squares and Cramer's V

Chi-squares analysis was designed to answer the likelihood of observed differences in proportions of data seen if two samples were not really that different (Drennan 1996). A set of expected values (hypothetical values) are calculated from the observed values (the actual data). The hypothetical values show what the distribution of actual data would look like if there was no significant difference between data proportions. A type of standard deviation is calculated based on these observed and expected values; resulting in a measure of significance and probability.

The probability indicates how likely the variance in observed values is evidence for an actual difference in the data. The sample size affects the outcome of the probability value. The larger the sample size, the more significant the chi-squares probability value will be (Drennan 1996). Therefore, a strength test is necessary to determine how strong the relationship is between compared data sets.

Common practice for the strength of chi-squares results uses the phi-coefficient. However, this formula can only be used in a table that has two rows and two columns. In this case there are more than two rows and two columns; therefore a version of the phi-coefficient was used called, Cramer's V. This test allows for any number of rows or columns and importantly, this test is not affected by sample size (Drennan 1996); it will return a value between zero and one that tells us the strength of the relationships found. The closer the value is to zero, the weaker the strength of the relationship. The closer the value is to one, the stronger the relationship. A value of zero means there is no difference between the observed values and the expected values at all (Drennan 1996). A value of one indicates the difference between the two is as large as it can possibly be (Drennan 1996). For the purpose of this thesis, values were rounded to four decimal places.

With regard to social organization of the settlement, conjugal family units of production will show greater differences in the types of activities carried out between areas as reflected in the artefact representations of each locus; and extended family units will show less difference in artefact representations between locations.

V. Stem-and-Leaf Plot

The stem-and-leaf plot is an organizational tool for batches of numbers (Drennan 1996: 4-10). It assists with making observations of data, as groups of numbers generally do not lend themselves to making 'interesting observations' (Drennan 1996: 4-5). A stem-and-leaf plot can help to find patterns by ordering the data along a scale (Drennan 1996: 4). The creation of a stem-and-leaf plot has two main parts. First, each data point or value is divided into a stem section and a leaf section (Drennan 1996: 4). For example, the value '45' would be divided into a stem value of four and a leaf value of five. Second, each leaf value that corresponds to a stem value is plotted beside the stem (Drennan 1996: 4). There can only be one stem position on the plot for all equivalent stem values (Figure iii).

Stem	Leaf
1	
2	
3	
4	5,8
5	

Figure iii: Example of stem-and-leaf plot

For example, the values '45' and '48', both have a stem value of four. Therefore on the stem-and-leaf plot there would only be one stem position of four. However, there can be several leaf values plotted (Figure iii). If there is more than one leaf value for a stem the numbers are organized in increasing order and separated by a comma to distinguish between different data points (e.g. 1, 4, 5, 7, 8). The stem-and-leaf plot was used to visualize the daub data and determine whether any interesting or useful information could be observed.

VI. Previous Analysis of the Data

Senior's (2004) analysis of this site quantified the number of artefacts into percentages as a measure per square metre unit of size. Senior (2004) adjusted the artefact proportions of the data to account for the different sizes of the loci. According to Senior (2004),

> "By looking at the proportion of the artefact inventory belonging to certain activity groups found in each pit locus, one should be able to determine whether or not the household was involved in a particular activity."

However the proportional difference between two loci with the same types of artefacts would not indicate that one locus did perform that activity and the other did not. Both loci would have carried out that particular activity to a greater or lesser degree based on household need, systems of reciprocity or exchange.

Another aspect of Senior's (2004) analysis is that the number of artefacts was used to interpret the importance of that activity in a particular house (i.e. percentages). He assumed that the higher the percentage value of a given artefact type indicated the predominance of an activity in that locus over other locus on the site. Thus, his criteria for evaluating whether a certain locus was more likely the center of an activity for the settlement as a whole was based on the locus with the higher percentage of artefacts for a given category.

In this thesis, artefact representation and its implications were used differently. Instead, of using artefact proportions to determine predominance of activities, the number of artefacts within loci were used to identify activity types required to satisfy household requirements for conjugal or extended family members.

Furthermore, Senior's (2004) method of analysis for the artefact quantities involved multiplying the data of the other locus to approximate a predicted value if all loci were the same size as locus 23. After this 'adjustment' was calculated Chi-square test was carried out on that data.

> "As the quantities of Early Neolithic artefacts recovered from the site are quite sparse, a multiplication factor – different for each pit – was used to place the contents of the pits all on the same level as Locus 23." (Senior 2004)

The assumption here is that differences in house sizes should not be taken into account. However, I am of the opinion that house sizes are in fact the reality of differences in household units whether conjugal or extended families. Locus size directly relates to either socio-cultural meaning of that space or practical use of it.

Senior (2004) tested the similarities of the normalized data, not the raw data, between loci. As a result of his method, Senior's results showed how similar his 'adjusted' data were, which caused him to conclude that most loci at the site were similar.

> "The spatial distribution of artefacts at the site suggests that certain domestic functions were repeated in a number of areas at the site. This implies that activity organization at the site was likely organized along a domestic mode of production and that at least three of the pits represent the residence of a single nuclear family. This evidence would support the site as having a predominantly domestic mode of production put forth by Chapman (1989). While certain communal activities may have taken place at the site, the three pit loci with the best preserved artefact sets appear to share activity sets." (Senior 2004)

Senior's results indicating the similarity of activities between houses was also exacerbated by the lower sample size. Use of spreadsheets in the query and calculation of NISP were erroneous causing inaccurate artefact sums. This along with the decision to adjust artefact percentages could also have affected the statistical results to indicate that most loci were similar.

Furthermore, archaeological analysis in general does not address inefficiency of production when interpreting greater numbers of particular artefact types. For example, a large number of lithic debitage (leftover flakes from the production of chipped stone tools), is usually interpreted to indicate a location of intense stone tool manufacturing. Another plausible interpretation that is not addressed is the possibility the large deposit of lithic debitage was a result of inefficiency in carrying out that particular activity. Skilled chert or flint knappers would be able to minimize lithic waste when creating a stone tool assuming the stone material was of good knapping quality (imperfections in chert or flint cause it to shatter or be reduced unpredictably). This is not to suggest that all large quantities of artefacts associated with tool manufacture or other types of manufacture are an indication of inefficiency just that it is a possibility not usually investigated. More information to make an accurate determination would include such factors as context of the material, length of occupation, observation of different quality of artefact manufacture, ability to reconstruct and compare tool reduction or manufacture, understanding of exchange and reciprocity systems, household requirements, etc. This element of inefficiency regarding tool manufacture was discussed after the results of the analysis were presented.

VII. Technique used in this research

A powerful property of a relational database management system (RDBMS) is its ability to seamlessly combine different sets of data that would normally be difficult to view together. All the data tables of different artefact types and locations that have been recorded for the settlement were related through the archaeological site's excavation provenance.

The first step was to create a central relational table containing all Trench and Quadrat values. The details are noted in section C entitled *Data Preparation and Normalization*.

A. Hypothesis Formula

Using the two different hypothetical models of the physical behavioural co-relates of the settlement patterns described in Chapter 2, and the assumption that a household unit would be made up of structure(s) and production activities that allowed it to reach household equilibrium (satisfy socio-economic needs), a testable formula was created. Based on the structure types, size, activity areas and their redundancy across the settlement, the degree to which the pattern at Foeni-Salaş resembles a conjugal or extended family unit of production can be measured. To access the information for this study, the database will be queried for all entries related to structures, features and artefacts associated with pit houses at Foeni-Salaş through the use of SQL statements.

B. Quantitative vs. Qualitative Information

Through the use of cross tabulation (cross tab) queries it will be possible to gather quantitative data: sums, counts, averages etc. about the different types of artefacts. It will also be possible to view qualitative information for each artefact through the use of queries. This will add important information to statistical observations about the data. Descriptive characteristics in the form of qualitative data can assist with identifying context of activity areas and structures.

C. Data Preparation and Normalization

The spreadsheet files were imported into tables with Microsoft Access. Initially, there were problems importing the data, thus, tables were manually created in MS Access design view and imported. After the data for all artefact types were imported; faunal, stone, figurine, daub and metal, the data was viewed for errors. Problems with the data such as empty records or data entered into the wrong columns were more readily visible than when viewed in the spreadsheet files. Problems of this nature occur due to the data entry methods used with the spreadsheets, such as cutting and pasting information. Through sorting and querying the tables in MS Access the improperly entered values were corrected.

Once the data records in the artefact tables were corrected the tables were related according to provenience; specifically the Plot, Trench and Quadrat (1x1m square units) excavation units. One central table was created to relate all tables together. It was hoped this organization would allow for the integration of artefact types between tables. However, there were problems relating the tables based on the provenience information entered in the spreadsheets.

Trench and quadrat data were amalgamated in the recording of provenience information in the spreadsheets. In particular, several quadrat units were entered into the same field. For example, if the individual wanted to indicate that a particular area was made up of Quadrats 2, 7, 8 and 9, they entered '2,7,8,9'. Or if the artefact was located in Quadrats 2, 3, 4 and 5, they would enter '2-5' in the field. The entry of data in this form was entirely logical; however, the inconsistencies between values in the 'Quadrat' field for different tables created problems with relating the tables together to create the RDBMS.

In order to relate the provenance information to each table, there must be a primary key and a foreign key. The foreign key in one table references the primary key of another table. In order to maintain referential integrity between tables there must be a common value that exists in each table. If one table has a Quadrat value of '2-5' and the other has a value of '2,3,4,5' in the same field the information is not considered to be the same. Therefore tables with this type of inconsistency between them cannot be related with referential integrity.

In order to create a central table to relate all other tables in the database a series of Structured Query Language (SQL) statements were created. The searches found any unmatched entries for Trench and Quadrat values in the artefact tables that did not match the central table. Once all the different Trench and Quadrat field values were added into the central table, each individual table could be related to the central table via referential integrity constraint (Figure iv).

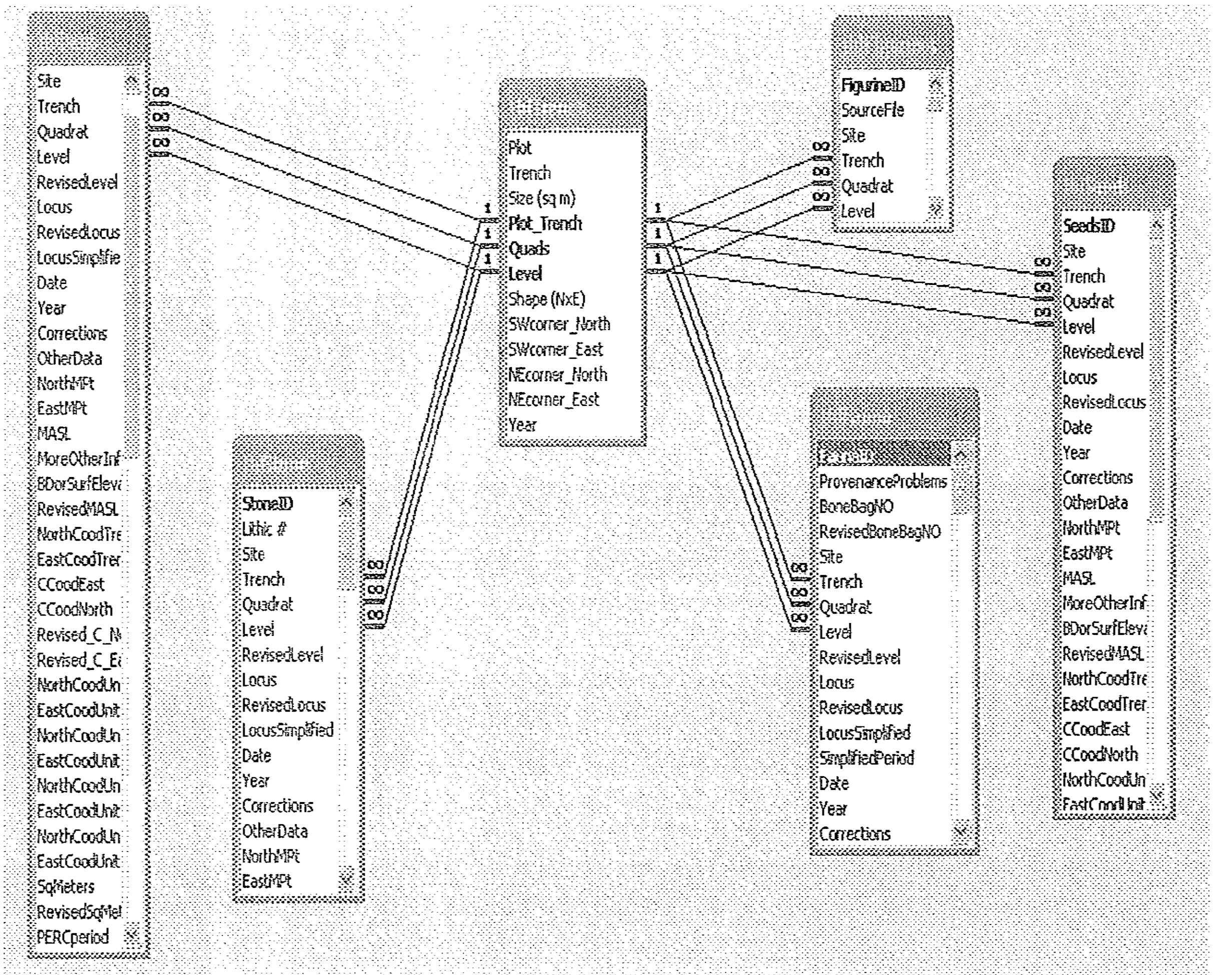

Figure iv: Representation of relationships between data tables

D. SQL Statements: Obtaining Information from the Database

In order to access and view information in a database, it must be queried. MS Access supports a language called Structured Query Language (SQL) to search and retrieve information from a database's records. An SQL statement has syntax and operators that indicate to the database what the user wants to do. A simple SELECT statement tells the database that it wants to get a set of records from specific tables that match certain criteria values. The SELECT statement can also include information such as how you want the database to show you this data by grouping or sorting it. For example, a simple SQL SELECT statement would be:

```
SELECT Trench, Quadrat, LocusSimplified, NISP, Taxon, ModificationType
FROM tblFauna
WHERE LocusSimplified LIKE "23" AND ModificationType LIKE "awl"
ORDER BY Trench;
```

This SQL statement tells the database to SELECT the fields, "Trench, Quadrat, LocusSimplified, number of individual specimens (NISP), Taxon and ModificationType" FROM the table, "tblFauna" WHERE the value in the LocusSimplified field is, "23" AND the value in the ModificationType field has the value, "awl". Then it asks the database to sort the records in alphabetical order according to the, "Trench" field. The results of this simple query are shown in Table 1.

Trench	Quadrat	LocusSimplified	NISP	Taxon	ModificationType
129D	4	23	1	Canis familiaris	Awl

129D	13	23	1	Mammal - Medium	Awl
129D	7	23	1	Mammal - Medium	Awl
129D	6	23	1	Mammal - Medium	Awl
129D	14	23	1	Mammal - Medium	Awl
129D	24	23	1	Mammal - Medium	Awl
129H	4	23	1	Mammal - Medium	Awl
129H	4	23	1	Mammal - Medium	Awl
130A	7	23	1	Mammal - Medium	Awl
130E	1	23	1	Mammal - Medium	Awl
149P	20	23	1	Mammal - Medium	Awl

Table 1: Results of SQL SELECT statement

Simple SQL statements were used to query the database for both qualitative and quantitative information pertaining to pit houses. This information was then analyzed to test for the similarities in artefact representations within house structures at the Early Neolithic settlement of Foeni-Salaş, Romania in an attempt to determine the inhabitants' social organization.

VIII. Conclusion

Retrieval and analysis of archaeological records using a relational database management system can facilitate understanding of a settlement's socio-economic organization. The combination of variable correlates should assist in measuring the artefact patterns within each pit house along a hypothetical linear model gradient. Using a combination of qualitative and quantitative data; and interpreted with anthropological knowledge pertaining to social relations of the domestic mode of production in small-scale societies allowed for the plausible reconstruction of a socio-economic pattern.

Using an RDBMS to search for and combine several different types of data sets collected from Foeni-Salaş, it will be possible to determine whether this settlement's socio-economic process was organized by a system related to either a conjugal family unit of production or an extended family unit of production. With a relational database, all the different data types that encompass the archaeological correlates of behaviour can be combined and analyzed. The development of a relational database will assist in the analysis of the archaeological data by relating separate data sets allowing them to be analyzed together. The basis for the design and analysis of the relational database are inherent in the theoretical framework and purpose of the research goals of this thesis.

Chapter 4: The Data from Foeni-Salaş

I. Introduction

This chapter deals with a description of the archaeological site at Foeni-Salaş and the types of data found for each pit house locus during the Early Neolithic. Foeni-Salaş is a site in southwestern Romania dated to 5500B.C. The site has been identified as being affiliated with the Starčevo-Criş archaeological culture (Greenfield and Draşovean 1994; Greenfield and Jongsma n.d.; Jongsma 1997). This site was originally chosen by the excavators for investigation because it was thought to be a single component site (Early Neolithic) that was occupied for a relatively short period of time. In reality, the remains of several periods were found overlying and cutting into the Early Neolithic deposits. This investigation focuses on the Early Neolithic level at the site and the following will summarize the relevant remains. Most of the later remains were laterally displaced with respect to the Early Neolithic deposits. The site's brief Early Neolithic occupation period and lack of archaeological deposits super-positioned above it allow for a more focused analysis on the Early Neolithic (Greenfield and Jongsma n.d.; Greenfield and Draşovean 1994).

This Early Neolithic archaeological site was more easily excavated than surrounding multi-component sites. The age of Early Neolithic sites in this region, generally makes them hard to reach archaeologically, as they are located at the lowest levels of occupation. Archaeological excavation is time consuming and takes a lot of financial resources when attempting to access earlier levels. Accurate assessments of lower occupation levels are difficult in these cases as archaeologists are not as easily able to get a horizontal overview of a site (Greenfield and Jongsma n.d.).

The lack of archaeological components above this Early Neolithic settlement at Foeni-Salaş facilitated excavation. This condition allowed for the investment of time and resources uncovering a wider horizontal area than would normally be possible. Thus a clearer picture of settlement occupation was revealed.

II. Cultural context –Starčevo-Criş

The Starčevo-Criş archaeological culture is a combination of two regional archaeological cultures that are simply local manifestations of larger cultural patterns - Starčevo in Serbia and Criş in Romania (Jongsma 1997). Both cultures exhibit similar material culture, settlement patterns, architecture, subsistence and mortuary practices (Jongsma 1997). The Starčevo-Criş cultural label has been applied to Foeni-Salaş due to its geographical location at the border between these two countries and "archaeological culture" areas (Greenfield and Draşovean 1994; Jongsma 1997). This archaeological culture is one of the earliest known food producing groups in SE Europe (Whittle 1986, 1996).

A. Settlement Pattern

Early Neolithic settlements in southwest Romania are found in specific locations. Usually they are found in clusters along the edges of rivers and streams (Jongsma 1997, Whittle 1986). Settlements were established on 'levees' (Jongsma 1997) in flood plains. These levees (areas of higher ground) were either unaffected by annual river flooding or recovered quickly (drained quickly or easily from annual river fluctuations).

These loose alluvial soils are easily tilled and appear to be a common location for Starčevo and Criş settlement patterns. This cultural pattern does not appear to be found associated with mountainous areas (Jongsma 1997).

Stratiographically, the Starčevo-Criş sites are generally a thin layer of occupation, no deeper than 1 meter (Srejović 1988) except for pit structures which range from 1-3 meters in depth. Jongsma (1997) notes stratigraphic levels tend to be disturbed or laterally displaced.

Thin occupational scatters have been noted to extend up to 2 km (Jongsma 1997). McPherron and Srejović (1988) hypothesize that the length of the larger sites are the result of short occupations by small groups of individuals at different times.

At some 'tell' sites, cultural deposits for this archaeological culture range from 3-4 meters in depth (Chapman 1981; Barker 1985). The surface area of these occupations were seemingly constrained to the size of the small hill or rise in landscape they are located on (Jongsma 1997). Living off of the mound would mean living in seasonally flooded areas (Jongsma 1997). With this in mind, it would seem logical that Starčevo-Criş artefact scatters on flood plains which extend up to 2 km (thought to have been small groups of occupations over short periods) could be partially the result of or influenced by flooding of these areas. Thus, some of the artefact distributions at these larger sites could have been "stretched out" or dispersed by rising and falling water levels.

B. Intra-site settlement pattern

The general pattern of Starčevo archaeological sites contain a large central building surrounded by several smaller buildings in a circle or semi-circle around the central structure (Jongsma 1977). Foeni-Salaş follows this typical pattern: it has five small house structures forming a semi-circle that surrounds a larger structure.

Pit houses typical of this archaeological culture pattern were dug in the soft loess deposits with walls made from daub. These structures were occupied for a relatively short period of time, thus not much effort was put into creating a lasting structure (Jongsma 1977). For example, the living floor was not specially constructed of any special building material, rather the loess soil was left as is and used thus (Jongsma 1977). Semi-subterranean dwellings vary in size and shape across Starčevo-Criş sites. The earliest structures generally have a circular or elliptical shape, and concave living floor surfaces. Later structures of the Starčevo culture (during the middle phase) are rectangular or trapezoidal; some of these had flat living surfaces and others, concave surfaces (Bogdanović 1988; Jongsma 1977).

Semi-subterranean houses also contained small hearths or ovens. This is in contrast with other structures that do not contain hearths or in which evidence of them is not found. These other structures may have been habitation structures or could have been used for other purposes/activities such as refuse deposits or storage pits. Generally, little evidence has been found for spatial divisions or "rooms" within houses (Bogdanović 1988).

Two sites in central Serbia are exceptions to this pattern. One pit-house at Crnokalačka Bara contained three rooms (Bogdanović 1988) and a dwelling at Blagotin had two rooms (Greenfield and Stankovič n.d.). The typical pattern found for semi-subterranean dwellings, which do not indicate spatial divisions, could be the normal "cultural pattern" or could be the combination of poor preservation of these structures over time, the method of excavation (not able to detect these internal structures) and/or recording techniques (were not able to discern structures in post-excavation analysis).

III. Description of the Early Neolithic occupation at Foeni-Salaş

Foeni-Salaş is located on a mound in a flood plain 3 km north of the modern day village of Foeni in Romania (Jongsma 1997). The site has a thin, single component layer of Early Neolithic occupation, ideal for attempting to understand a particular temporal period. For this reason, a broad horizontal excavation was conducted there during the summers of 1992-1994 (Jongsma 1997; Greenfield and Draşovean 1994: Greenfield and Jongsma n.d.) to understand the socio-economic and community organization of this regional and temporal, archaeological phenomenon.

A. Loci

There are several periods of occupation and their respective loci at the site (i.e. Pleistocene, Post- Pleistocene, Early Neolithic, Middle Bronze Age, Early Iron Age and Medieval – Greenfield and Jongsma n.d.; Jongsma 1997). A locus is a major stratigraphic layer; this unit of measure was also used to define or identify visible features (i.e. cultural deposits or artefact concentrations that are located in different soil types or colours, such as a pit feature). Some loci extend across the entire site (as they identify a complete stratigraphic layer) or specifically identify a cultural feature (such as a pit) (Greenfield n.d.). The focus here is on those loci specific to the Early Neolithic occupation. Dwellings for this occupation include: loci 7, 10, 23, 24, 41 and 50. Other excavated activity areas include one storage pit found at locus 25 and three open air loci (51, 52 and 53).

B. Dwellings (Loci 7, 10, 23, 24, 41, 50)

The majority of artefact concentrations were found within dwelling structures (Jongsma 1997). A small number of artefacts were found between dwellings. Jongsma's (1997) analysis of the daub and associated features found at Foeni-Salaş determined the following loci to be semi-subterranean dwellings: loci 7, 10, 23, 24, 41 and 50.

Architectural styles and spatial patterning vary or differ slightly from culture to culture and can become important to understanding socio-cultural aspects. The unique characteristics of pit houses currently identify this regional cultural pattern from the pattern found in surrounding countries during the same time period. Jongsma (1997) notes Hungary, Bulgaria, Bosnia, northern Macedonia and Greece all have surface houses associated with Early Neolithic occupations (Gimbutas 1976; Horvath 1989; Renfrew 1969).

1. Locus 7 – Small Pit House

A small pit house that contained a number of daub artefacts associated with linen and textile production (bolas, spindle whorls, loom weights) and some daub net weights (Senior 2004). Senior notes that this dwelling contained the densest concentration of loom weights than any other locus excavated (Senior 2004).

Chipped stone artefacts were also found including two chipped lithic cores. Generally, lithic cores are associated with microblade production. Grinding stones used for the purpose of food production were found.

Two legs of an 'altar' were found. Based on other archaeological and ethnographic evidence it was suggested that this type of artefact was used as a lighting source in dwellings (Manson 1990; Tringham and Stevanović 1990). There were no figurines present.

Bone artefacts for this dwelling indicated potential for the production of leather/hide work, fabric, basket weaving and pottery decoration. One bone scraper found here was thought to be used for food preparation; and a bone handle was believed to be associated with the chipped stone artefacts (Senior 2004).

Daub Artefacts	
Type	NISP
Bola	49
Fish weight	5
Loaf	10
Loom weight	18
Spindle whorl	57
Stamp	1
Altar Leg	1

Stone Artefacts	
Type	NISP
Blade	2
Core (bip)	1
Flake	3
Grinding stone – lower	1
Hammer stone	1

Bone Artefacts		
Modification	NISP	Comment 2
Tool?	6	
Tool	9	
Scraper?	1	
Handle	1	Hole made in proximal epiphysis
Awl	7	
Punch	1	
Reworked shaft end	1	
Tool/Ornament	1	Possible modification
Ornament Pendant?	1	
Ornament	1	

Table 2: Artefacts for locus 7- NISP

2. Locus 10 – Small Pit House

A small number of spindle whorls and bolas were found here. Daub loaf weights were present, thought to be used for holding down the roof skins or thatching (Barber 1991). Senior (2004) notes that the frequency of these artefacts was extremely minimal.

The stone artefacts in this dwelling comprised a lithic core, a blade and some lithic debitage. No grinding stone artefacts were present (Senior 2004).

Figurines and altar legs were not present.

One bone awl/handle and two spatulas were found here (Senior 2004).

Daub Artefacts	
Type	NISP
Bola	3
Fish weight	2
Loaf	6
Loom weight	15

Bone Artefacts	
Type	NISP
Awl/Handle	1
Spatula	2

Spindle whorl	10
Stone Artefacts	
Type	NISP
Blade	1
Core (bip)	1
Flake	6

Table 3: Artefacts for locus 10 - NISP

3. Locus 23 – Large Pit House

A number of loom weights were found in this dwelling. No spindle whorls and only two bolas were found. Other daub artefacts included a large number of loaf weights and fish net weights.

Stone artefacts consisted of one core, sixteen flakes (lithic debitage), thirteen blades, one circular end scraper, one stone axe/adze and seven grinding stones (one lower grinding stone, three upper and three fragments).

Bone artefacts consisted of several awls, probably used in leather working, a few beads, several bone handles (which probably contained lithic blades – thus used as knives for a variety of tasks), a pierced bone tool, rubber thought to have been used in pottery polishing (Senior 2004), five scoops: believed to be used in food preparation and serving and one scraper: also thought to be used in food preparation (Senior 2004).

The 'Figurine artefacts' category comprises fragments of altars, a figurine, two labrets used as body adornment, a tiny ceramic pot thought to have been made by a child (Tringham and Stevanović 1990), a ceramic handle and two ball weights. The artefacts called 'altars' were given this name by archaeologists as they were thought to be used for ritual purposes. However, it has been noted in recent ethnographic research and historical contexts that these 'altars' were used as a light source in houses (Manson 1990; Tringham and Stevanović 1990).

Daub Artefacts	
Type	NISP
Bola	2
Fish weight	181
Loaf	493
Loom weight	39

Bone Artefacts	
Type	NISP
Awl	14
Bead	2
Handle	4
Pierced	1
Rubber	1
Scoop	5
Scraper	1

Stone Artefacts	
Type	NISP
Abrader (tool sharpener)	1
Blade	13
Core	1
Endscraper - circular	1
Flake	16
Grinding stone	3
Grinding stone - lower	1
Grinding stone - upper	3

Figurine Artefacts	
Type	NISP
Altar	2
Figurine	1
Ball Weight	2
Ceramic Handle	1
Labret	2
Altar Leg	1
Miniature pot	1

Table 4: Locus 23 artefacts - NISP

4. Locus 24 – Small Pit House

Daub artefacts from this locus include some four bola shaped weights, twenty-eight fish net shaped weights, seventy-one loaf shaped weights, nineteen loom weights and three spindle whorls.

Stone artefacts include a few blades, two cores, ten flakes, and five grinding stones for food processing and production.

Figurine artefacts are minimal: only one altar leg and a zoomorphic figurine were recovered.

Daub Artefacts	
Type	NISP
Bola	4
Fish weight	28
Loaf	71
Loom weight	19
Spindle whorl	3

Bone Artefacts	
Type	NISP
Awl	2
Pierced	2
Spatula	2

Stone Artefacts	
Type	NISP
Blade	3
Core	2
Flake	10
Grinding stone	1
Grinding stone - lower	3
Grinding stone - upper	1

Figurine Artefacts	
Type	NISP
Altar Leg	1
Figurine - Zoomorphic	1

Table 5: Locus 24 artefacts - NISP

5. Locus 41 – Small Pit House

This small dwelling had relatively small numbers of artefacts. No figurine artefacts were found in association with this locus. Only one fish net shaped weight, two loaf shaped weights and one 'unknown' weight were found. Three stone blades, two flakes, and one grinding stone fragment are in the stone tool category. An iron slag fragment is probably intrusive from the overlying EIA locus (44). One bone awl and a scoop were also recovered.

Daub Artefacts	
Type	NISP
Fish weight	1
Loaf	2
Unknown	1

Bone Artefacts	
Type	NISP
Awl	1
Scoop	1

Stone Artefacts	
Type	NISP

Blade	1
Blade	2
Flake	2
Grinding stone - lower	1
Slag	1
Unknown	1

Table 6: Locus 41 artefacts - NISP

6. Locus 50 – Dwelling

This locus was found on the last day of excavation. Due to time constraints it was not excavated; no artefacts were recovered from this locus.

C. Storage Pits (Locus 25)

This feature was a deep storage pit, relatively small in diameter. Only a large ceramic pot and a daub loaf were found in the pit.

Daub Artefacts	
Type	NISP
Loaf	1

D. Activity Areas (Loci 51, 52, and 53)

1. Locus 51

This locus is a dense concentration of ceramics and loom weights. It is hypothesized to represent a weaving locus (Greenfield and Jongsma n.d.).

2. Locus 52

This locus is a large concentration of bone and ceramics. It has been interpreted as the remains of a possible livestock enclosure (Jongsma 1997).

3. Locus 53 – Small Surface Structure

This locus was not recognized as a locus of activity during excavation; rather it was identified in the post-season analysis of daub remains (Jongsma 1997). It appears to be a small above ground daub structure. Jongsma (1997) notes this could be a possible storage area. Unfortunately the artefacts in this area were not separated from the rest of the excavated surroundings; as a result they were mixed in with all other artefacts across the site.

IV. Conclusion

The relatively short period of occupation at this site and the lack of overwhelming cultural deposits that would be found if this were a tell site allow for a more complete analysis of the settlement data. The unique cultural dwelling pattern (in the form of pit houses) is different from the surrounding regions (surface dwellings). The smaller pit houses centred around a larger house superficially appears to represent a meaningful cultural pattern. If the settlement's architectural pattern of pit house structures at Foeni-Salaş was socially meaningful to its inhabitants and through anthropological insight about the domestic mode of production it is hoped that the following analysis of artefact representations will be able to determine the settlement's social organization.

Chapter 5: Analysis of Data from Foeni-Salas

I. Introduction

Devoid of culture, spaces are meaningless areas. However, places are meaningful spaces to the people using them. Meaning is super-imposed on landscapes or areas through cultural use and social meanings. Some spaces become places through use. It is only until meaning is given to a specified area through its use and/or modification that empty spaces become places. Repetitive or continued use of places is conditioned along social and cultural meanings and practices, which either consciously or unconsciously guide social individuals. With repetitive use of places and "material culture" (physical objects that are used by individuals in a society and are therefore imbued with cultural meaning), behaviours become more apparent through spatial patterning.

A study of material culture to determine or understand social uses of space, requires the understanding and distinction between objects and the socio-cultural processes that create and pattern them in space (Dietler and Herbich 1998). "Material culture results from a productive process and as a production it is the result of purposeful activity: … positioned in relation to social structures and social strategies" (Shanks and Tilley 1987: 131). The processes (or techniques) of their production and use are embedded in and conditioned by social relations and cultural practice (Dietler and Herbich 1998). Material culture is part of an active process of social relations that both creates and reflects daily social interaction (Shanks and Tilley 1987: 130-134):

> "Material culture is charged with meaning and structured in relation to social strategies. People symbolically construct and organize their activities in a pre-constituted social field and simultaneously effect an ordering of the representation of those activities in language and material objects as a symbolic scheme or modality for action in the world…" (Shanks and Tilley 1987: 132)

Shanks and Tilley (1987: 132) further indicate that social interaction is, "characterized by distinctive practices, strategies and structures which are temporally, spatially and socially situated and articulated". Thus, production of material culture and its consequential patterning in space is guided by socio-cultural relations and practices within meaningful places. These places are used and possibly modified according to culturally appropriate behaviour, practice or meaning. Modification of places can be intentional or can be an indirect function of cultural practice (an unintended consequence of patterned behaviour).

The pit houses a Foeni-Salaş provided a distinct sphere of social activity used by the inhabitants. These archaeologically defined areas are the focus of analysis. They are readily identifiable as socially meaningful places; the activities and behaviour of people using these spaces would have caused the material culture to reflect patterns of social interaction. Analysis of the artefact data from these culturally meaningful places could potentially provide greater understanding of social organization at Foeni-Salaş.

The data presented in the previous chapter shows the number of specimens found and their typological classification. Unfortunately, the distribution of these artefacts as presented is not conducive to statistical investigations. With the low artefact counts in many categories, the use of statistical measures is likely to return spurious results. In order to derive reliable and meaning information, the data needs to be organized into meaningful categories.

The goal of this chapter is to determine social organization; therefore, the artefacts should be grouped according to their associated activities. This grouping assumes that the categories these artefacts were placed in were used for tasks identified through historical or ethnological analogies. Future research may revise or discover other uses of these artefacts; this would necessitate that the following analysis be revisited to re-evaluate its conclusions or revise them.

II. The Need for Meaningful Categories

Pit dwellings were the focus of the analysis simply because anthropology clearly identifies houses and households as culturally and socially meaningful spheres of interaction. Excavations at Foeni-Salaş, and the analysis of daub remains clearly identified Early Neolithic house structures, making this type of social place possible to investigate. Other areas were not easily identifiable or definable as meaningful places where social interaction occurred (i.e. loci 52, 53 and 25).

As noted in the previous chapter, the data appears to show variances in the amounts of different artefact types. However, a statistical measure is required to determine whether the observed differences in data are significant or just a consequence of proportional samples. Due to the statistically sensitive nature of archaeological data, a chi-square analysis was chosen to investigate the artefact relationships.

III. Spurious Data

Due to the small numbers of daub artefacts from locus 41 (a small pit house), data from this area was left out of the chi-square and Cramer's V tests; to determine whether the work group activities between house structures was more similar or less similar. The low numbers of artefacts from this locus would create spurious results (make the production areas appear less similar). This data is incorporated in the discussion after the analysis.

IV. Meaningful Categories

The goal for the creation of meaningful categories was the creation of a robust data set that will contain reliable results to determine the social organization of the settlement architecture through patterned behaviour that resulted from artefact use. The artefact categories in each main, material category were combined where appropriate: according to associated production activities. These main categories were daub, stone, figurine and bone.

A. Daub Artefact Categories

Daub artefact categories were bola, loom weight, fish net weight and spindle whorl. Because there was only one stamp found, the lack of values for other loci that did not contain a stamp was spurious data; this category was removed for chi-square and discussed later. These categories were picked because they seemed to be the smallest categorical units that would allow for a depiction of production modes without compromising potential differences in their use. Bolas could have been used for hunting or textile production. While loom weights and spindle whorls are related to textile production, the values in each locus were high enough to keep these categories separate in a chi-squares test. This separation could allow for determination of meaningful production relationships.

Loaf weights are believed to have been placed on top of the roof structure and around the outside of the walls of structures to weigh them down. These artefacts were not deemed to represent meaningful units which could be related to social organization for this particular study and were left out of chi-squares tests. However, the time, energy and labour pool required for the creation of these weights (714 loaves for this short period of occupation) would have been a product of the settlement's forces of production.

When the four meaningful loci (7, 10, 23 and 24) were compared the chi-square (χ^2) was: $\chi^2 = 326.37$ with a probability (p) of $p = 0.00$ and a Cramer's V (V) value of $V = 0.50$ ($\chi^2 = 326.37$, $p = 0.00$, $V = 0.50$). Cramer's V ($V=0.50$) indicates on a scale between zero and one there is a 0.50 difference in the observed values between all four houses separately (Table 7).

Table 7: Daub chi-square - all loci separated

Observed Values

Locus Simplified	Daub Artefacts Bola	Fish weight	Loom weight	Spindle whorl	Total
10	3	2	15	10	30
24	4	28	19	3	54
7	49	5	18	57	129
23	2	181	39	0	222
	58	216	91	70	[illegible]

Expected Values

Locus Simplified	Daub Artefacts Bola	Fish weight	Loom weight	Spindle whorl
10	4	14.89655172	6.275862069	4.827586207
24	7.2	26.8137931	11.29655172	8.689655172
7	17.2	64.05517241	26.9862069	20.75862069
23	29.6	110.2344828	46.44137931	35.72413793

Daub Chi-square Probability:[illegible] Chi-square Value:[illegible]
Cramer's V:0.500094627

When the three smaller house structures (loci 7, 10 and 24) are compared against the larger dwelling (locus 23) we see a greater difference in the representation of artefacts (χ^2 = 215.4292, p = 0.00, V = 0.70) (Table 8). Cramer's V (V = 0.70) indicates on a scale of between zero and one; there is a 0.70 difference between the representation of artefacts occurring in the smaller dwellings and the larger central dwelling. This confirms the differences seen in the raw data that indicate a different set of production tasks associated with the daub categories occurring in this larger house than in the smaller houses.

Table 8: Daub artefact comparison between the smaller dwellings and central larger dwelling

Observed Values

Locus Simplified	Daub Artefacts Bola	Fish weight	Loom weight	Spindle whorl	Total
7,10,24	56	35	52	70	213
23	2	181	39	0	222
	58	216	91	70	[illegible]

Expected Values				
	Daub Artefacts			
Locus Simplified	Bola	Fish weight	Loom weight	Spindle whorl
10,24,7	28.4	105.7655172	44.5586207	34.27586207
23	29.6	110.2344828	46.4413793	35.72413793

Daub Chi-square	
Probability:0.0000	Chi-square Value:215.4292
Cramer's V:0.703732577	

1. Comparing the Smaller Pit Houses

The following pit houses were compared to determine where any differences might occur in production modes for daub categories.

Differences in daub artefacts existed between loci 7 and 10 (Table 9). The results were (χ^2 = 22.1736729, p = 0.0000599, V = 0.373439503). Cramer's V indicates a difference of 0.37 on a scale of zero to one between daub artefacts in loci 7 and 10.

Table 9: Daub artefact comparison between loci 7 and 10

Observed Values					
	Daub Artefacts				
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl	Total
10	3	2	15	10	30
7	49	5	18	57	129
	52	7	33	67	[illegible]

Expected Values				
	Daub Artefacts			
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl
10	9.811320755	1.320754717	6.22641509	12.64150943
7	42.18867925	5.679245283	26.7735849	54.35849057

Daub Chi-square	
Probability:0.0000599	Chi-square Value:22.1736729
Cramer's V:0.373439503	

The strongest variation between small pit houses for daub production artefacts existed with loci 7 and 24 (Table 10). The results were (χ^2 = 86.6561, p = 0, V = 0.688135598). When compared we see a stronger difference between loci 7 and 24 (V = 0.6881); than between loci 7 and 10 (V = 0.3734).

Table 10: Daub artefact comparison between loci 7 and 24

Observed Values

	Daub Artefacts				
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl	Total
24	4	28	19	3	54
7	49	5	18	57	129
	53	33	37	60	[illegible]

Expected Values

	Daub Artefacts			
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl
24	15.63934426	9.737704918	10.9180328	17.70491803
7	37.36065574	23.26229508	26.0819672	42.29508197

Daub Chi-square
Probability: 0.0000000 Chi square Value: 56.6561
Cramer's V: 0.688135598

When the two small pit houses of loci 24 and 10 (Table 11) are compared we see less differences than those observed in the comparison between the pit houses of loci 7 and 10 (V = 0.373439503) and less differences between loci 24 and 7 (V = 0.6881). The results for the comparison of daub artefacts in loci 24 and 10 were (χ^2 = 21.9775, p = 0.00007, V = 0.294378399).

Table 11: Daub artefact comparison between loci 24 and 10.

Observed Values

	Daub Artefacts				
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl	Total
10	3	2	15	10	30
24	4	28	19	3	54
	7	30	34	13	[illegible]

Expected Values				
	Daub Artefacts			
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl
10	2.5	10.71428571	12.1428571	4.642857143
24	4.5	19.28571429	21.8571429	8.357142857

Daub Chi-square
Probability:0.[illegible] Chi-square Value:21.83[illegible]
Cramer's V:0.294378399

2. Comparison of Locus 24 Against 23

From the comparisons of the smaller pit houses, it appears that locus 24 has relatively similar daub artefact categories with 23 than with loci 7 and 10. Loci 7 and 10 appeared to be very similar in daub artefact categories. The results were ($\chi^2 = 33.3786011$, $p = 0.0000005$, $V = 0.200779282$) (Table 12). Cramer's V = 0.2008 indicates the strength of the differences observed by the artefacts in locus 24 compared to locus 23 was weaker than any values observed between the smaller pit houses. It is possible that locus 24 was the site of relatively similar patterns that locus 23 contained during occupation. It should be noted that the types of activities in locus 24 reflected by the raw artefact numbers where produced on a much smaller scale than locus 23.

Table 12: Daub artefact comparison between loci 24 and 23

Observed Values					
	Daub Artefacts				
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl	Total
24	4	28	19	3	54
23	2	181	39	0	222
	6	209	58	3	[illegible]

Expected Values				
	Daub Artefacts			
LocusSimplified	Bola	Fish weight	Loom weight	Spindle whorl

24	1.173913043	40.89130435	11.3478261	0.586956522
23	4.826086957	168.1086957	46.6521739	2.413043478

Daub Chi-square:	
Probability:0.0000085	Chi-square Value:33.3786011
Cramer's V:0.200779282	

A better visual representation of the different values calculated for Cramer's V between loci was summarized in a stem-and-leaf plot. The Cramer's V value for loci 24 and 23 is 0.20, for loci 24 and 10 is 0.29. These two values are shown on the same line in the stem-and-leaf plot (stem has the value of 0.2). The Cramer's V value for loci 7 and 10 is 0.37 (stem value is 0.3) while loci 23 and 7 is 0.51 (stem value of 0.5). For loci 24 and 7; and for loci 23 and 10 Cramer's V is 0.69. These two comparisons are also found on the same line in the stem-and-leaf plot (stem value of 0.6). The plot shows how loci 24, was more similar to both locus 23 and locus 10; as, Cramer's V values were clustered together (V = 0.20 and 0.29) (Table 13).

Table 13: Stem-and-leaf Plot for individual pit house comparisons

Stem-and-leaf Plot for Cramer's V - Daub Artefacts				
Locus Comparison	Cramer's V	Stem Value	Leaf Value	Stem-and-leaf Plot
				0.0 |
				0.1 |
24 and 23	0.2008	0.2	0	0.2 | 0,9
24 and 10	0.2943	0.2	9	0.3 | 7
7 and 10	0.3734	0.3	7	0.4 |
23 and 7	0.5053	0.5	1	0.5 | 1
24 and 7	0.6881	0.6	9	0.6 | 9,9
23 and 10	0.6854	0.6	9	0.7 |
				0.8 |
				0.9 |

There were two discreet clusters of values. Loci 24 and 23 were more similar in artefact ratios.

B. Lithic Artefact Categories

Lithic artefacts were also grouped into categories for better statistical analysis. Meaningful groups were created according to logical categories that could be indirectly related to patterns of social behaviour. The categories were microblades (called blades); a concatenation of cores, flakes, hammer stones and abraders; and, lower grinding stones.

1. Chipped Stones

Blades are a result of stone tool production and could have been used for a variety of tasks. Their presence indicates use of this tool type but not necessarily its production where it was found archaeologically. They could have been made anywhere on the site of even at another site and used.

Cores, flakes, hammer stones and abraders are related to stone tool production, repair or maintenance. Flakes are often referred to as lithic debitage. Debitage is the resulting debris caused by hammering on stone to produce stone tools. Presence of lithic flakes or debitage was important as they directly relate to stone tool production or maintenance where they were found archaeologically.

2. Ground Stones

Grinding stone tools are used in the preparation of foods. Two general categories of grinding stones are upper and lower. Upper grinding stones refer to a stone that would have been held in the hand of the person grinding a plant material against the larger lower grinding stone. The lower grinding stone would have rested on the floor where materials could be placed on it and ground (with the hand held upper grinding stone). Senior's (2004) analysis grouped all grinding stones together and not distinguish between upper and lower grinding stones.

I rationalized that only the lower grinding stone would suffice to represent the presence or absence of food production within the pit houses as they are generally larger and heavier; thus would not likely have been moved often from their site of consistent use. Some upper stones were broken or partial specimens that misleadingly increased the number of artefacts in this category; thus, statistical use of both the upper and lower grinding stone could create misleading results on the importance, presence or absence of food production.

The overall comparison between the pit houses (Loci 7, 10, 23, 24 and 41) showed weak differences in the observed values (Table 14). The Chi-square results indicated only a 60% confidence interval in observed differences ($\chi^2 = 8.391474723$, $p = 0.40$, $V = 0.2397$). While differences in the data were observed, the site as a whole did not show strong statistical differences in proportional use, production or maintenance of lithic tools; or, in the production of foods.

Table 14: Stone artefact comparison between all pit houses - loci 7, 10, 23, 24 and 41

Observed Values

	Stone Artefacts			
Locus Simplified	Blade	Core/ Flake/ Hammer Stone / Abraider	Grinding stone - lower	**Totals**
10	1	7	0	8
24	3	13	3	19
41	3	2	1	6
7	2	4	1	7
23	13	18	2	33
	22	44	7	[illegible]

[illegible]

	Stone Artefacts		
Locus Simplified	Blade	Core/ Flake/ Hammer Stone / Abraider	Grinding stone - lower
10	2.410958904	4.821917808	0.767123288
24	5.726027397	11.45205479	1.821917808
41	1.808219178	3.616438356	0.575342466
7	2.109589041	4.219178082	0.671232877
23	9.945205479	19.89041096	3.164383562

Stone Chi-Square
Probability: 0.40 Chi-Square value: 8.391474723
Cramer's V: 0.239741224

C. Figurine Artefacts

Two main groups of artefacts were created for this category. However the values were too low to allow for meaningful statistical analysis (Table 15). The groups were altar and figurine.

Table 15: Figurine artefacts

Observed Values

	Figurine Artefacts		
LocusSimplified	Altar	Figurine	Totals
10	0	0	0
24	1	1	2
41	0	0	0
7	1	0	1
23	3	3	6
	5	4	[illegible]

The presence of altar legs does not seem to have much significance in terms of production. If these were used for lighting purposes, as noted in chapter 4, they would likely reflect house size. A larger house would require more lighting sources for visibility. However, the fragmentary nature of altar leg artefacts does not provide an accurate assessment of any differences in the number of altars used within or between houses.

The only recovered figurines were found in loci 23 and 24. Table 16 shows the database query of the figurine data found in these loci.

Table 16: Database query of figurine artefacts in loci 23 and 24

Locus Simplified	Material	Material General	Material Specific
23	figurine	Figurine	
23	labret	Figurine	Labret
23	labret	Figurine	Labret
24	zoomorphic figurine	Figurine	Zoomorphic

Locus 23 contained two labrets and one unidentifiable figurine, whereas, locus 24 contained a zoomorphic figurine.

D. Bone Artefacts

Bone artefacts were grouped into awls to represent leather working and scoop/scraper/spatula to represent food preparation and food serving activities. Across the site, the comparison between structures showed a significant difference between activities, with a strength of 0.4340 ($\chi^2 = 7.7235001$, $p = 0.102248282$, $V = 0.434025404$) (Table 17.).

Table 17: Bone artefact comparisons

Observed Values

	Bone Artefacts		
Locus Simplified	Awl	Scoop / Scraper / Spatula	Totals
10	0	2	2
24	2	2	4
41	1	1	2
7	8	1	9
23	18	6	24
	29	12	[illegible]

Expected Values

	Bone Artefacts	
Locus Simplified	Awl	Scoop / Scraper / Spatula
10	1.414634146	0.585365854
24	2.829268293	1.170731707

41	1.414634146	0.585365854	
7	6.365853659	2.634146341	
23	16.97560976	7.024390244	

Bone Chi-square
Probability: 0.102248282 Chi Square value: 7.7235801
Cramer's V: 0.434025404

The observed values showed a higher number of bone artefacts in both categories. Assuming that different houses combined labour to form work groups two sets of loci were created to explore the possibility of viewing these work groups archaeologically. Loci 7 and 23 contained the highest values for the awl category. Assuming that these two loci were the main nodes of such work, they were logically organized and grouped with values from the other locus.

Low values of locus 10 where no awls could be found were combined with locus 23 that contained the highest values for this category to form one work group; assuming that individuals from locus 10 would go to locus 23 and work in a group.

The second work group assumed that locus 7 was the site of another node of work with loci 24 and 41 being part of the 'work group' through kinship or some other type of affiliation but carrying out their activities within their own houses.

When the combined activities of loci 24, 7 and 41 were compared against loci 23 and 10 (Table 18), there was more similarity between values (χ^2 = 1.7537019, p = 0.780941004, V = 0.20681687). There is almost no difference between value groupings. The chance that these grouped values could actually reflect a difference in activity is 32%. In fact, Cramer's V (V = 0.20681687) indicates that these groupings are extremely similar.

This test does not provide any definitive support for the existence of these logical groups as actual workgroups or of any affiliation between these houses. It was used as a conceptual tool to think about how different locus could have socially organized themselves for labour activities. These groups could equally represent the individual nature of work carried out for this type of activity within loci 7, 24, and 41 as compared to activities at locus 23 without any type of group work or kinship affiliation.

Table 18: Bone artefact groupings

Observed Values

	Bone Artefacts		
LocusSimplified	Awl	Scoop / Scraper / Spatula	Totals
24,41,7	11	4	15
23,10	18	8	26
	29	12	41

Expected Values

	Bone Artefacts		
LocusSimplified	Awl	Scoop / Scraper / Spatula	
24,41,7	10.6097561	4.390243902	
23,10	18.3902439	7.609756098	

Bone Chi-square
Probability: 0.780941004 Chi-square Value: 1.7537019
Cramer's V: 0.20681687

V. Discussion - 'Nodes' of Production

Up to this point in the thesis, I have discussed and outlined workgroups based on either conjugal or extended family organizational units. Since the analysis of the data concerns physical architectural patterns and artefact representations as a reflection of human behaviour, for discussion purposes it would be more appropriate to refer to the results and interpretations of them as 'nodes' of production reflecting the central focus of household (workgroup) social boundaries. Nodes of production more clearly signifies focus of workgroup production areas in relation to the architectural structures as socially defined areas of organization or demarcation. While most artefact categories were represented in each locus the relative concentrations of artefacts were shown to be of greater or lesser significance and strength using chi-squares and Cramer's V. The analysis allowed us to measure the data for more informed interpretations of their relationships.

While activities associated with these artefacts were likely carried out to lesser extent in each locus where artefacts were found, larger 'nodes' of production for certain activities appeared to have taken place in certain loci.

The largest pit house excavated (locus 23) appeared to be a main area of production associated with fish net weights, certain elements of textile manufacturing (although not all elements), formal lithic production, food production and leather working. Five out of six bone scoops artefacts, assumed to be used for serving food, were found in this locus. This could be a reflection of greater numbers of individuals eating in this area close to where they carried out these tasks. Conversely, it could be a function of the larger number of individuals residing here.

1. Locus 23

If locus 23 was the site of making or mending fish nets, it could be possible loom weights and awls found here were used for tying and knotting net cord together; however this concatenation of tools for such a task cannot be substantiated. The higher amounts of blade tools found in locus 23 might also reflect the use of expedient blades that were hafted for fish processing. Again this claim cannot be supported with the current data and analysis.

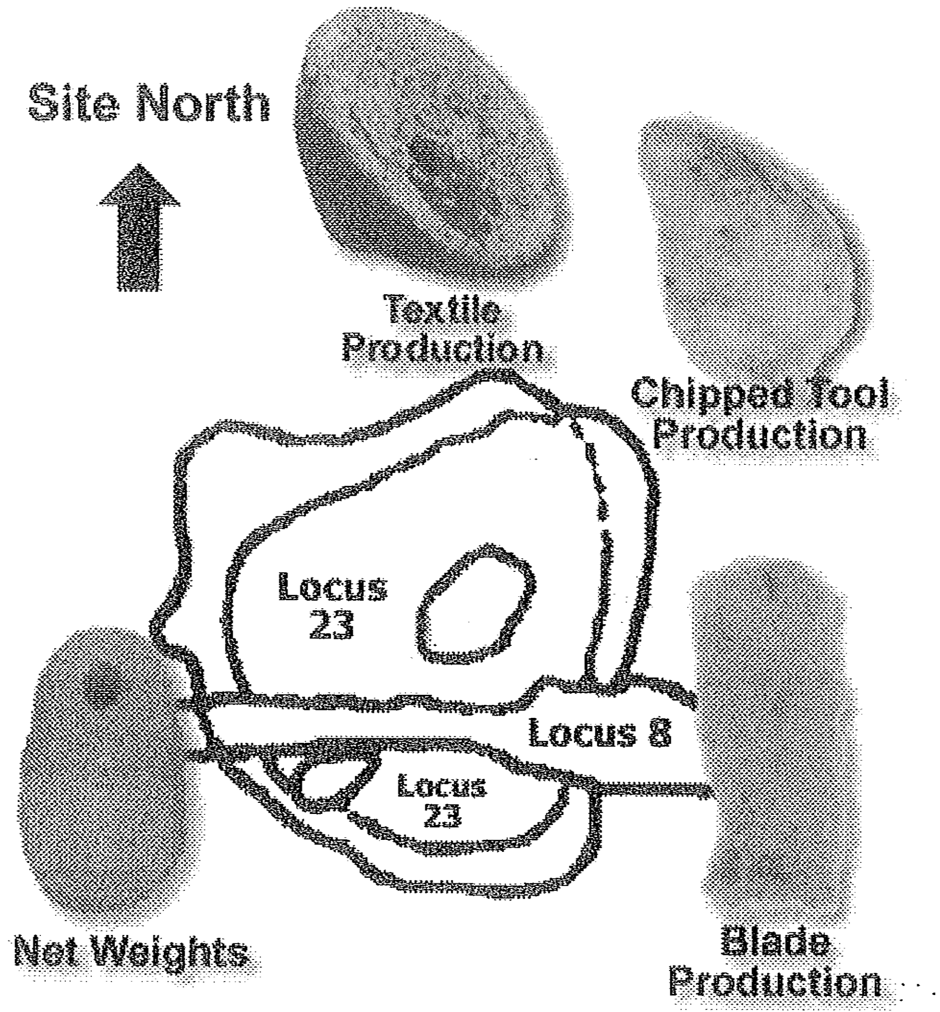

Figure v: Locus 23

The greater numbers of ground stone mortars (lower ground stones) indicate processing activity of botanical foods. This is reflected in the different patterns of plant remains found archaeologically.

According to botanical remains analyzed by Jezik (1998) most domesticated cereal remains and high concentrations of wild varieties of gathered plants come from loci 23 and 24. Locus 23 contained concentrations of *Quercus sp. cotyledon* (acorn); presence of *Avena sp.* (oat), *Hordenuem vulgare* (barley) and *Triticum monococcum* (einkorn).

2. Locus 24

Locus 24 was also the focus of production associated with fish net shaped weights, loom shaped weights, maintainable tool production and plant production. The amount of fish net weights and loom weights suggest these activities were performed on a much smaller scale than the node found at locus 23.

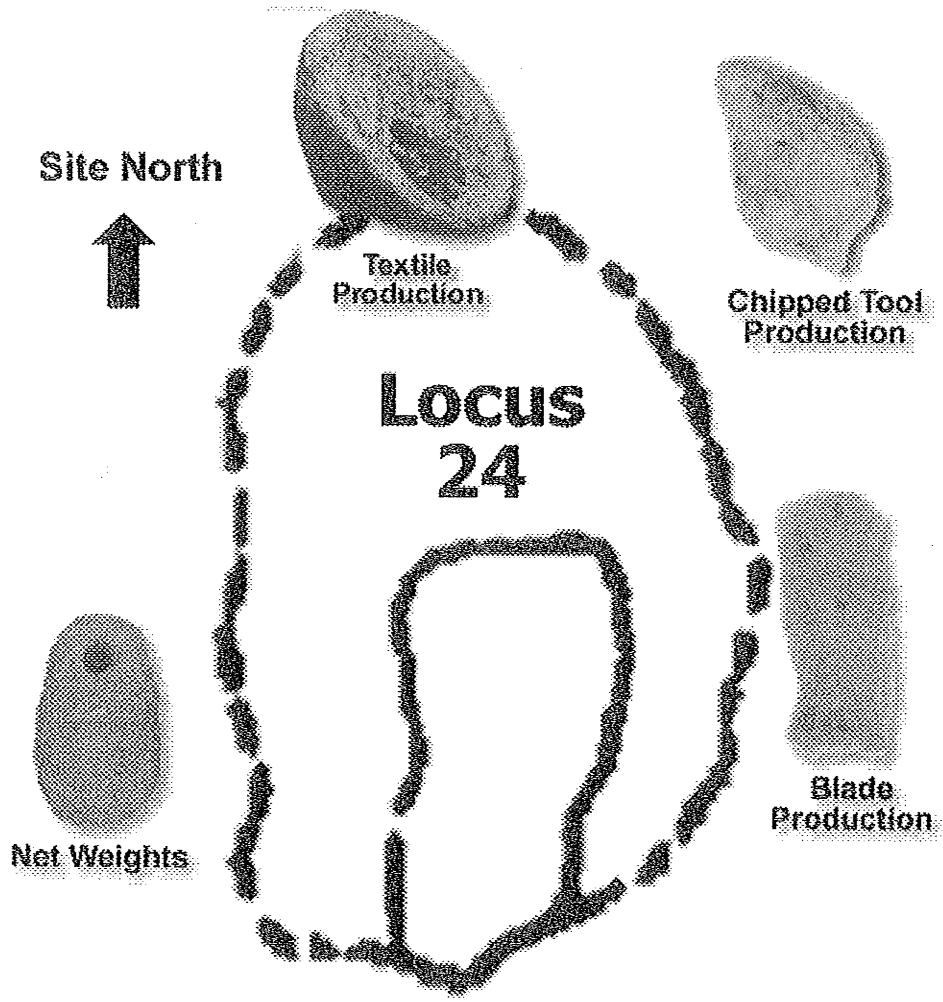

Figure vi: Locus 24

Botanical remains found in locus 24 mostly contained a mixture of domestic and wild varieties of einkorn. Jezik (1998) also suggested that the scattering of these plant materials over locus 24 in contrast to the discrete clustering of remains to the north-eastern corner of locus 23 could represent either an inefficient harvesting system or the early stages of crop processing. Locus 24 was likely a node of production for this plant.

3. Locus 7

With the large amounts of bolas, loom shaped weights and spindle whorls locus 7 was likely a site of textile production. Leather production was performed as evidenced by the presence of bone awls. However, the number of awls suggests this activity was performed to a lesser extent than in locus 23. Locus 7 also contained a variety of botanical material. However, the concentration of this material was attributed to the later use of this locus as a refuse deposit (Jezik 1998).

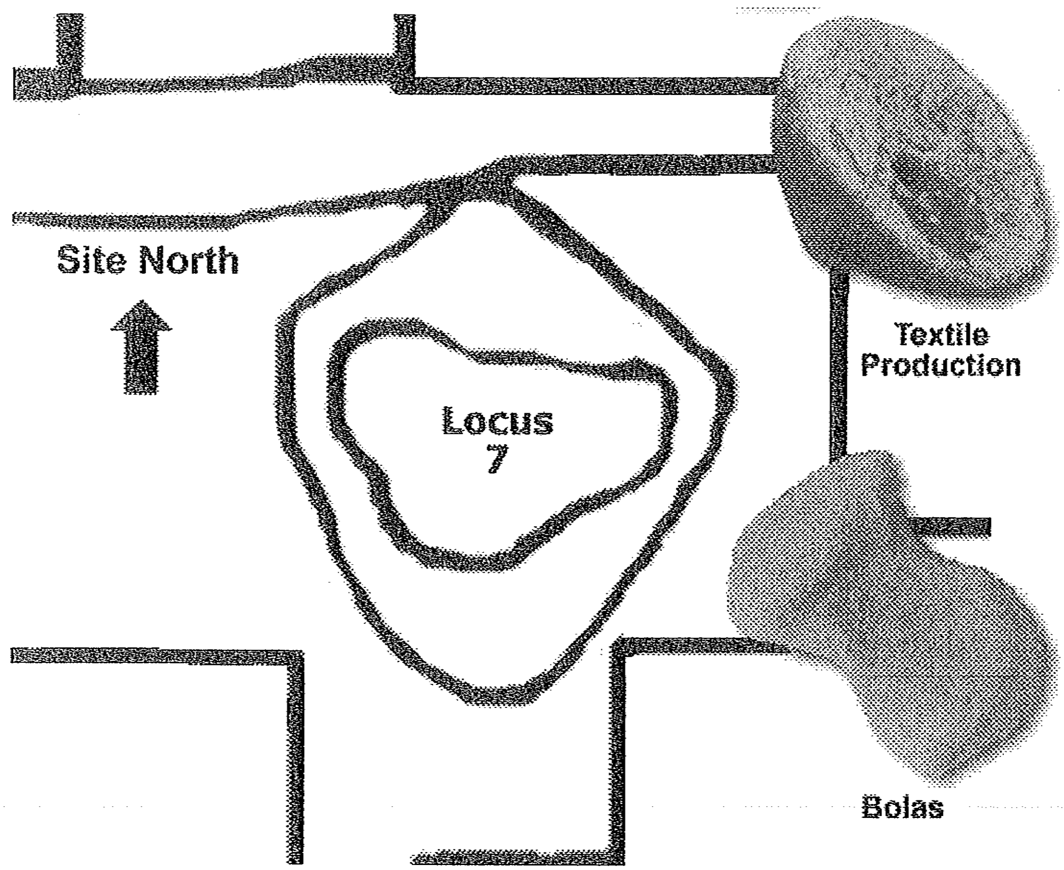

Figure vii: Locus 7

4. Locus 10

This house was likely part of a larger household. The presence of loom weights and spindle whorls indicate could represent a minor textile production area. The absence of botanical remains from locus 10 provides consistent evidence consistent with the lack of plant processing facilities; suggesting food production was unlikely to have taken place here.

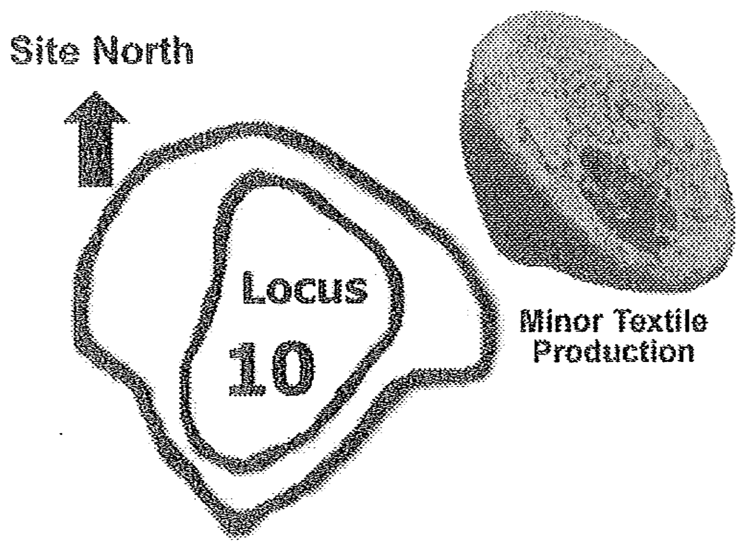

Figure viii: Locus 10

5. Locus 41

Few artefacts associated with this locus and absence of botanical remains suggests that it was not an important node of production. The individuals from this house likely were part of a larger household and performed activities in one or several of the other loci.

6. Tool Production

Two types of chipped stone cores are found at Foeni-Salaş: bipolar and pebble cores. Bipolar cores are the major source of microblades on the site, which were the most common stone tool type at Foeni-Salaş. They are generally referred to as blades. Blades are an extremely versatile and adaptable tool type. Blades can be easily modified or hafted and used of a wide variety of functions; carving, cutting, scraping, drilling, etc. Production of this type of tool is a very efficient use of lithic material. This is a constant problem at the site, which is far removed from any lithic sources. More blades can be made with less stone and in less time than chipped stone tools. Once a microblade begins to become dull it can be discarded and another (sharp) blade produced immediately to replace the dull one. Pebble cores is a more amorphous or irregular type of core. Each flake tool is unique.

The distribution of the two core types more or less parallels the distribution of the tools struck from them. All of the structures contained blades, but only loci 7 and 10 contained bi-polar cores. In contrast, pebble cores are found in loci 23 and 24, while only one scraper was found (Locus 23). This suggests that blade tools were ubiquitous throughout the site. The presence of pebble in loci 23 and 24 indicate more restricted use of both pebble cores and scraping tools.

7. Possible Social Implications

Figurine data indicated the presence of 2 labrets in locus 23. Labrets were decorative body adornment items usually worn through the lower lip. Apart from the culturally aesthetic aspects to this type of body adornment, labrets could also have been a form or indication of social identity, gender, position or group affiliation.

Other labrets at the site not directly associated with pit houses, were in the vicinity of loci 23 and 24. A database query of labrets found across the site with trench and quadrat data selected revealed that 4 out or 6 labrets in total were proximal to locus 23 (see Table 19: Location of labret artefacts). One labret out of the 6 was close to locus 24.

Locus Simplified	Proximal to Pit House Locus	Material Specific	Material General	Quantity	Plot_Trench	Quads
2	24	Labret	Figurine	1	150L	23
2	53	Labret	Figurine	1	130G	20
2	23	Labret	Figurine	1	130E	2
23		Labret	Figurine	1	129D	10
23		Labret	Figurine	1	129D	4
4	23	Labret	Figurine	1	129B	5

Table 19: Location of labret artefacts

The relatively low numbers of labrets found and their absence in or relative distance from other loci (7, 10 and 41) suggests this type of body adornment was not common to all settlement occupants. It is more likely this adornment did have social meaning rather than pure decorative value. This observation is more probable in light of the fact that locus 23 was the largest structure on the site (approximately 50% larger than Locus 24; and approximately 75% larger than loci 7, 10 and 41) which could also have been symbolic of rank or status within the settlement. The area of the loci is based on Senior's (2004) calculations (see Table 20).

Locus Number	Size (m^2)
Locus 10:	$14m^2$
Locus 23:	$54m^2$
Locus 24:	$26m^2$
Locus 41:	$13m^2$
Locus 7:	$16m^2$

Table 20: Area of loci (Senior 2004)

The main 'nodes' of production at the site appear to be loci 23 and 24 maintained access to resources or labour through ownership, kinship or group affiliation. These two loci are likely the main households or domestic groups that controlled forces of production at Foeni-Salaş. Similarity in textile production between loci 7 and 10 suggests these loci each belonged to one of the larger households (locus 23 or 24). In terms of proximity, locus 7 is closer to locus 24 and locus 10 near locus 23. It would be reasonable but not substantial to assume that loci 10 and 23 formed one household and loci 24 and 7 another. Locus 41 also appeared to be affiliated with a larger household, possibly locus 23. However, it might also have been affiliated with another unexcavated house.

Foeni-Salaş household and community organization could be conceptually thought of using the characteristic social and economic structure of Melanesian 'big-man' societies. This is not to suggest that Foeni-Salaş is the same as Melanesian 'big-man' societies, rather some concepts can be used to illustrate plausible similarities. In general, 'big-man' types of social organization generally consist of autonomous kinship-residential groups (Sahlins 1963: 288-289). Small villages tend to be economically self-governing, and similar to surrounding villages in terms of political status (Sahlins 1963: 228). Big-man authority is based in personal power and attained through the demonstration of certain skills (e.g. magical powers, gardening prowess, oratorical skill or bravery in warfare); not through kinship or lineage succession; (Sahlins 1963: 289). A big-man initially depends on a small core of followers, mainly his own household and closest relatives, to gain economic advantage through kinship obligation and reciprocity (Sahlins 1963: 291). He increases his household by incorporating other non-kin related individuals (Sahlins 1963: 291). Often a big-man will have a dwelling or clubhouse for him and his 'followers'.

The pit houses at Foeni-Salaş were probably part of larger dominant households that organized themselves according to extended kin-based units of production. The activities of production took place in socially meaningful spaces that would have reflected kinship, social or marital relations/affiliations.

VI. Conclusion

The analysis of data from the Early Neolithic settlement at Foeni-Salaş was organized into logically meaningful categories that could potentially provide insight into the domestic mode of production. Data showed observed variances between locus for different artefact categories. Chi-squares and Cramer's V was used as a tool to measure observed proportions of artefacts found in socially meaningful places for a more informative assessment of the data. Hypothetical data, called the expected values, represented the values that would have been shown if all loci had contained the same activities. Statistical analysis was not meant to provide an answer; rather, was used as a heuristic device to provide a measure of data gathered. Once measured, logical assessment and interpretations of data were carried out based on anthropological knowledge and assumptions about human behaviour.

It was determined that excavations at Foeni-Salaş suggest the presence of two domestic groups organized by extended family units which maintained and controlled access to resources or labour through social, kinship or marital affiliation. The precise manner in which these groups controlled resources could not be determined archaeologically.

Chapter 6: Conclusions

I. Introduction

The organizational structure for Early Neolithic settlements in temperate southeast Europe has been shrouded in mystery. Most archaeological sites in the region have been buried under later occupations making large scale excavation costly and difficult. The archaeological site of Foeni-Salaş allowed archaeologists to take a 'snapshot' of time in the lives of these pre-historic inhabitants. The compilation of data and research conducted at this site allowed for the creation and integration of information into a relational database system. Different data sets were combined and analyzed to determine the socio-economic structure of this Early Neolithic settlement.

II. Results

The data from Foeni-Salaş was organized into logically meaningful categories based on assumed functions or associated activities. Data showed observed variances between loci for different artefact categories. Chi-squares and Cramer's V was used as a tool to measure observed proportions of artefacts found in socially meaningful places for a more informative assessment of the data. Observed data was compared against hypothetical data. The hypothetical data, referred to as the expected values, represented the numbers of artefacts that would have been represented archaeologically if the loci being compared contained the same activities.

The analysis of data from Foeni-Salaş suggests the settlement was organized around two main households. Anthropological knowledge about the domestic mode of production suggests that these households would have been based on extended family units. These two households would have maintained and controlled access to resources or labour through social, kinship or marital affiliation. The precise manner in which the forces of production were controlled could not be determined archaeologically.

A previous analysis of the remains from the site (Senior 2004) focused on activity areas within pit houses. It determined that differences in activity importance existed between loci 7, 23, and 24.

> "Although the artefact distributions in Loci 7, 23 and 24 are similar in content, they become less similar when examined from an activity analysis perspective. The number of spindle whorls in Loci 7 and 24 set them apart from Locus 23. Although Locus 23 does not have any evidence for spindle whorls, it does appear to have been a centre for a great number of tasks including textile manufacturing. The greatest number of loom weights and net weights is found in this locus" (Senior 2004).

In particular, Senior suggested that when values were normalized (adjusted for size of pit), two pits stand out from the rest - loci 7 and 23.

> "When the artefact proportions are adjusted to account for the size of the pit, the importance of Locus 23 shifts and Locus 7 appears to take on a greater importance for certain activities" (Senior 2004).

Therefore, loci 7, 23, and 24 (which had been disturbed by later Eneolithic and EIA pits) would be the primary activity loci at the site. The other smaller loci (10 and 41) were likely secondary work areas. But the quantitative differences between the three large loci (7, 23 and 24) are so small that he could not substantiate whether activities taking place in these loci were different (Senior 2004), leaving his activity analyses somewhat inconclusive.

The analysis presented in this thesis focused on a different level of investigation than Senior's (2004) previous analysis of loci at Foeni-Salaş. My analysis differed from Senior's (2004) in that it focused on the settlement's social organization – were households/workgroups based on conjugal or extended modes of production which are prevalent in small-scale societies. Based on the excavated data from Foeni-Salaş, the analysis presented in this thesis indicated the settlement was likely composed of two extended family units or households. These household groups would have controlled the forces of production, maintained access to resources and ensured the needs of settlement occupants were met.

III. Relational Database

The relational database management system (RDBMS) allowed for the collection and storage of larger amounts of information than simple spreadsheets. With the use of SQL statements the research was able to query the database for information pertaining to both qualitative and quantitative data about the artefacts which could be used in the analysis.

The use of an RDBMS for this research allowed for several improvements. Strictly in terms of data management all of the collected data is now centralized into a single file which makes the storage and maintenance of the data simpler. Previously the data was organized as several different files (in the form of spreadsheets) which were more difficult to keep track of and backup. With the data organized into one file it is easier to manage. Also, MS Access has built in tools, such as database compaction, repair and security that are available.

Another improvement to the data management was the issue of data corruption and cleanup. Data in the spreadsheets was prone to data corruption, where some records had data entered in the wrong fields. In some cases, a record was located across several rows. These problems effect data analysis, however were easily identified with the relational database and corrected using simple queries. Using the relational database also revealed incomplete entries, mistakes in data entry and use of different data values for similar categories by some students. Having several different forms of the same value creates inaccurate counts of data and information. Therefore the relational database was beneficial to recognizing these problems and facilitated correction of them.

In terms of analysis, the RDBMS facilitated accurate retrieval of the data from Foeni-Salaş. The relational database facilitated grouping and sorting of the data for evaluation and analysis. It also facilitated counts and summaries of non-numerical data categories (text or alphanumeric values). Record filtering, sorting and grouping is more difficult to perform with spreadsheets. Large datasets in spreadsheets are less efficient with data- mining than relational databases. This proved invaluable in searching for useful data and creating tables to carry out the statistical analysis. Previous use of spreadsheets has shown inaccuracies with counts and summaries, likely due to the data corruption problems noted earlier. The relational database has the added benefit of automatically incorporation any new data entered into the database with the SQL statements. This will facilitate future research with the data.

A relational database enhances the data from Foeni-Salaş by providing for more user friendly features to facilitate data entry and retrieval. Data entry is time consuming. Incorporating forms with pre-entry values in certain fields would reduce time and costs incurred with this aspect of research. Database synchronization and web access would also be useful for researchers to search for and view data. This would facilitate communication of the data internationally in real-time to other archaeologists involved in the project, as well as any other interested researchers.

Previous attempts at analyzing this data did not use a relational database management system which created problems with applying statistical measures. The creation of a RDBMS alleviates previous methodological problems and facilitates future analysis of this data.

Analysis of archaeological records using a relational database management system to query data facilitated understanding of this Early Neolithic settlement's socio-economic organization. The relational database system is not a replacement for statistical tools, rather it is a tool to enable archaeologists to organize and find the information they require in a useful format. Once the data is organized the archaeologist can apply statistical functions. Some database programmes contain built in functions that can be used for simple analysis. However, for complex statistical measures it would be more useful to export this data into a statistical software programme.

IV. Behaviour and Archaeological Correlates

An investigation of active production and reproduction of socio-economic activities was carried out at Foeni-Salaş. Without written records archaeology is limited to studying the material remains that have survived form the daily activities of human behaviour. The socio-economic analysis examined a human population located in time and space and attempt to understand the processes by which inhabitants of this settlement organized themselves to produce and reproduce their way of life.

Anthropological studies have indicated that economic production in small-scale societies is a process instituted by domestic groups, organized in the form of families and extended families (Sahlins 1972: 76). In kin-based societies, kinship serves as a primary organizing feature for production modes called domestic groups (Sahlins 1972: 76).

Households made up a type of small economy. This was a flexible group which was expanded beyond the conjugal family unit to a type of extended family depending on the size and complexity of work/production required to be done (Sahlins 1972: 78). A family is minimally comprised of a husband and wife, which makes up the general economic form of most societies. This general form is usually based on the sexual division of labour (Sahlins 1972: 79).

According to Sahlins (1972: 69-74), it is common for production output between households within a village to be significantly different. Some households within a village do not meet the needs of their members sufficiently (Sahlins 1972: 101). However, the benefit of living in a settlement was the redistribution of essential subsistence needs to households in the community.

Understanding the socio-economic pattern of an archaeological site requires the identification of social structure and productive organization. Social groups articulate directly with economic and ecological processes at the household level (Wilk and Rathje 1982: 618). The analysis and interpretations of data at Foeni-Salaş identified two nodes of household production within the settlement. The Early Neolithic settlement at Foeni-Salaş was based on a domestic mode of production involving two major households that collaborated with smaller households in the community to ensure that household members' needs were met.

V. Conclusion

In conclusion, a better understanding of the organizational structure at Foeni-Salaş was achieved through a relational database analysis. The inhabitants of this settlement appear to have been organized into two sets of extended family units to provide essential household needs. It was clear that not all houses at Foeni-Salaş produced similar economic output and that two main households appear to have maintained control over larger productive activities. These archaeological observations were consistent with general ethnographic accounts of behaviour and economy in similar small-scale societies. As more research is conducted on the material culture of Foeni-Salaş and added to the relational database it is hoped that more information concerning the Early Neolithic way of life can be revealed.

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