THE ORIGINS OF AGRICULTURE IN TEMPERATE EUROPE: AN EXPLORATION INTO THE SUBSISTENCE STRATEGIES OF TWO EARLY NEOLITHIC GROUPS IN THE CENTRAL BALKANS, FOENI-SALAS AND BLAGOTIN

By

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A Thesis
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To my Mom, Dad and Sister

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ABSTRACT

This thesis examines the charred seed assemblages from two Early Neolithic sites in the central Balkans, Foeni-Salaş and Blagotin (c. 5500 BC). The data are examined for evidence of crop processing and production. Using the results obtained, this thesis evaluates whether agriculture was an important component of subsistence to the inhabitants of Foeni-Salaş and Blagotin and how this information changes our views on the origins of agriculture in temperate Europe.

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CHAPTER I:

INTRODUCTION TO THE PROBLEM

The first farming communities to enter Europe settled in the southern half of the Balkan Peninsula (Northern Greece) ca. 6500 BC. Less than 500 years after their establishment, farmers appeared in the northern Balkans (south Romania, Yugoslavia, Bulgaria, and south-east Hungary), across the climatic divide between the semi-arid Mediterranean littoral and temperate central Europe zones (Figure 1). The incipient farming groups of the north adapted to environmental and climatic conditions more favourable in terms of precipitation than those of the south, but demanding the use of alternative agricultural strategies (Garašanin 1979; Tringham 1971; Whittle 1985; Greenfield 1993).

These Early Neolithic cultures of the central Balkans, represented by the Starčevo-Criş culture, set the stage for the spread of agriculture in central and northern Europe. They mark the first adaptation to a temperate environment. Although the material culture of this period and region has been well investigated (Milojčić 1949; Arandjelović-Garašanin 1954; Srejović 1969, 1988; Dimitrijević 1974; Garašanin 1979; Manson 1990, 1995), the economic adaptations, particularly the strategies of agricultural exploitation, are poorly understood. The paleobotanical record of the north Balkan peninsula has been especially inadequately studied. Most paleobotanical investigations in this region have aimed to inventory the type of crops planted, rather than to examine the role of crop agriculture in the overall subsistence of the Early Neolithic (Dennell 1992: 71). Such an examination is crucial if we are to understand the economic adaptations of the first farmers and the significance of these communities in the spread of farming.

In this context, the goals of this thesis are: (1) to establish the primary crop products that were grown in the region, (2) to evaluate whether agriculture was an important component in their overall subsistence strategies and, (3) to examine how these principal crops may contribute to our knowledge of the origins and spread of agriculture in the temperate zone of Europe. This thesis draws upon new paleobotanical evidence from two Early Neolithic sites in the central Balkans, Blagotin and Foeni-Salaş, in order to advance our understanding of the importance of agricultural developments in the Early Neolithic. Recent investigations at these two sites have provided a rich botanical assemblage which can be closely associated with the remnants of an Early Neolithic farming community.

Source of data investigated

The carbonised seed remains to be analysed for this thesis were recovered over four field seasons at the Early Neolithic archaeological sites of Foeni-Salaş and Blagotin. Foeni-Salaş, in south-western Romania, was excavated from 1992 to 1994 by Haskel Greenfield (The University of Manitoba) and Florin Draşovean (The Museum of the Banat in Timişoara, Romania). The site is located in the flat plains of the Romanian Banat. Soil collection for flotation was systematic, similar to the "blanket sampling" strategy described by Pearsall (1989: 95). Collected samples were floated using a manual flotation devise, capturing charred seed and charcoal debris in a set of 1.00 mm and 0.50 mm sieves (Greenfield n.d.).

Blagotin, in central Serbia, was excavated in 1991 and 1992 by Haskel Greenfield (The University of Manitoba) and Svetozar Stanković (The University of

Belgrade). The site is located in the rolling foothills of the mountains of central Serbia. The samples collected at Blagotin were gathered using the same technique as Foeni-Salaş and floated in a similar manner (Greenfield and Stanković n.d.).

The data from these sites are unique. They are the first botanical data sets from Early Neolithic archaeological sites in the region that were systematically collected, spatially referenced, and contextually associated. The data are particularly comparable since they were collected with similar methods. They are also useful for achieving the goals of this thesis because the two sites are found in differing environments. Both sites are found in the temperate zone of the Balkans, but are slightly different in topography. The site of Blagotin is found in the hilly (low mountain) zone of the central Balkans, while Foeni-Salaş is found in the flat plains region (i.e. the Banat). This allows for consideration of the effect of differing environmental conditions (plains vs. low mountain zone) found at each site upon issues related to subsistence and preservation.

Methods

To test the above research questions, a data set consisting of charred seed remains from Foeni-Salaş and Blagotin were analysed and interpreted. The objectives listed below will aid in fulfilling the central purpose of this investigation. There are three levels of investigation: within each site; comparison between both sites; and comparison to other sites in the region. This hierarchical order of investigation will point out patterns of distributions and provide manageable units of comparison with sites of similar nature. The objectives are:

1. To identify all charred seed remains recovered on both sites and examine cereal

grains for domestication. The carbonised botanical remains were analysed by use of the comparative seed collection at the University of Manitoba Department of Anthropology laboratory, and reference to literature on the subject (Renfrew 1973: Zohary and Hopf 1993; Scohch, Pawlik and Schweingruber 1988; Delorit 1970; Hubbard 1992).

2. To quantify the frequency of wild versus domestic plant species found. Quantitative methods of analysis entailed compilation of charts of all seeds analysed and use of a variety of statistical techniques, such as frequency distribution or presence/absence. The quantitative methods chosen were based on the applicability to the data being analysed

3. To investigate the spatial distribution of charred seed remains recovered at each site. These paleobotancial data were investigated in terms of their associations to features, artifacts and other botanical remains.

4. To compare and contrast the seed assemblages of the two sites in terms of: (a) distribution of domesticates, and (b) ratios between wild and domesticate types.

5. The finds from Foeni-Salaş and Blagotin will also be compared to the results from paleobotanical investigation practised on other Early Neolithic sites of the Balkans, such as Chevdar in Bulgaria. A regional synthesis can be made when site specific patterns are compared to other sites of a similar temporal range.

Hypotheses

In the context of the above research objectives, there will be three working hypotheses for this thesis. All three conjectures are not mutually exclusive. The first hypothesis states that the inhabitants of Foeni-Salaş and Blagotin are true agriculturists and agriculture is the focus of the plant economy. The null hypothesis is that agriculture is not a major component of subsistence. In order to demonstrate the nature of agriculture at these sites, the types of crop processing, refuse and storage activities must be identified. The stages of crop processing will help establish the primary products, the importance of cereal crops to subsistence and whether agriculture is a major component of subsistence. Refuse activities would demonstrate differences between long-term (sedentary agriculturalists) and short-term (mobile pastoral or hunter-gatherer) settlements. For instance, a long term settlement would contain several refuse locations consisting of large accumulations of non-homogeneous material. The longer a pit is open, the less likely it would contain homogeneous refuse (Kreuz 1990: 72). Short term sites would have small refuse loci (if at all), reflecting a transitory occupation. Storage activities would demonstrate permanency of settlement. For example, it is expected that if the inhabitants of Foeni-Salaş and Blagotin invested time in developing the land they were inhabiting and fully utilised their surroundings for long term settlement, they would build long term storage facilities.

The second hypothesis assumes the spatial patterning of botanical remains at Foeni-Salaş and Blagotin will reflect cultural phenomena, such as crop processing, refuse and/or storage activities. If there is similar systematic patterning in the botanical data from both Foeni-Salaş and Blagotin, then it is assumed that the patterning is a result of similar cultural behaviours. If there is no similarity in the distribution of botanical remains between sites, then the source of the patterning could be different subsistence orientations and/or from natural taphonomic forces (such as differential preservation due to erosion, differing environmental conditions, etc.). In order to distinguish between differing subsistence or natural forces, the context of remains and the taphonomy of each site must be considered.

The third hypothesis assumes that the subsistence orientation at Foeni-Salaş and Blagotin, as reflected by the botanical remains, will reflect who these inhabitants were, either colonists from the south or indigenous groups of the central Balkans. To test this hypothesis, the research will move beyond the types of crops planted and processed and towards understanding the significance of crops to the overall subsistence strategies. For instance, if the botanical assemblages from Foeni-Salaş and Blagotin closely parallel assemblages found in Greece (in terms of distribution, types of domesticates planted and frequency of wild to domesticated species), one might conclude that the first farming groups of Europe were colonists from the south. However, if domesticates are less prominent than wild species in the botanical assemblages, or if there are high aggregates of wild plant species, it is possible that crop agriculture was not integral to the subsistence and/or it was an experimental (or new, adoptive) Neolithic pattern with domesticates. As a result, one may conclude that the subsistence strategies represent the remnants of an older (Mesolithic) subsistence pattern which was incorporating agricultural elements as diffused from the south. Understanding the role of crops to the subsistence strategies of the Early Neolithic provides clues to who the first farmers were and how agriculture spread throughout Europe.

Chapter Summary

This thesis will attempt to investigate some of the small and large scale problems associated with the beginning of crop agriculture in the Early Neolithic. In order for this type of examination to take place, the chapters of this thesis will cover the following topics. The first chapter will emphasise the potential contributions of this study and discuss the problems and issues that pertain to farming in the Early Neolithic. Chapter two presents the theoretical issues concerning the origins of agriculture. An investigation of the types of agricultural systems and harvesting techniques that may have existed in prehistory and the models that have been constructed to investigate them archaeologically will be discussed in chapters three and four. Chapter four will also discuss the methods and techniques used to discern types of crop production and processing in the archaeological record and the means of establishing the primary crop products of a given site. Chapter five will discuss the geography of the central Balkans, and the locations early farmers chose for farming. The culture history of the Balkans and the material culture, settlement patterns and chronology of the Starčevo-Criş archaeological culture will be reviewed in chapter six. Chapter seven will describe the sites of Foeni-Salaş and Blagotin, including the excavation methodology and results from of each site. Soil sample methodology, flotation procedure and quantitative methods for each site are described in chapter eight. In chapter nine, the discussion will shift to the results of the analysis and the spatial distribution of finds. Lastly, chapter ten will interpret the results analysed and discuss how the results aid in our understanding of agricultural exploitation and the origins and spread of farming during the Early Neolithic of the central Balkans.

Contribution

The ultimate aim of this thesis is to clarify our general understanding of the origins of agriculture in temperate southeast Europe and to contribute to our specific knowledge of Early Neolithic farming in the central Balkans. This thesis aims to shift away from a traditional reliance on colonisation theories to account for the origins of agriculture. Many theories of the spread of agriculture in Europe begin with the assumption that farmers from the south Balkans and Greece spread through Europe and took over, replaced-or diminished-the local Mesolithic hunting and gathering population that existed in Europe at that time. In contrast, I hope to increase awareness of the potential for including Mesolithic adaptive strategies or forager/farmer interactions in accounting for the spread of agriculture in this region. A consideration of botanical data can help decide between these alternative hypothesis. However, there is a great need for information on the nature of Early Neolithic strategies of agricultural exploitation before any conclusion can be made.

Another contribution of this work will be to emphasise the importance of the spatial investigation of Early Neolithic sites, particularly paleoeconomic data such as charred seeds. This allows researchers to move away from providing simple inventories of palaeoecological or paleoeconomic data and to increase our understanding of the significance of specific items (plants or animals) to subsistence. This type of investigation needs development all across the Old World, but in the central Balkans in particular.

CHAPTER II:

THE ORIGINS OF EUROPEAN AGRICULTURE

There are few aspects of prehistory that have received more attention than the origins of agriculture (Flannery 1973). The concept of "agricultural origins," however, covers a multiplicity of meanings depending on the area of the world one is investigating. For instance, in the Near East , the "origins of agriculture" refers to the actual emergence of agriculture, in which humans first gathered enough knowledge of the plants and animals of their surrounding environment to control their reproductive processes. In Europe, the study of agricultural origins reflects the role of migration, diffusion (adoption), and independent innovation of introduced plant and animal communities (Harris 1996: 7). In interpreting the origins of agriculture, emphasis is placed either on primary ("demic" or "migratory") contexts or secondary (sometimes called "cultural") diffusion (Harris1996: 7).

This chapter will focus on issues that pertain to the first agricultural crops of Europe, particularly how and why the crops reached the continent. It is beyond the scope of this thesis to review all the theories that have attempted to explain the origins of European agriculture. Instead, there will be a brief discussion of the more well-known and currently employed theories.

Research now has established that c. 7000 BC domesticated plants and animals spread from the Near East to south-east Europe. Between 6000 BC to 5500 BC, agriculture spread to most of south and central Europe (Whittle 1996). The nature and timing of movement from the Near East to Europe has caused much debate. There is no doubt that the earliest domesticated cereal grains found in Europe are of Near Eastern origin. There is, however, vast confusion about the nature and organisation of Early Neolithic communities involved in the spread of agriculture and also in the rate, direction and method of domesticated plant dispersal (Zvelebil 1988: 576).

Theories for the origins and spread of early agriculture in Europe can be divided into three groups: (1) the result of "demic diffusion" (migration or colonisation) where populations of migrant farmers from south-west Asia enter Europe and spread, carrying the knowledge of agriculture with them (Ammerman and Cavalli-Sforza 1984); (2) the result of indigenous Mesolithic hunter-gatherer populations selectively adopting ("cultural diffusions") domesticated plants and animals and other cultural items by contact from intrusive populations (Zvelebil and Rowley-Conwy 1986); and 3) the independent innovation of agriculture. Colonist theories suggest that agricultural groups from the Near East infiltrated Europe with the first domesticated plants and animals, and either slowly or rapidly, replaced the existing cultural systems of Europe (Renfrew 1987, 1996; van Andel and Runnels 1995; Ammerman and Cavalli-Sforza 1984). Cultural diffusion theories suggest that farming was slowly adopted by the indigenous groups of Europe and that it was based both on local and imported cultigens and domesticates (Clarke 1976; Dennell 1983; Barker 1985; Zvelebil and Rowley-Conwy 1986; Chapman and Muller 1990; Greenfield 1993). Unfortunately, the archaeological record can be read to support both theories, preventing resolution to the debate. There is no doubt that the cereal domesticates of Europe are of Asiatic stock, but the question still remains: were these early domesticates slowly integrated into a forager subsistence pattern or did colonists from the south take over. Both theories raise important questions (Bogucki 1996). If agriculture was brought into Europe by colonists, then why did they leave the Near East, and what route did they take to get to Europe? Moreover, if agriculture was adopted by indigenous peoples; why did these groups opt for a more difficult and risky lifestyle in agriculture rather than a carefree hunting and gathering way of life? It is important to review these theories in the context of this thesis because the inhabitants of Foeni-Salaş and Blagotin may represent either of these processes.

Colonisation Theories

The basic premise behind colonist theories in prehistory is that large movements of peoples trigger cultural change. Colonisation is a very popular theme in archaeology. There are many historic accounts that document culture change as a result of colonisation. In the classical world, linguists and historians have posed major linguistic changes as the cause of cultural change at the advent of the Bronze Age in mainland Greece. Also, Ionian speakers were said to have infiltrated Asia Minor, founding a Greek presence that lasted to the Dark Ages (Beirs 1987: 95). In the New World, the change in ecology and landscape of New England has been attributed to the arrival of colonial settlers. However, the change in plant and animal communities was the result of a complex web of relationships between land, environment, and the peoples that inhabited the land (Cronon 1983: viii). In light of this, many prehistoric archaeologists still make the assumption that sudden cultural change is a result of colonisation. Although many archaeologists no longer believe in unilinear approaches towards interpreting the archaeological record (see Zvelebil and Zvelebil 1988), this has not deterred many archaeologists from using colonisation theories to explain the origins of European agriculture. In fact, different lines of evidence are used to support colonisation models for early agriculture in Europe: *genetics* (Ammerman and Cavalli-Sforza 1984), *linguistics* (Renfrew 1987), and *settlement patterns* (van Andel and Runnels 1995). These are reviewed below.

Demic diffusion models

Ammerman and Cavalli-Sforza (1984) use the genetic model to argue that agricultural groups introduced farming to Europe from the Near East. The authors propose that the spread of farming into Europe was the result of demic diffusion, where large movements of people (or in this case, farmers) entered Europe with domesticates and farming techniques. The concept of demic diffusion evolved from the "wave of advance" model introduced by the geneticist Fisher (1937). He believed that advantageous genes spread in a linear fashion, virtually wiping out recessive, or maladaptive genes in the processes.

Using Fisher's model, Ammerman and Cavalli-Sforza (1984) attempted to predict mathematically how population growth and migratory activity (when combined together) result in large population waves expanding outwards at steady, calculable rates. The authors examined the radiocarbon evidence of 106 archaeological sites and found that the average rate of the spread of farming in Europe between Greece and Britain was 1 km/year. This rate of advance is predicated on the basis of population growth, direction of spread, and migratory activity. The authors found that even slight migratory activity in Europe triggered "wave fronts" at a constant rate. After testing the archaeological and genetic evidence, the authors believe that the Neolithic transition set the template for the geographic distribution of human genes in Europe.

Ammerman and Cavalli-Sforza believed that this same linear growth occurred in Europe with the advent of farming. They found that the diffusion of farmers in Europe, and the spread of a farming way of life, affected the diets and lifestyles of Mesolithic hunter-gatherers. Genetically, wheat and barley contain gluten, and milk of domesticated cattle contains lactose. Both products were indigestible by hunter-gatherers which means the population was eventually replaced. Natural selection eventually would have eliminated foraging groups in Europe.

Linguistic models

Renfrew (1987) uses a linguistic model as a point of origin for explaining the origins of agriculture in Europe. He argues that the only event in European prehistory that was large enough to account for the rapid spread of Indo-European languages was the spread of farming during the Neolithic. Renfrew states Indo-European languages reached Europe via Anatolia and infiltrated the continent by small scale migration and occupation of unoccupied land. His model argues that the wide uniformity in language and farming is a function of a large demographic and economic expansion which can only be traced back to the Early Neolithic farmers of Greece (Renfrew 1987: 151).

Using botanical evidence, Renfrew, notes that "the economy of agriculture was in the main an imported one". The first farmers of Europe settled in Greece (and Crete) before 6000 BC and relied on a mixed economy of emmer and einkorn wheat, peas and vetch along with livestock of sheep, goat and some cattle and pigs. He rejects the idea that the hunter-gatherer population of Europe acquired plant and animal species by adapting to a farming way of life. Rather, he suggests that early farming took place by processes similar to the "wave of advance". The population of Europe grew exponentially because of farming and eventually filled the entire continent. Along with the rapid growth of farming, Indo-European languages also spread. By the time farming was fully established in Europe, the continent was also filled with a new Indo-European-speaking population. Areas where the Mesolithic population had been dense and vibrant (such as the shores of Portugal), were slow to integrate farming into their local system. This would account for the occasional pockets of non-European languages that have survived into historic times, such as Etruscan or Basque (Renfrew 1987: 151).

Settlement pattern models

Van Andel and Runnels (1995) examined early Neolithic settlement patterns in Greece to understand the origins of agriculture. They concluded that the first farmers of Greece were colonists from the Far East, and settled on small patches of land, almost always on alluvial flood plains. These areas were not previously occupied by Mesolithic foragers. Colonists preferred to settle on alluvial flood plains because: (a) annual flooding in these areas was gentle and minimal, (b) there was little vegetation to clear, and (c) there was a high seed-to-harvest ratio from cultivating lowlands and terraces (1995: 490).

A prime example of this type of settlement selection is found in the Larisa basin of Thessaly, Greece (Figure 2). This region shows an incredibly high density of sites much higher more than latter areas such as Macedonia, Boeotia, Attica, Epiros and the Peloponnese, where there is a sparse scatter of sites. Settlements in these areas were located near shores and springs, but were much more scattered than in Thessaly.

The Larisa basin contained more fertile loam than other flood plains. It is argued that this is why it was more densely settled. Sites in Anatolia show the same soil preference by early farmers. Areas such as Beyşehir-Sûgla and the Könya basin of south central Anatolia were large flood plains that were densely populated. The basin provided a dependable harvests for a large population (van Andel and Runnels 1995: 495). The authors emphasise that the mere presence of open space was not enough for the first farmers to expand (van Andel and Runnels 1995: 481). The flood plains of Thessaly offered Neolithic farmers dry dwelling places and vast amounts of arable land on abandoned levee/channel systems.

How do these trends shed light on the origins of agriculture? Van Andel and Runnels propose a new working hypothesis based on the wave of advance model presented by Ammerman and Cavalli-Sforza (1984). Ammerman and Cavalli-Sforza base their model on two assumptions: (a) population growth increases at a continuous advance across broad fronts, and (b) local migratory activity occurs continuously, but in random directions (Ammerman and Cavalli-Sforza in van Andel and Runnels 1996: 496). Van Andel and Runnels believe that barriers like the Aegean were major obstacles for the first agriculturists. The first farmers on the continent chose to live in the most desirable areas (flood plains) for farming. Once the desirable patches of virgin land were filled or exhausted, the next fruitful patch of land was settled. The first settlements were carefully chosen by the farmers. They did not just randomly sweep over Greece and the rest of Europe with the techniques of farming. Migration took place in discrete steps as opposed to large continuous wave fronts, and the length and interval of each step was dictated by local geography and population growth.

Agriculture by indigenous adoption

Indigenous theories are much more complex than most colonist theories because they are not based on unilinear theory. Dennell (1985) states there has been considerable prejudice against the investigation of hunter-gatherer populations. Much emphasis in research has been placed on food production by agriculturists. This, in turn, has minimised hunter-gatherer adaptations (a view strongly held by Clarke, 1976). Some archaeologists believe that the beginnings of agriculture in Europe started off as a slow process, with step-by-step interaction between Mesolithic hunter-gatherers and incoming farmers (Zvelebil and Zvelebil 1989; Zvelebil and Rowley-Conwy 1986; Greenfield 1993; Tringham 1971). Others believe that Mesolithic groups in Europe varied greatly in social structure and the interaction between foragers and farmers differed all over Europe (Thomas 1996: 313). The following section will describe indigenous theories pertaining to the origins of agriculture.

Agriculture replacement models

Before the publication of David Clarke's *The Economic Basis of Europe* (1976), many archaeologists had an idealised vision of Mesolithic society: small scale bands followed migratory animals, and stone tools used solely for the butchering and hunting of animals. Clarke believed that all research done on Mesolithic sites had seriously underestimated the importance of plant foods and greatly exaggerated the use of wild animal food. Also, the minimal emphasis of plant use in Mesolithic investigation was the result of bias in preservation, and a misinterpretation of the recovered technology. Clarke also believed that Mesolithic hunter-gatherers were transhumant and relied heavily on the availability of different plant resources through time, plant food would increase in importance, particularly when groups could not rely on migratory herbivores and this in turn caused an increase in sedentism and a greater ability and need to control resources. During times of intensive plant and animal use, Neolithic domesticates had become available either by the natural spread of plants and animals or by new agricultural groups that had made their way to the continent. Domesticates eventually replaced wild plants and in turn reduced the reliance on marine resources. This is what Clarke termed the "agricultural replacement" model.

Since Clarke's agricultural replacement model was introduced, other archaeologists have expanded upon his theory (Evans 1987; Geddes 1985). Chapman and Muller (1990) applied Clarke's agricultural replacement model to the Eastern Adriatic. They found that the Trieste karst region of Dalmatia remained a hunting and gathering refuge well into the 6th millennium BC and the Montenegrin interior contained groups that hunted goats from coastal herdsman before they adopted agriculture. The adoption of agrarian practices took place quite rapidly after its first appearance in coastal Dalmatia, and this verifies Clarke's replacement model (1990: 132).

Forager-farmer interaction models

Dennell (1985) believed it was improbable that agriculture expanded into temperate Europe simply by colonisation. He argues that there was complex interaction between colonists and hunter-gatherers. Dennell recognises that there are two types of frontiers that most likely existed between the two groups: open static frontiers and closed static frontiers. Open frontier models assume there would be exchange between the two groups. Agriculturists would have found hunter-gatherers useful for special commodities, including furs, skins and game or non-perishable goods like amber, obsidian, or flint (1985: 133). Hunter-gatherers would have benefited from the presence of agriculturists by acquiring commodities such as pottery. Closed static frontiers would be exemplified by warfare, defended farming sites and a lack of exchange or in more subtle ways by mutual indifference. This would be noted archaeologically by finding foraging and farming sites that are contemporary but segregated and lack of any evidence for exchange. Static frontiers would have developed between foragers and farmers in areas where the latter had no advantage in acquiring and developing agricultural resources. There may also have been instances where farmers would have found reasons for assimilating foragers into agricultural groups, or they may have been in regions where agriculturists did not feel they were worth colonising.

Dennell (1985: 135) stresses the fact that Mesolithic foragers played a large role in agricultural expansion into Europe. However, the actual rate of agricultural expansion may be overestimated by mistaking the acquisition of agricultural commodities by hunter-gatherers across open, static frontiers for agricultural colonisation. He believes that hunter-gatherers and agriculturists coexisted in many parts of Europe and the spread of agriculture was rapid in some areas, while in other areas it was slow and took place over a long period of time (1985: 113). The cohabitation between foragers and farmers varied in duration and proximity and this variation was dictated by location and surrounding environment. For instance, in temperate Europe, hunter-gatherers and farmers were scattered amongst each other and each group maintained their own subsistence pattern until agriculture became the predominant choice of subsistence. Dennell uses four models to describe the different type of interaction that my have existed between hunter-gatherers and early farmers.

(a) Agricultural expansion through hunter-gatherer immigration. In this scenario, local hunter-gatherers use larger territories than the new introduced agricultural groups and contact between these two groups takes place on agricultural territory. Hunter-gatherers spend more time in agricultural settlements than vice-versa (Dennell 1985: 123). Eventually, adult males from the foraging groups show a keen interest in the technology of the agricultural communities. The agriculturists on the other hand find it advantageous to use the additional labour from foragers in times of need. Hunter-gatherers find agriculture worthwhile since the long term storage of food is appealing during the winter months and agriculturists find the added labour force useful.

(b) The result of contact: hunter-gatherer assimilation. This model displays agriculture as expanding because of positive interaction between hunter-gatherers and foragers. This model makes three assumptions: (a) both parties welcome change and have a vested interest in maintaining relationships with each other, (b) the hunter-gatherer populations are an immediate source of recruitment for the agriculturists, and (c) agricultural groups provide a useful insurance for hunter-gatherer groups. If interaction between hunter-gatherers is positive, agriculture expands. If interaction between these groups was not positive, new agricultural groups would dwindle in size after the first generation. The interaction between the two groups especially benefits the agriculturists because of the knowledge hunter-gatherers have of the environment. Eventually, there is a rapid expansion of agriculture, and an agricultural way of life. Areas where this would have most likely occurred include areas of Central Europe where the early Neolithic Linearbandkeramik culture expanded rapidly from the Czech and Slovak Republics to the Netherlands (Dennell 1985: 125).

(c) Agricultural expansion through hunter-gatherer acquisition. The third model depicts agriculture as expanding into areas occupied by hunter-gatherers without any movement by a colonising population (Dennell 1985: 127). There are three assumptions to this model. First, contact between hunter-gatherers and agriculturists are more likely to occur in the vicinity of agricultural settlement than hunter-gatherer territory. Second, hunter-gatherers will alter their subsistence strategy if it is deemed advantageous to do so. Third, hunter-gatherers are aware of communities beyond their natural territories and of what they were doing, particularly what groups were planting. Eventually, hunter-gatherers pick-up some of the skills of the agriculturists (i.e. potting or cereal cultivation), as both require observation and experimentation. With time, these new practices supplement subsistence practices of the hunter-gatherers and they achieve their own economic and social transformation and become agriculturists without colonisation.

(d) Agricultural expansion into hunter-gather areas through resource migration. The final model allows for plant and animal dispersal to take place without the help or manipulation of humans. There is no reason why resources like sheep, goat, cereals or legumes could not have migrated into hunter-gatherer territory on their own. But it is less likely that they were adopted by hunter-gatherer populations to be used for long term use. However, the natural expansion of domesticates may have triggered an expansion of farming groups and may have been a reason why agriculturists expanded into parts of temperate Europe.

To conclude Dennell's arguments, he emphasises that contact between foragers and farmers were mostly likely to have taken place on the land of the agriculturists because they had smaller annual territories and higher labour requirements. Hunter-gatherers, on the other hand, used vast amounts of land and would have been less accessible to farmers. Foragers would have been aware about agriculture and were in a good position to help farmers because of their knowledge of the land. The rate and pattern of agricultural expansion into hunter-gatherer territory was "affected [as much] by the perception of hunter-gatherers as that of agriculturists" (1985: 136). In the end, hunter-gatherers did not fully adopt the "Neolithic package," but they would have selected at least some techniques and resources that would have been useful for them.

Availability models

Another indigenous adoption model is Zvelebil and Rowley-Conwy's (1984) availability model. These authors use Northern Europe as a case study because both Denmark and Finland show a long continuation of foraging adaptations and a long delay between the initial appearance of farmers and a full scale agricultural economy. Zvelebil and Rowley-Conwy believe that forager interaction takes place in three stages before a final agricultural society evolves. The first phase is the availability phase, when both groups are aware of each other but remain culturally and economically independent. The second phase is the substitution phase and this is marked by farming practices taking over hunter-gatherer strategies. The final phase is the consolidation phase and this phase represents a system that is based on full-scale agriculture.

The first phase of this process, the availability phase, is when farmers are aware of foraging groups and there is a slight exchange of materials and information. Farming takes place between settlements, hunter-gatherer groups however, do not adopt farming. Because of this, an availability phase exists between the two groups before the formation of an agricultural frontier. Both foragers and farmers maintain contacts but operate culturally and economically independent of each other. The phase ends when the foragers begin to adopt either elements of farming, or farming expands into territories of hunter-gatherers (Zvelebil and Rowley-Conwy 1984: 105). Contacts between foragers and farmers can occur at slow rates (even for several hundred years). The availability phase can include the exchange of goods like furs, raw materials and forest products for prestige items. Sites from this phase contain less than 5% of domesticates in the faunal samples when calculated on a regional scale (Zvelebil 1996).

The second phase, the substitution phase, has two sub-phases. The first sub-phase is considered external, when farmers move into hunter-gatherer territory, settle and compete with foragers. The second sub-phase is when foragers adopt farming without giving up foraging and their usual modes of subsistence. The outcome of either case is virtually the same: farming replaces a foraging economy. However, the reverse can happen if environmental conditions are adverse to farming and result in either: (1) hunter-gatherers no longer being able to compete with farming for resources if they are left to operate in a marginal niche, and (2) this niche will eventually becoming depleted and the foraging way of life ceasing to be a major contributor to the economy, particularly in terms of food supply, organisation of labour and socio-economic conditions. The major catalyst in this situation is the competition between two mutually incompatible ways of life (Zvelebil and Rowley-Conway 1984: 105). These competitions occur on several levels: land, food resources, and raw material (see Anderson 1976; Bender 1978; Sahlins 1974). Groups with a mixture of farming and foraging contain a wide subsistence range which can cause problems of scheduling and work force (Zvelebil and Rowley-Conway 1984: 105-106). This phase is the time of "presumed" neolithization. Archaeologically, this phase is said to include sites with less than 50% domesticates in the faunal sample on a regional scale (Zvelebil 1996: 325).

The last phase before the final transition to agricultural is called the consolidation phase. This phase is when "the social and economic structures of the old frontier mature to hinterland conditions" (Zvelebil and Rowley-Conwy 1984: 106). This is the first phase of a predominantly Neolithic economy and is marked by typical Neolithic traits: extensive and intensive growth of food production, and occupation of the best soils. Other characteristics include a marked secondary colonisation of sub-optimal habitats with more intensive farming practices. Archaeologically, domesticates constitute 50-100% of the faunal samples (Zvelebil 1996: 325). Hunting and trapping are not essential to the economic system but are still used for other industrial purposes. This phase occurs when socio-economic developments of an area become more settled areas and effects of a "frontier" disappear (Zvelebil and Rowley-

Conwy 1989).

By assessing which sites fall within one of the three phases, the agricultural transition can be monitored to a finer level than was previously possible. Many archaeologists have used the criteria of the final stage to enforce the notion of a rapid introduction of farming (Ammerman and Cavalli-Sforza 1984; Renfrew 1987; Neustupný 1987; Zvelebil and Dolukhanov 1991). The consolidation phase also rests on the two assumptions: (a) the plants and animals recovered from a site reflect the economy of a community, and (b) the economic change is linked to social and ideological change within a society (Zvelebil 1996: 326). The first point rests on the assumption that all taphonomic processes affecting deposition, preservation, etc. are understood. Secondly, the regional scale of economic reconstruction reduces the local variation in animal and plants species to provide a more accurate account of subsistence (1996: 326). The second assumption, however, recognises the link between subsistence change and socio-ideological factors.

The three-phase model is structured where the final outcome is farming, but length and availability are seen as connected to forager-farmer interaction and the organisation of labour in both economies (Zvelebil and Rowley-Conwy 1984; Zvelebil 1996: 327). Although the model cannot account for "reverse" transition (from farming to foraging) or instances where the substitution phase lasts for a long time, it can explain the existence of societies before full scale agriculture (Zvelebil 1996: 326).

Zvelebil believes that the interaction between Mesolithic hunter-gatherers and farmers took place within the agricultural frontier zone. The frontier zone can be divided into mobile and stationary frontiers. The former develops during periods of agricultural expansion and is associated with models of colonisation by demic diffusion (Zvelebil 1996: 333). This type of expansion has features like rapid population growth, extensive land use, frequent relocation, low subsistence and high labour costs and a preponderance of males (Zvelebil 1996: 333). The stationary zone, on the other hand, is associated with low population growth or stable situation populations and allows for the development of contact and exchange between foragers and farmers. In the circum-Baltic region, stationary frontiers were marked by periods of stability (an availability phase) and shorter periods of rapid adoption to farming (substitution phase-mobile frontier). In the west Baltic, the availability and substitution phases were long and conditions of a stationary frontier prevailed. In the contact zone of a stationary frontier, four types of development are common: (1) exchange of technical innovation and imports, (2) exchange of mates, (3) disease, and (4) ecological change. The ethnographic evidence for these different types of exchanges reveals that social and geographic distance are the two primary factors that determine the nature of exchange.

To conclude, the notion of the contact between foragers and farmers in an agricultural frontier zone no doubt had a direct effect on the nature and rate of transition to farming. These contacts may have delayed or accelerated the adoption of farming by indigenous groups at the end of the Mesolithic. The forager-farmer contacts nevertheless were mediated by both groups, and in many ways regulated the rate of transition. However, understanding forager-farmer contacts in different parts of Europe is an area of research that is still highly underdeveloped.

Discussion

The theories summarised in this chapter describe colonisation and indigenous adoption views on the origins of European farming. However, some archaeologists believe that by using information from both sides of the equation, a clearer picture can emerge. For instance, Bogucki (1996) recognises that there is considerable geographic and temporal variability in early agricultural settlements across Europe. He believes that soil moisture was a major determinant of where first farming groups settled, similar to van Andel and Runnels' (1984) theory. Evidence from site location in southern Anatolia and central Europe has shown a similar preference for flood plain and alluvial habitats. In these areas of Anatolia and Europe, colonisation is considered a more viable hypothesis (Bogucki 1996: 252-253).

Halstead (1996) has interpreted settlement patterns of Greece differently than van Andel, Runnels and Bogucki. He found that the spatial pattern of early agricultural groups in Greece showed no preference for ecological conditions. Very few early Neolithic sites have been found in the lowland of Macedonia and in the south-western mainland where there are river systems with well-watered fertile soil ideal for agriculture. If future research on settlement patterns reveals that populations of foragers persisted in these two areas until the advent of the early Neolithic, the distribution of farming settlements may in fact reflect the adoption of domesticates by foragers under stress. Also, one cannot ignore sites in this region that have revealed a continuity in occupation from Mesolithic to the Neolithic. Lepenski Vir and Franchthi Cave are prime examples of sites that have revealed an extension from hunting-gathering to agriculture. Bogucki interprets this situation as foragers' integrating domesticates into an existing subsistence system.

The question that of course remains is "why" did these groups change their subsistence strategy at all? Bogucki believes that the "stability" of a hunting and gathering way of life is an illusion and that it is more reasonable to assume that foragers were highly prone to fluctuation on seasonal and annual time scales. These unstable periods would have made agriculture a much more attractive option (Bogucki 1996: 253). This may of course explain the variability between forager-farmer interaction in different areas of Europe. The data from the North European plain has shown that domestic plants and animals became elements of a foraging way of life with appearance of full scale farming communities on the southern edge of the plain (Bogucki 1996: 250). The question of "why" did hunter-gatherers eventually change cannot clearly be explained in this region, however. It is possible that feral livestock were introduced to the foragers, or simply sedentism may have been appealing to the foragers. Either way, Bogucki (1996) clearly demonstrates that the transition of agriculture greatly varied across Europe. Other archaeologists, like Greenfield (personal communication; 1993) have emphasised the variability of early agricultural groups by examining the proportions of bones from wild and domestic animals, implying that some indigenous groups were integrating domestic plants and animals into their own economy. Dennell (1992: 91) also notes that acorns and hazel nuts were Mesolithic plant foods but were replaced by other stable, protein-rich plants like cereals or legumes. Cereals and legumes have high yields, are easy to process, and can be harvested in greater abundance than gathered plants like berries or nuts.

Conclusion

This chapter highlighted some of the current and more popular theories about the origins of agriculture. While some of the theories may appear to be narrow in their view of prehistory, each creates a template for further discussion and research. Although many strides have taken place on the subject, there are still many gaps that are present in our current understanding. The highlights of this chapter are listed below.

It is difficult to contest the concrete nature of colonist theories and it is arduous to reject colonist models because: (1) domesticated plants and animals are of Near East stock, (2) the length of time between the appearance of agricultural products in the Mediterranean basin and the formation of fully sedentary agricultural villages seems too short to result from acculturation, (3) the simultaneous flow of pottery, stone tools, cultigens and domesticates, (4) the earliest fully agricultural communities appear along or near the coast or rather than in the interior, and (5) there is little evidence for intensive wild plant use in the Mesolithic as precursor to agriculture (Donahue 1992: 76). Aside from the fact the early domesticates are from Southwest Asia, it is difficult to regard most of these points as solid evidence for a colonisation theory for reasons about to be mentioned.

1. Although Clarke mentioned in the 1970's that Mesolithic food production was poorly understood, there is still very little known about hunter-gatherer populations, not only in the Balkans and the rest of central Europe, but Greece as well. Since Greece was the "launch-pad" for agriculture in Europe, there is a dire need to understand the economy of the indigenous groups on the mainland and surrounding

islands. Very few Mesolithic sites have been investigated in this region. The one site that has shed some light on this issue is Franchthi Cave. The Mesolithic levels at Franchthi Cave revealed a broad range of gathered plants, including, oat, wild barley, emmer wheat, lentil, and two-row barley. Franchthi Cave may have been one of a chain of sites that linked mainland Greece and Turkey and may underlay the notion that a pre-Neolithic interaction existed across the Aegean (Renfrew and Aspinall 1990; Papthanassopoulos 1981: 32). However, the rarity of Mesolithic sites in Greece and the high density of Neolithic sites in Thessaly have led many archaeologists to the conclusion that farming was the result of immigrant farmers. But, the "absence of evidence is surely not evidence of absence" and additional Mesolithic sites in Greece are to be expected (Halstead 1996: 299). The same can be said of southern Yugoslavia, where the Mesolithic is virtually unknown. Srejović (1988) and Chapman (1989: 505) also note the dearth of Mesolithic sites in nearly all of southeastern Europe.

2. There is a growing recognition that colonisation cannot explain the spread of agriculture to Europe. Technology and subsistence strategies can spread through the diffusion of ideas and products rather than people (Gebauer and Price 1992). The best evidence of this comes from Northern Europe, where the idea of agriculture existed long before it was implemented. Groups in this area were slow or possibly hesitant to adopt agriculture as a way of life. This does not, however, explain the rapid dispersal of farming settlements in central Europe, particularly with the Linearbandkeramik farmers, where colonisation was more likely to have taken place.

3. There is variability in response to agriculture in various parts of Europe,

particularly when comparing the transition to agriculture in central Europe and Northern Europe. The former showed a quick dispersal, while the latter showed more of the effects of a "frontier" zone.

4. The final and most important point to be made here is that plant and animal domestication and the origins of agriculture would be much better understood if the criteria for recognising animals and plants were applied consistently (Jarman 1972; Jarman and Wilkinson 1972). Once this is achieved preoccupation with the "when" and "where" did domestication occur can be replaced with questions of "which resources may have been domesticated but later discarded in favour of others" and "why" did this happen (Dennell 1992: 91). Unfortunately, because the concept of the "Neolithic" has become pivotal for defining the beginning of agriculture, it has resulted in the underestimation of the subsistence strategies of hunter-gatherers and the continuity of previous foraging strategies (Dennell 1992: 93).

Because of these circumstances, the data analysed from the sites of Foeni-Salaş and Blagotin remain pivotal in understanding the strategies of agricultural exploitation and the origins of agriculture in the temperate zones of Europe. The paleobotanical data from the Balkans needs to be investigated both in terms of types of domesticates and wild seeds found, and in terms of its spatial distribution and significance. If foragers were developing into farmers, or if inhabitants of Foeni-Salaş and Blagotin are colonists from the south, than certain trends should be apparent in the data. If the inhabitants were indeed colonists, then we would expect to find botanical remains in segregated locales around the sites. None the less, it is important to understand the agricultural activities of Early Neolithic sites at the "site level" so wider global assumptions of the Early Neolithic agricultural exploitation and the origins of agriculture can be made.

CHAPTER III:
INVESTIGATING CROP CULTIVATION AND CROP PROCESSING ACTIVITIES IN THE ARCHAEOLOGICAL RECORD

Crop cultivation is a distinct economic activity based in complex human behaviour that may be reflected in an archaeological context. The remains of carbonised seeds found on archaeological sites are the end-products of human activities, including crop processing and crop production (Dennell 1978; Jones 1984; Hillman 1984). This chapter will discuss the types of crop production and the processing activities that may have taken place in prehistory. Two lines of evidence will be used: (1) ethnographic studies, and (2) documented ancient agrarian agricultural practices.

Systems of Crop Production

Crop production pertains to the activities that result in mature plants being harvested for use (Hastorf 1988: 122). The production of seed crops includes preparing soil and terrain for planting. This may encompass soil turning, fertilising, watering, weeding and collecting plants. Harvesting can include reaping or beating plant tops to extract seeds, plucking mature fruits, uprooting an entire plant, or furrowing for subsurface roots or tubers. Harvesting can occur more than once during a growth cycle (Hastorf 1988: 122). Crops can consist of commodities other than food: raw material, construction material, fuel, oil, fibres, fodder, etc.

Virtually all activities that pertain to crop production, such as beating or reaping, take place in fields where crops are grown. This, however, makes archaeological detection of crop production difficult because production does not take place in habitation areas of a site where archaeologists usually excavate. It is very rare that investigators excavate fields to uncover crops and artefacts for direct production. Consequently, archaeologists will use indirect data to study crop production. This type of investigation can be done by: (1) investigating crop ecologies, (2) mapping field systems, (3) excavating fields for plant remains, or (4) examining the associations of harvested crops with weed seeds collected from habitation sites (Hastorf 1988: 122). In some areas of the world, certain crop locations are restricted by ecological conditions (climate, slopes, etc.), in which case certain taxa can be inferred from the types of ecological conditions that constrain them (Hastorf 1988: 123). This method of investigation can also be practised archaeologically be eliminating species that are not likely to be found growing in a particular region.

Another method for investigating crop production is to correlate weed seeds with domesticate seeds (Hillman 1981, 1984). Certain types of weed seeds are normally found in association with certain crops. Comparing the archaeological frequencies of weeds and grains with observed modern day frequencies may indicate the type of production technique that may have been used in that context. Different farming procedures produce different plant compositions, and this can be reflected numerically between wild seed and crop seeds.

> *if* the pattern of variation in composition corresponds with the distribution of particular classes of site context, and *if* it is possible to assign to each context-type specific activities concerned with crop processing, the same progress may be made towards limiting the possible range of agricultural activities likely to have generated crop products of that type. (Hillman 1981: 124-25).

Hillman found that the compositions of charred plant remains provide a solid basis for assigning past functions to features, structures or even entire sites (1981: 125). He further states that observing context-related events of charred seed remains allow for the "erection of hypotheses relating to the farming practice that, in some cases, may be tested by simple experiment" (Hillman 1981: 125). A prime example of this is the Butser Farm Experiment in Hampshire, England. This farm experiment was set up to explore and understand theories and ideas on daily life in the Iron Age. The experiment grew stands of emmer (*Triticum dicoccon*), einkorn (*T. monococcum*) and spelt (*T. spelta*), and carried out all stages of processing and production using ancient Iron Age technology. Crops were examined in terms of their productivity, weed infestation, processing and storage (Reynolds 1979).

Hillman (1981) also believes that it would be possible to discover which prehistoric tilling methods may have been employed based on the weed seeds recovered in sites. Moreover, the sowing times of various crops could be detected by the weed flora composition, because some weeds grow as with winter wheat, while others survive in spring-sown fields. Weeding and harvesting methods can be identified in archaeological plant samples if the proper contexts are sampled (i.e., storage areas).

Cultivation Techniques

This section will discuss some of the different techniques of cereal and legume cultivation. It is important that these crops be discussed because they are the most common type of crops found in early agricultural society of the Old World Neolithic. Cultivation is defined here as the growing of plants from seeds, bulbs, shoots, etc. However, for the purposes of this study, crops grown by seeds will be the only types discussed here. Most contemporary cropping systems can be grouped into three categories: shifting cultivation, grain cultivation under short fallow, and leguminous crop rotation (Dennell 1978: 33).

Shifting cultivation

This cultivation system is also known as swidden, slash-and-burn, long or forest fallow. This system of cultivation does not use the same plot of land for more than a few seasons. Plots are only used for a few seasons because they quickly become unproductive. When fields become unproductive, another plot of land is cleared off and planted. There are two advantages to shifting cultivation: a low input of labour and a high crop yield (Dennell 1978: 37). Based on palynological data, it has long been hypothesised that shifting cultivation was practised in Europe since the Neolithic (Clarke 1952, Dennell 1978: 37). This, however, is still debated.

Grain cultivation under short fallow

Short fallow is the practice of allowing land that is reaped to remain uncultivated periodically. Fallow land, or land that is left unplanted to restore fertility usually consists of weeds and grasses, not shrubs or tress (Dennell 1978: 39). This system is similar to shifting cultivation because breaks between planting seasons are of equal length. However, the main difference between shifting cultivation and fallowing is the *type* of vegetation that is cleared. Short fallow clears off weeds from the last crop harvested, while shifting cultivation clears off savannah grassland or secondary forest. The benefits of this type of system are threefold. First, this system allows for high crop yields. Second, short fallow reduces the weed population of arable land. Third, after the initial clearing of land, a much higher input of labour is required for short fallow rather than shifting cultivation.

Leguminous crop rotation

Leguminous crop rotation supplements regular fallow techniques (as described above) by rotating fallow with leguminous crops. This is the most productive of all agricultural systems. Soil is replenished with nodules of *Rhizobium radicola* which form on the roots of legumes and in turn provide soil nutrients that benefit later crops (Dennell 1978: 40). This method is very labour effective and can easily result in a labour surplus during the year, but a shortage during the harvest. Another benefit of the procedure is the high crop yield. Plots of land that have had four-course rotation with legumes produced much higher yields than when wheat is alternated with fallow periods (Dennell 1978: 40). Even if fallowed crops are manured, yields do not exceed that of leguminous crop rotation. This system prevents weed growth and allows for more effective usage of soil nutrients (Dennell 1978: 40).

Techniques of Crop Processing

Crop processing is the stage of production that includes transporting plants to the settlement and readying plant parts for use as food, shelter, and fodder. Crop processing can be defined in several ways: preparation, storage, and cooking of all edible and inedible plant parts (Hastorf 1988: 125). Most of these activities take place in the habitation area of a site, unlike production which takes place in the field. These activities leave material traces of seed (grains, weeds, etc.) as processing residue, which can easily be recovered by archaeologists (Hastorf 1988: 126; Dennell 1978; Jones 1984, 1987). The residue of processing techniques contains unique combinations of botanical remains (particularly the types of weeds), and this may allow for the interpretation of specific stages of crop processing. The stages of interpretation will be described in the next chapter.

Harvesting

Harvesting is the first step of crop processing. Cereals are reaped by hand stripping or by using a sickle or scythe; a sickle however, is not always appropriate. The straw is either cut quite low to the ground or broken off near the root of the stand. Reynolds (1979: 64), in his experimental farm noted that emmer wheat, einkorn wheat and spelt contain ears at various levels, as much as 75 cm apart, on the same plant. This makes sickle reaping difficult because one cannot simply grab a handful of ears and make a neat cut with a sickle. Reaping was found to be much easier by hand picking rather than cutting with a sickle. Picking heads off stands is a practice still found in modern day Spain (Reynolds 1979: 64). Pulses can be uprooted with a blunt sickle or reaped with a scythe (Jones 1984: 45).

Once reaped, cereals and pulses are tied in bundles and left to dry for a few days. Threshing is much easier when ears are dry and brittle. Harvested crops contain three main components: (a) *Cultigens*, which are the actual crop cultivated, (b) *Weeds*, which are uncultivated plant taxa that benefit from human disturbance or impact (Blumer and Byrne 1991: 24), and accidentally reaped with cultigens (Dennell 1978: 33), and (c) *Commensals,* which are cultivable plants that are found as single strands in a crop (i.e. wheat in a field of barley - Dennell 1978: 33).

Threshing

Threshing releases grains from chaff and seeds from pods. Threshing can be done a number of ways: with a long stick (where crops are pounded on a threshing floor), or by trampling (the harvested crops can be trampled by animals to release the seeds). Threshing with animals or threshing with a stick leaves no effect on the composition of seeds (Hillman 1981: 153; Jones 1984: 45). Threshing may have also been done using flails, but there is no archaeological evidence for this.

Emmer, spelt and einkorn are all bearded wheat and are extremely difficult to thresh (Reynolds 1979: 63). Reynolds claims that it is easy to understand why these three grains were superseded by varieties that are threshed much more easily, such as club wheat (*T. compactum*) and bread wheat (*T. aestivum*).

There are vast differences in threshing methods between villages located in temperate moist areas (with wet summers), versus those located in arid regions. In wet areas, threshing is normally done in confined indoor areas by lashing (or heading) separate sheaves, or by using sticks or flails. In dry areas, threshing takes place outdoors with any method that is convenient - trampling animals, pulverising with flint-bladed sledges, or by beating with sticks or flails (Hillman 1981: 130). As of yet, there are no documented accounts of threshing floors (Fowler 1983: 197). It is also very difficult to distinguish if threshing takes place in the habitation area of a site, or in the field.

Ethnographically, there is variation in the location of threshing floors. In Northwest Spain, these practices take place in a private barn or house (Fowler 1983: 197). There is great variability as to whether or not threshing takes place in or outside of the habitation site, and there are no general trends found as of yet. This makes archaeological investigation of threshing difficult.

Winnowing

This stage is defined as separating out the chaff and straw (leaf, stem, pod) from the grain. This is often done by tossing the freshly threshed crops into the air and allowing a light breeze to carry away the chaff and straw fragments (Jones 1984: 45). The heavier grains simply fall down and are captured. If crops are too large to be threshed, or cannot be winnowed at once, repeated stages of threshing and winnowing take place (Jones 1984: 45). Barley requires repeated threshing to break the barley awns (hummeling).

The final stages of winnowing usually require that large fragments of straw be raked off the top of the grain pile. For example, in Amorgos, Greece, this was done using a thyme brush and a small hand rake (Jones 1984: 45). There are only small differences in the composition of crops by use of different winnowing methods.

Coarse sieving

Coarse sieving cleans crops of debris that do not disappear from threshing and winnowing. This excess debris includes large straw fragments, weeds, heads, unthreshed ears and pods. This stage usually occurs immediately after winnowing takes place (Jones 1984: 46). In Amorgos, this practise was done by laying down a winnowed pile of grain and allowing the wind to blow the lightest chaff and straw fractions to one end of a threshing floor and leaving the grain at the other end. Heavy straw fragments that are to be sieved are found between the piles of grain and chaff. This "between pile" contains fragments of straw and grain. Rakings from the top of the grain pile (that collect during winnowing) are also sieved. Afterwards, the grain and the chaff are kept apart for separate use. Fodder crops are not sieved (Jones 1984: 46).

Fine sieving

A stage of fine sieving can take place to rid the grain of accumulated debris (that may appear while in storage), and for the removal of contaminants smaller than the grain itself (i.e. weevil-infestation). This stage is most likely to take place just before grains are to be milled or ground into flour. The light components (such as straw) that result from sieving are scooped off and mixed in with the bottom residue (the residue that has been sifted through the sieve) and used as feed. Fodder crops are not fine sieved (Jones 1984: 46).

Hand sorting

Hand sorting is a final step done to remove grains of weed seed, straw nodes, etc., that are not removed from previous steps of winnowing and sieving (Jones 1984: 46).

Processing grains with glumes

Grains with glumes (emmer, spelt, and einkorn) must go through additional stages of processing to remove the tough glume covering. In addition to the above stages of winnowing, threshing, etc., these grains must go through stages of pounding (to release the grains from glumes), a second winnowing as well as additional stages of coarse and fine sieving. In wet climates, however, grains with glumes must be mildly parched as the grains must be dry before pounding. Parching, renders glumes brittle so they can be pounded and removed (Van der Veen 1992: 81). If this step is required, larger crops are parched piecemeal - from day to day, as needed, and not all at once (Hillman 1984). Winnowing is repeated to remove the newly released light chaff fragments and light weed seeds. Coarse and fine sieving will remove remaining weed heads, large weeds, straw nodes, and glume bases (Van der Veen 1992: 81).

Conclusions

Although today there are several different techniques in crop husbandry and crop cultivation, in the Neolithic there were considerable limitations on these practices, particularly in the technology and labour available (Dennell 1978). Ethnographic accounts (Hillman1984; Jones 1984) reveal that crop processing is accomplished in a limited number of ways. Even when technology and labour vary from group to group, the processing stages remain basically the same. For instance, even though all crops must be threshed, how the crops are threshed may vary among groups. All harvested crops must go through the same stages of harvesting, drying, threshing, raking, winnowing, fine and coarse sieving. Seeds with glumes go through additional stages (Hillman 1984; Jones 1984; Van der Veen 1992). However, it is difficult to define archaeologically how crops were harvested as the technology for this stage (asides from sickle blades and microliths) is almost non-existent in the archaeological record. It is important that we define these processes as much as possible if we are to understand the significance of certain crops to the husbandry regimes and subsistence of prehistoric groups. The next chapter will discuss the models constructed to define different stages of crop processing archaeologically.

CHAPTER IV:

INTERPRETING CROP PROCESSING ACTIVITIES IN THE ARCHAEOLOGICAL RECORD

Each stage of crop processing creates products and by-products. The stages of processing can be determined by examining the proportions of grains (products) and chaff, straw and weeds (the by-products) (Van der Veen 1992: 81). However, not all by-products survive, and some by-products are mixed with debris from the surrounding environment, making it difficult to simply correlate by-products with a specific activity. However, careful observations of modern day agrarian systems have revealed that there are enough by-products that become carbonised from day to day activity. Therefore, careful analysis of the context and composition of archaeological samples may reveal parallels to the ethnographic record, or at least provide enough information so that stages of crop processing may be deduced. There are four by-products that are most likely to be found in an archaeological context: (1) winnowing by-product, (2) coarse sieve by-product, (3) fine sieve product and, (4) fine sieve by-product.

The distribution of carbonised seeds is never the result of randomness. Carbonisation will almost always be directly linked to an activity (Fasham and Mork 1978: 364). Prehistoric plant foods recovered on archaeological sites should correspond to the food processing and refuse disposal activities they were involved in (Dennell 1978: 27). Therefore, different contexts are likely to have different frequencies of carbonised seeds based on the plants used and the activity they were involved in (Fasham and Monk 1978: 364). Carbonisation of plant materials occur if they are exposed to temperatures of 250^0 to 500^0 C under low oxygen conditions (Hillman 1981; Lopinot 1984). Ample amounts of oxygen will turn a substance to ash at high temperatures, while carbonisation will leave a substance (such as seeds or fruits) 50 to 60% elemental carbon and resistant to further decay (Meyer 1980: 403).

Dennell (1974, 1978), Jones (1984, 1987), and Hillman (1981, 1984) have each constructed models to archaeologically define the stages of crop processing for free-threshing (bread wheat, rye, and barley) and glume wheats (emmer, spelt and einkorn). All three models have one thing in common: they note the importance of weeds for deciphering stages of crop processing. There is, however, variation in technique and application used to unfold the stages of crop processing. Dennell (1974, 1978) examines the context and composition of grains and weeds for the evidence of crop processing. Jones' model uses statistical analysis based on the behaviour of the different weed seeds throughout the crop processing sequence, and examines the relative proportions of different weed seed categories (1984, 1987). Hillman's model is based on the qualitative information available in his diagrams (Figures 3, 4, 5).

It is important to review these models because each model provides clues as to: (a) what types of activities were necessary to processes cereal crops, (b) what the primary crop products were in each site, and (c) the significance of certain crops to subsistence.

The Dennell model

Dennell (1974, 1978) used observations of traditional pre-industrial grain processing in the Old World to construct models that depict different crop3 processing activities. He established a sequence of processing steps based on the size of grains and grain parts, and the wild seeds generated at each step of processing. This model of crop processing and deposition was examined in terms of which "types" of contexts (e.g. storage areas) would yield specific crop processing activities and specific archaeologically visible residues (Dennell 1974, 1976).

Dennell emphasises that it is important to keep in mind that certain activities, such as grain cleaning or winnowing, remove grains of particular sizes. The mere presence of a grain cannot be used as a means of assessing the phylogenetic status of a crop unless the processing stage is understood (1976: 284).

Dennell (1978) examined several Early Neolithic sites consumed by fire, and noted that the charred seed remains were found in three forms: (1) crops fully processed and ready for storage, (2) partially processed crops with weed residues, and (3) crop processing residues. Using the size of grains (and grain parts) and the associated weeds from each sample, Dennell concluded that different contexts contain different stages of processed grain. For instance, partially processed samples were small and heterogeneous and contained more weed seeds. These sample types were commonly associated with contexts like floors of structures. Dennell also believed that the presence of certain weed species reflected different stages of processing. For instance, seeds of *Rumex sp., Polygonum sp., Galium sp.* and *Linum sp.* represent weed fractions or legume harvests that have undergone stages of winnowing and cleaning.

Below are a few examples of the types of samples recovered in different contexts at Chevdar and Kazanluk. Dennell applied his techniques to two Neolithic sites (Chevdar and Kazanluk ca. 5500-5000 BC) and an Early Bronze age site (Ezero ca. 3000 BC) in Bulgaria. By using the variables of grain size, archaeological context and composition (of seeds to weeds), he examined the carbonised residues and found that six different types of samples were found in different contexts of each site. The contexts include jars (context A), ovens (context B), floors (context C), middens or rubbish pits (context D), impressions in pottery (context E), fill deposits (context F) and faecal deposits (context G).

Type 1: Samples consist almost entirely of seeds or grains of one species, thus, the range of weed species represented is limited. No spikelet fragments are found. At Chevdar, these sample types were found associated with ovens. These samples were large and most likely represent fully processed crops. The average grain size found in these samples were small and uniform These samples may represent fully processed crops ready for storage (Dennell 1974).

Type 2: Samples consist of grains of several species but the proportion of cultigen seeds is over half the total. The weed seeds that are represented are less than half the total amount and consist of a moderate range of species. No spikelet fragments are found. The floor deposits at Chevdar and Kazanluk revealed a very high proportion of weed seeds and several species of crop plants (1974: 278). Dennell's explanation as to why these samples were different from the type 1 samples is that the type 2 samples may represent a different stage of production or the residue of a crop processing activity. The absence of spikelet fragments may indicate that the crops have already been threshed and winnowed.

Type 3: Samples are small and consist of seeds or grains of several plant species. No spikelet fragments are present. These sample types derive from fill deposits but are not carbonised in situ. At Chevdar, it is possible that these seeds derived from day to day activities performed in the life of the settlement and eventually this day to day debris accumulated as post-depositional fill (Dennell 1978: 88). This provides information on the amount of plant food that was accidentally carbonised, or the amount of wastage that was tolerated by the community. However, considering that these samples were small in comparison to the amount of soil floated, only a small percentage of the material that used by the inhabitants was actually wasted.

Type 4: Samples do not contain any seeds or grains and consist primarily of straw and glume fragments. At Chevdar, samples of this type consisted primarily of chaff fragments and most likely represent winnowing residue. Unfortunately only exceptional preservation conditions can yield such samples (Dennell 1978: 89).

Type 5: Samples contain several species of plants, but cereals are the most important. No spikelet fragments are present. Since there were no spikelet fragments recovered in these samples, the remains were already husked. All these samples were obtained from midden deposits at Kazanluk. The low density and the high frequency of refuse found in association with these sample types indicate that the seeds derive from activities performed elsewhere on the site. Because of this, it is difficult to decipher the types of activities these samples were involved in. When

Dennell observed the composition and grain size of these samples, he interpreted the samples to be remnants of fully-processed crops. There are two reasons for this: a) the size of cereals were large (larger than type 2 cereals) and, b) there were very few weeds associated with these deposits.

Type 6: The proportion of cultigen grains are small, but consist of several species. The proportion of weed seeds are high and consist of many species. There is a high frequency of spikelet fragments. Samples of this type were recovered in an accumulated refuse deposit, a floor deposit and an oven deposit in the Karanovo I settlement at Kazanluk. These samples revealed a high proportion of weed seeds and spikelet fragments than the first samples. Additionally, the average size of the cereal grains were greater than type 2 but smaller than the oven and midden samples (at Chevdar). Dennell interprets these samples to be the result of crop processing activities.

<u>The Hillman model</u>

Hillman (1981, 1984) noted that there are 30 operations involved in converting crops to food for consumption. These operations were observed in present day agrarian systems in Turkey. Ethnographic accounts in Turkey reveal that each stage of operation produces a unique composition of products (the final outcome of each processing stage) and by-products (the residue of each processing stage). Hillman found that samples of charred remains from archaeological sites exhibit compositions similar to the different stages of crop processing observed in Turkey. He summarised his observations in three flow charts (see Hillman 1981 figures 2-4), each of which depicts the stages of crop processing and the residues of each stage. These models take into account: (a) the different geographic areas where crops might be grown (wet or dry), (b) the different harvesting methods, and (c) the effects of sheaf burning on the composition of products and by-products produced at each stage of processing. Hillman claims there is always consistency in the composition of products and by-products produced at each stage of processing, even when comparing products from different households of different villages (1981). However, there is flexibility in the steps of the processing sequence where certain operations (i.e. threshing) differ among groups. Fortunately, this has no effect on the composition of products and by-products of crop processing (Hillman 1981, 1984).

The composition of modern crop products for each stage is distinctive. However, the stages of crop husbandry are not always apparent in archaeological sites with large numbers of rich and diverse charred seed remains. Therefore, one must construct a system that will find the correlation of different seed combinations and extract information on the husbandry and processing of crops, based on these correlations. This is done by testing the significance of the relationship between the horizontal distribution of site contexts, and components in sample composition (Hillman 1984: 16).

Hillman applied his model to the charred seed assemblages recovered at Cefn Graeanog, an Iron Age/Romano-British farming site in England. There are two possible ways of statistically examining botanical remains for products and by-product activities. Hillman however, advocates the following method:

(1) All charred botanical material recovered is fed into a computer and then statistically manipulated using Principle Component Analysis (PCA). Each taxon

receives a separate score for each sample to be entered. Scores are grouped and compared by the composition of each sample through computer generated groups. The distribution of different groups can be tested by examining the correlation among the groups and the distributions of excavated structures.

(2) Each class of chaff and grain is classified by direct reference to ethnographic models. There are several steps to this process. (a) All scores of items of like-classes are amalgamated from samples. (b) All classes with amalgamations that are represented in a few samples are eliminated. (c) All class frequencies are converted to ratios from ethnographic models. This step provides clues to questions relating to husbandry and processing methods. (d) Using Principle Component Analysis (PCA), test similarities in composition between samples from any phase and between samples from any context, such as floors or hearths. (e) Samples are then grouped on the basis of systematic correlation between the distribution of sample groups and the distribution of excavated features. One must also eliminate variation within each phase and test for systematic changes through time (i.e. variation between phases).

Once the above calculations are completed, there are four additional steps in classifying remains. These steps are:

Step 1: Classification of each species by the probable mode of arrival of its seeds on the site. This first step organises the different species represented on a site by classifying them by the possible means of arrival on a site. For example, some seeds that are recovered on a site can be classified as "seeds gathered as food" or "seeds gathered as fodder." This classification varies from site to site because the types of seeds represented and sites investigated is never uniform. When Hillman attempted to classify the species of his own site, he concluded that there were six different "modes of arrival." Each mode of arrival was designated a classification number ranging from A1 to A6. For instance, all seeds, chaff and grain (components of crop products) arrive on site by harvested sheaves, ear or straw and were classified A1. Seeds from plants gathered as foods, condiments, medicines or dyes were classified as A3.

Step 2: Subdivide all species that were classified as the components of crop products (A1 from preceding step) by the type of crop product or by-product in which each item is normally found. The objective here is to find out which processing stages are represented on the site. This step is a further subdivision of the A1 class from above (components of crop products). In this subdivision, all identified segetal weed seeds and cereal components are classified according to the type of crop product they represent. Each class is labelled from B1-B6. Weeds and grains are treated separately in this subdivision. For the latter, all components (i.e. glume bases) are tallied according to the seven different products in (Table 1). For example, the classification of B1 represents winnowing waste, which is produced in steps 4, 5, and 10 (in flow chart 3). Weeds are classified according to their

(i) ratio of surface area to weight (i.e. their winnow ability),

(ii) seed size (i.e. sieve ability), and

(iii) and seed headedness (seeds that are produced in capsules or capitulae and released only in the coarse of processing. These assignments are made in direct reference to ethnographic models and flow charts.

Step 3: Classification of segetal weeds (from class A1) by their growth habit and height when growing in crop stands. This is a further classification of weeds assigned in the A1 classification. The objective in this classification is to extract information on harvesting methods. For instance, Hillman noted that weeds like *Ploygonum convolvulus*, which do not grow very high (relative to crop stands), can be associated with harvesting methods such as twining (when crops are uprooted or reaped at low or medium height), or weeds like *Agrostemma githago* which grow about three-quarters the length of crops and require a medium or low reaping. However, Hillman suggests that step 3 is optional, and in some cases may even be dubious because soil and water greatly effect the height of crops.

Step 4: Classification of Non-segetal species (i.e. classes A2 TO A6) by the habitant in which they probably grew. All species other than crops and weeds are classified according to the habitat which they were likely to have derived from. When Hillman used this application on his own site, he concluded that particular species of plants arrived on site by non-arable habitats. This observation provides clues to the type of vegetational resources available in the area during site occupation (Hillman 1984: 27). Hillman's use of this method revealed that non-segetal species could be divided into four groups: D1 -- weeds of waste land (ruderals); D2 -- pasture of heath species; D3 -- plants of cleared woodland or woodland fringes and glades; and D4 -- marsh and bog species.

Once the above classifications are completed, each sample is statistically analysed. Two steps are involved in this process. The first step requires that all scores be amalgamated for all charred seed remains assigned to the same class (i.e., B2, A1, D3). These classifications are added up to provide class totals. When Hillman amalgamated his results there were two different outcomes. The first outcome was that one class was represented in more samples than were any of its constituent taxa (1984: 28). Second, class totals for any one sample were larger than scores for individual taxa. Therefore, the difference between the archaeological samples to the class totals were most likely a "genuine" reflection of the differences in human activities.

The second step after classification is to delete taxa from further analysis at two levels as follows: The first is the deletion of individual species, particularly species that could not be classified in systems A to D. The second is the deletion of whole classes, particularly classes with A to D, that are present in only a few samples of charred remains. Once the above two steps have been completed, the absolute frequency of each class (e.g. the total score of class A) is converted to a percentage (Hillman 1984: 32). Absolute frequencies can result in misleading comparisons of different samples, however. The solution is to convert all class totals to percentages. Once percentages have been calculated, they are converted to ratios and them compared between class totals. When small numbers of samples are involved, calculating ratios is unnecessary because the composition of samples and the composition of equivalent present-day products is apparent from direct comparisons of class totals.

By converting absolute frequencies to percentages, there is a diluting effect on extreme or high numbers. Also, when class and taxa totals are compared with each other, the frequency of one item is expressed only relative to the others combined

(Hillman 1984: 32). Comparing the ratios between class totals offers a direct answer to questions that relate to the crop economy and human activities, particularly with the manipulation of plant resources. For example, to discern if a prime grain sample is charred in bulk storage or in the coarse of preparing foods, one must compare the ratios between B4 (grain in a semi-clean state) and B6 (grain that has been hand sorted and ready for preparation). B4 grain consists of the by-products from hand sorting (waster from B5). The most common characteristics of B5 weeds are seeds that are of the same size as the grain that could be removed by sieving. Hillman noted in his ethnographic studies that a B5:B6 ratio is more than one weed to 20 in grains that are in bulk storage. Values less than 1:20 identify the product as B6 - a clean grain that has been hand sorted and charred in the process of food preparation. The use of Principle Component Analysis separates out clusters in scattergrams and should find groups with narrow ranges of B4:B6 ratios.

When large samples are involved, it is necessary to use computerised systems of analysis like PCA. PCA finds patterns of variation in the values of different reactions from each large number of samples then measures the degrees of similarity between samples and finds a means of classifying them (Hillman 1984: 35).

The Jones model

Interpreting charred seed assemblages can be done by using an internal or external approach (Jones 1987). The internal approach, pioneered by Dennell (1974, 1976, 1978), examines the (a) context of seeds assemblages, (b) composition of seed samples, (c) measurements of grains, and (d) seed density, in order to interpret or distinguish crop processing activities. The external approach is somewhat different than an internal one. The external approach statistically analyses ethnographically collected samples of seed remains generated by different stages of crop processing, similar to the Hillman model just described. The advantage of the external approach is that interpretations are based on actual observation of recovered seed assemblages. Jones (1987) advocates an external approach but her technique is somewhat different from the Hillman model just described.

Weeds found at different stages of crop processing contain certain "characteristics" relevant to crop processing. For example, small, free, light weeds (SFL) are characteristic of seeds associated with winnowing. Jones emphasises that the characteristics of weeds rather than the weeds themselves are important for distinguishing crop production in archaeological samples (Jones 1983, 1984, 1987). Jones advocates this method because archaeological seed assemblages are bound to be different than ethnographic ones. Therefore, it is important to observe the characteristics of weeds assemblages. These characteristics include:

1. The **"aerodynamic"** qualities (particularly weight) of weed species.
2. The tendency of grains and weeds **to remain in heads** despite being threshed.
3. The actual **size** of the weed seed (Jones 1987: 312).

Jones developed the external approach by examining the products and by-products generated by processing free-threshing cereal and pulses from an agrarian farming community in Amorgos, Greece. When weed species are grouped into these characteristics, the separation of products and by-products can be achieved (Jones 1987: 313). Although other models of this nature have used chaff and straw ratios to crops (see Hillman 1984, 1981), the use of seeds is more successful because it permits the discrimination between processing groups for pulses and weeds where chaff is not usually preserved (Jones 1987: 312).

Jones implemented her model on the botanical remains recovered from the site of Assiros Toumba, a Bronze Age settlement in Greek Macedonia. At Assiros, samples were extracted from various contexts: postholes, pits, floors, etc. The crops recovered were pulse, bitter vetch, free-threshing cereals, 6-row hulled barley, bread/macaroni wheat, broomcorn millet, einkorn, emmer and spelt. Through ethnographic analogy, Jones noted that seeds most likely to be charred will be the by-products generated from winnowing, coarse and fine sieving. At Amorgos, these products were frequently burnt as fuel (Hillman 1984; Jones 1984, 1987). The products of fine sieving however, can either go into storage immediately after sieving, or they can be stored for periods of time before sieving and run the risk of accidental burning in storage (1987: 314).

To distinguish the four processing groups from ethnographic data, Jones used discriminant analysis (using the "direct" method from SPSS, Klecka 1975), using winnowing, coarse sieving, fine sieving and fine sieve products as the predefined groups to be discriminated (Jones 1984: 49). This was first done by using the percentage of weed seeds in each category, followed by the square roots of percentages for the discriminating variables. Jones claims that the use of discriminant analysis reduces the discriminating variables to three composite functions that maximise the statistical separation of the four predefined groups (1984: 49). Discriminating variables contribute to discriminant functions to varying degrees and loadings of variables on each function is taken as a measure of their contribution to that function. Therefore, variables that load high (positively or negatively) are more likely to contribute to variables that load low. The discriminating variables that were used were based on 30 species, and the ratios of crop seed to weeds (by number and weight). Although there are several stages to crop processing, the entire sequence can be narrowed down into four major products and by-products:

Winnowing by-product. All winnowing products would be amalgamated into one pile. The remains of coarse sieving and raking would be sometimes combined with winnowing by-products and used as fodder. If large amounts of this by-product accumulated, it would be placed in storage, in which case, it ran the risk of accidental burning. Winnowing products may also be used as fuel. The seeds commonly associated with this by-product are small, free, light seeds (SFL).

Coarse-sieve product and by-product. The by-products of coarse sieving are the least likely product to be found archaeologically. These remains are relatively short lived before they are used as fodder. Hillman noted that this product many also be used as fuel. The weed seed remains most likely to be recovered at this stage are small, headed, light (SHL), small, headed, heavy (SHH) and big, headed, heavy (BHH).

Fine sieve product. Fine sieving usually occurs as piecemeal throughout the year. Products that are passed through a fine sieve can later be used as chicken food. With the absence of fowl, fine sieve products can be directly thrown onto household fires (Jones 1984: 47). The seeds at this stage are small, free, heavy (SFH).

Fine sieve by-product. Fine sieving usually took place just before it was processed (milled) into food for cooking. In wet areas, grains can be kiln dried before storage which increase the likelihood of charring. Weeds commonly associated with this stage are big, free heavy (BHH) (Jones 1984: 47).

Although Jones advocates an external approach to examining crop agriculture, she emphasised that an internal approach should be used to accommodate for the limits that the external approach has. The internal approach, unlike the external one, accounts for the preservation and other variables that are not usually detected by ethnographic analogy. There are three factors to be considered in the internal approach:

1. The **density** of charred seeds (per litre of soil). This provides some indication of the rate of deposition of material and helps distinguish between charred refuse discarded gradually over a period of time and the charred remains of single accidents during storage, parching, cooking and so on.

2. The state of **preservation** of seeds (on a 1-5 scale devised by Hubbard, unpublished). This may indicate how long charred seeds were exposed before burial and help distinguish between storage products burnt in situ and refuse discarded in secondary or tertiary contexts.

3.The degree of **distortion** of crop seeds (on a 1-6 scale devised by Hubbard, unpublished). This may reflect the circumstances of charring and so aid in the distinction between deliberately burnt refuse and accidentally burnt products (see Hubbard 1976) (Jones 1987: 317).

When Jones applied Principle Component Analysis to the above predefined categories in her analysis of the material from Amorgos, she obtained the following results. The first function contained high positive loads for large-seeded weeds and high negative loadings for weeds that commonly remain in "heads" or with appendages (Jones 1984: 51). The second function separated the fine sieve by-product positively with a relatively high positive loading for small-seeded weeds, and high negative loadings for big or headed weed seeds. The third function separated the winnowing by-product (negatively) and coarse sieve by-products (positively), with high positive loadings for seeds that remain in heads and high negative loadings for light weed seeds (see Jones 1984 figure 5). Jones found that if there was no distinguishing whether the fine sieve product was charred before or after storage, the discriminant analysis was accurate 84% of the time.

In total, 29 weed taxa were found in the archaeological samples at Amorgos and this resulted in a successful discrimination and categorisation of weeds according to their characteristics. All archaeological samples could be classified either as fine sieve products or by-products. No products represented winnowing or coarse sieve by-products. Even when discriminant analysis was performed comparing one processing group with the remaining three individual groups, all groups were discriminated successfully and the fine sieved products were correctly classified (Jones 1984: 52). Weed seeds were distributed amongst various products and by-product were dispersed based on certain characteristics of the seeds themselves. Throughout her analysis, Jones noted that the same species will occur archaeologically as well as ethnographically.

Since the fine sieve products and by-products were the only processing groups represented in the archaeological samples, Jones repeated her analysis using control groups and the discriminating variables of big, free, heavy (BFH), and small, free, heavy groups (SFH). The first two discriminant functions separated the products and by-products successfully. Therefore, the Assiros products were analysed correctly and represent both fine sieve products and by-products.

Jones concludes that all weeds must be included in the analysis, even if they are known to have other known ethnographic uses. In this analysis, if weeds with other known uses were excluded from calculations, there would not be enough seeds to statistically manipulate. Thus, all weeds must be calculated and species not present as weeds much be excluded (i.e., the seeds of fruits or nuts).

Principle Component Analysis (PCA) was used separate by-products burnt as refuse from products that are burnt by accident. Jones noted that the density of charred seeds and big, free, heavy weed seeds load strongly in one direction (negatively) while - (a) preservation and distortion of crop seeds, (b) free and heavy headed weed seeds, and (c) ratio of weed to crop seeds - positively load in the other direction. Therefore, there is an association between

(i) high density of seeds,

(ii) good preservation,

(iii) little distortion,

(iv) low ratios of weed to crop seeds,

(v) large quantities of big, free, heavy weed seeds, and

(vi) small quantities of small heavy weed seeds (Jones 1987: 318).

Conclusions

The models reviewed here are relevant to the investigations of the botanical remains at Blagotin and Foeni-Salaş. Each model separates processing and production activities that may have taken place in the past. It is uncertain at this point which of the three models described is most applicable to the analysis here. All three models have positive and negative aspects to them. For samples that are small, the Dennell model is better suited because it does not require a large sample size. However, it relies very heavily on contextual interpretation which may not always be accurate. The Hillman model requires a large sample size and employs a statistical method so complex that it may distort data rather then provide an accurate account of prehistoric events. The Jones model, while requiring a large sample size, does not rely on the use of context or association. Rather, it uses the characteristics of weed seed species to decipher the different stages of processing. This type of method omits biassed and sketchy contextual data during analysis and interpretation. Nonetheless, the applicability of each model will be better understood during the analysis and interpretation chapters of this thesis.

CHAPTER V:

THE GEOGRAPHY OF THE CENTRAL BALKANS

Traditional history, in the same way as the contemporary press, prefers tidy theories. The Balkans... bridge or cross-roads between Europe and Asia, mixing point or melting pot of races, powder room or battlefield of Europe. These are valid descriptions, or were so at different periods of history, yet fail to plumb the richness and variety of these countries and the peoples who live in this peninsula.
- George Castellan, 1992

The Balkan peninsula consists of the modern countries of Albania, Bulgaria, parts of Greece, Turkey in Europe, sections of Romania, and most of the former Yugoslavia (Figure 1). However, defining the exact borders of the "Balkans" is difficult because there are no known topographic features that clearly define its extent (Greenfield 1986: 35). Conventional definitions of the Balkans, such as the Encyclopaedia Britannica (1997: 591), consider this a region bordered by Italy on the north and north-east, Greece and Turkey on the south, the Adriatic Sea to the west, the Ionian Sea to the south-west, and the Black Sea to the east.

The southern borders of the Balkans are empirically difficult to define. Macedonia (of Northern Greece) is considered a Balkan member by most geographers and will be in this study also. The rest of Greece, however, is considered a "Mediterranean" country and will not be discussed in this study. The northern borders of the Balkans are also difficult to define. Standard geographical precepts regard the rivers Danube (from the mouths in the Black Sea) and Sava (following westward to the Adriatic), as the division between the Balkans and central Europe (Castellan 1992). However, the Danube cuts across natural topographic features, simply forming an arbitrary boundary to the Balkans (Greenfield 1986: 35). Additionally, the

Pannonian Basin (Great Hungarian plain), obscures this border because it extends from Croatia, Serbia and Romania (all considered "Balkan" states), beyond the Sava and the Danube into Hungary which is considered a part of central Europe. Most archaeologists consider much of Pannonia to be culturally part of the Balkan peninsula (Manson 1990, Garašanin 1983, Greenfield 1986) because the archaeological cultures do not stop at the Danube. In this study, the southern part, or edge of the Pannonian basin will be viewed as a part of the Balkans, rather than central Europe. The central Balkans, the geographic focus of this thesis, is north-east Yugoslavia (Serbia and the Vojvodina), north-west Bulgaria, and south-west Romania (Banat and Oltenia) (Greenfield 1986: 35).

Climate

The Serbian-Macedonian (political) border is the approximate division between temperate central Europe and the arid Mediterranean climate zone. From this border to the Danube is the transition zone, a southern variant of the central European temperate climatic regime. This transition zone is characterised by year round precipitation, cold winters, and warm summers. However, because of the close proximity to the Mediterranean, this region has higher summer temperatures than that to the north (Greenfield 1991; Pounds 1969).

The climate of the central Balkans is influenced by the warm fronts of the Adriatic and the open cold air masses from the north (central Europe). However, there are slight differences in climate between the two sites investigated for this thesis: southern Šumadija, where Blagotin is located and the Banat, where Foeni-Salaş is found. In central Šumadija, a region that extends from Belgrade to Orašac, the mean monthly maximum in July (the hottest month) is 20° to 25° C. The monthly mean slightly jumps in the Vojvodina (plains region) to 35° C. In January, the coolest month, the temperature drops to -15° C (Greenfield 1986; Halpern 1967).

In the flat plains of Pannonia, as opposed to the rolling hills of Šumadija, there are more severe changes in temperature. Summer temperatures can reach up to 42° C and in the winter they can fall to -26° C (Furlan 1977: 195; Halpern 1967: 67; Navy 1: 234-239).

Precipitation

In general, there is little variation in precipitation over much of the central Balkans. This area has a continental rainfall regime with the highest rainfall occurring in the summer (June) and the lowest in winter (February). However, precipitation falls fairly evenly throughout the year and seasonal fluctuations are not as extreme as in the Mediterranean (Greenfield 1986: 46). Half of the precipitation falls between April-July, which provide an ample water supply to agricultural land during the growing seasons. Šumadija receives an annual mean of 600-1200 mm, while the Banat receives less (>600-700 mm) and the Iron Gates more (800-1200 mm).

In the Banat, the timing and amount of snow depends primarily on altitude. The Banat experiences snow for 20 to 30 days. In areas of higher elevation (500-600 asl - eg. around Blagotin in Šumadija), there are 35 to 40 days of snow (Greenfield 1986: 47).

Soil

A discussion of soil types is necessary because certain soil types inhibit or allow particular plant species to prosper. This is important when dealing with agriculture in the Balkan peninsula. The soil conditions of the Balkans show a larger range of variation than in any other area of equal size in Europe (Manson 1990). This variety is attributed to the large variation in the rocks that underlie the region and because of the varied climatic conditions.

There are several soil types that are distributed over the central Balkans and each type influences the potential for economic productivity (Greenfield 1986: 48). There is no great regional extension of any one type of soil, but loess (although not technically a soil but a parent material) has the most continuous distribution (Turrill 1929: 25-31). Attention will be made to the following soil types because of their connection to Neolithic sites.

Alluvial. This soil type is found on the edges of and within stream and river valleys. The nutrients in the soil are renewed annually by periodic flooding of silt-filled water. However, because of seasonal water logging, marshes and meadows may form (Greenfield 1986: 48).

Riverine. Riverine soil forms on alluvial deposits. Riverine soils are light and sandy, particularly in the Morava-Vardar corridor where the gradients are steep. Downstream, where gradients lessen, riverine soils are more loamy and clayey. This soil is not considered useful for agriculture (Barker 1975: 88).

Diluvium. Diluvial soil accumulates on the bottom of eroding highlands and hills. This soil type is also typical of the Morava-Vardar corridor areas. These soils are considered relatively fertile because fertility is restored from silt-laden waters on higher ground (Barker 1975: 88). Most geographers regard this soil type as colluvial (L. Stene, personal communication), but for purposes of this study, and for consistency with other reports of the region (see Barker 1975), the term diluvial will be used.

Chernozem. This is a rich, black, thick grassland soil with a high humus content. This heavy black earth, found in the plains and valleys of the Sava, Drava, Pannonia and Morava, formed under steppe conditions of the past. It is also found in isolated pockets of the Danube and in the Morava valley. Today this soil is highly evolved as it is rich in plant nutrients and has a good stable structure. It is a highly valued soil in Yugoslavia but requires deep ploughing. This may have been a detriment to prehistoric inhabitants.

Brown Forest Soil. (Serbo-Croatian "gajnjača") This soil type is formed under deciduous forest as a result of chemical weathering of decomposing trees, leaves and other woody debris (Manson 1990: 23). This soil type is found in areas of varied relief (Pešić 1967). The forest and soil are both dependent on each other for survival and regeneration (Greenfield 1986: 48). The forest canopy prevents these soil from degrading and the roots of tress extract important chemicals. Leaf-fall replaces lost nutrients. Absent trees on this soil result in erosion. Brown Forest soils are relatively fertile but today are found in eroded and leached forms. This soil type is common in areas like the hill country south of the Danube and have a wide variety of plant life growing on it (Barker 1975: 88).

Smonitsa. Smonitsa soils are found in the lower courses of river valleys formed on rich alluvium clay. They are hydromorphic black or dark-grey that develop from calcareous clay overlying sand. The texture is heavy and clayey and because of this the soil has a tendency to swell when wet. However, the soil is considered very fertile when not waterlogged. This soil type is found in the lowest elevations of river valleys and are similar to alluvial deposits (Barker 1975: 88).

Redzina. Redzina's are found on limestone highlands and cover most of the highland areas in the central Balkans. These soils are shallow, stony and relatively infertile. However, with the limestone substratum and steep topography combined, excessive drainage can result leaving little water for soil and plant growth. Drainage results in nutrient depletion and infertility. This soil is also liable to drought in warm seasons (Barker 1975: 87).

Physiographic divisions of the area under study

The central Balkans consist of a wide array of topographic features that cross-cut modern political borders (Greenfield 1986: 35). These divisions are: (i) the Pannonian plain (Great Hungarian plain), (ii) central Serbia, or the Šumadija, and (iii) the Dinaric, Iron Gates, Carpathian-Balkan and Rhodopian mountain ranges. The following is a description of each unit.

Pannonia

The Pannonian plain is located north of the Danube and Sava Rivers and is a relatively flat basin range surrounded by the arms of the Carpathian, Dinaric and Alpine mountains. It has a maximum width of 200 km (Manson 1990: 11). The plain is characterised by an elaborate river system. The Sava, Drava, Tiza, Körös, Mureş and Timiş rivers all drain into the Danube. This region is appropriately referred to as the Middle Danube Basin (Greenfield 1986: 42).

The Pannonian plain is divided among the countries of Yugoslavia, Romania and Hungary. Because of this, sections of the plain are referred by to different names.

In Yugoslavia, Pannonia is known as the Vojvodina and it is divided into two sections: 1) west of the Danube and South of Fruška Gora (a low mountain range in the centre of the plain) is Srem, and 2) east of the Danube is the Banat. The Banat extends into SW Romania and is referred to by the same name. In Hungary, modern literature usually refers to Pannonia as the Great Hungarian plain.

Pannonia is a low plain, 100-200 m ASL, and consists of sedimentary deposits, wide river valleys, alluvial plains, sandy dunes, and crystalline hills covered with loam (McDonald et. al. 1973: 12; in Manson 1990: 11). The annual precipitation in this area is 600-700 mm and slightly increases towards the west (Furlan 1977).

The vegetation is predominantly pine and spruce, particularly on the upper terraces. Lowland areas are used today for agriculture, but they still retain some mixed oak forest in the higher elevations. (Filipovski and Čirić 1969; Greenfield 1986).

Alluvial, chernozem, and small pockets of brown forest soil are found on the Pannonian plain but, loess deposits (formed during the Pleistocene) are the most common. The low areas experience high amounts of ground water and flooding (Manson 1990: 17). The Vojvodina is the driest area of the plain where it is not uncommon for ground water to dry-up and mineralise causing high degrees of salination and the formation of salt marshes (Manson 1990). The higher elevations of this plain contain acid brown soils.

The Balkan ranges

There are three main mountain ranges in the central Balkans. To the west are the Dinaric Alps (700-2200 m) which merge into the southwestern end of the Julian Alps (1800 m). In the east, there is the Carpathian-Balkan mountain ranges with lower peaks then those of the Dinaric (500-1800 m). The Carpathians stretch for 1200 km up north of the Iron Gates, while the Balkan ranges continue for 600 kilometres to the south. The final zone is the Rhodopian mountain chain found in south Serbia, Kosovo and Macedonia. The highest point of the Rhodopes is in Bulgaria (2920 km). Although no mountain range exceeds 3000 m, the mountains are very deep and jagged and would have been a difficult area to cross in prehistory. Movement was most likely limited to a few passages along the rivers.

The Iron Gate area is a corridor that cuts through the Carpathians and Balkan mountain range by the Danube. This corridor connects the Pannonian and Dacian plains. Sites in this area are found in small basins where the river widens (Greenfield 1986: 44). The region is characterised by a more steppe climate (treeless region usually found on loess with extremes in temperature) in the east and a moist continental climate in the west. The Carpathians shelter this area from the colder air (that come from the north and east) and excessive summer heat (from the south) (Srejović 1972: 16). This area has a distinctive micro-climate with a uniform rainfall and an absence of extreme temperature.

The mountain ranges cause most of the annual precipitation of the Balkans, but there are vast differences in the annual precipitation in sections of the ranges (Furlan 1977: 203). Precipitation increases with height. The highest plateau's (such as Boko Kotorska in the Dinaric Alps) have over 5000 mm annual precipitation, while other areas of the Dinaric's have 4000 mm. Not only is elevation a factor in precipitation, but also direction in relation to coastal areas. The slopes of the Dinaric's that rise directly from the coast contain the highest amounts of annual precipitation in

Europe. Precipitation slowly decreases further away from high plateau ridges. Because the south-western Dinaric's absorb most of the humidity in the air of the Balkans, the ranges of the Rhodopes, Balkans and Carpathians have much less annual precipitation (>1500 mm). These ranges are dependent on south-westerly winds (from the Dinaric) as the only source of humidity. Although these mountains have less precipitation than the Dinaric's, they have more precipitation then lowland areas.

Erosion is the main cause of soil depletion in the mountain ranges. Heavy precipitation erodes soil leaving the tops of the mountains bare and lower terraces full of soil and rock. On the west side of the ranges, which are lower in elevation, soils are podsol (acidic soils), degraded brown forest soil, and rendzina (Manson 1990: 17). On the east side, soil is less acidic and there more rendzina and humus-silicate type soils (Filipovski and Čirić 1969: 14-19). In the central mountains and the basin of the Rhodopes, soil variety changes with altitude. Downpours cause erosion leaving only a small area of the mountain with developed smonitsa and terra rossa soils.

The central Balkans - Šumadija and the Morava Valley

The central Balkans is the most inland of all the divisions of the Central Balkans and all rivers in this region drain entirely into the Danube. Northern sections are low and subject to flooding, and mountains surround the east, south and west sides. Below is a description of the major areas of focus for this thesis.

The Morava Valley. The Morava river drains into the Danube leaving a deep fertile area that has been occupied from prehistoric times to the present. The Morava stems from Montenegro and the north border of Macedonia and has, historically, been the route of easiest access between central and southeastern Europe (Navy 1: 87). The

Lower Morava empties into the Danube near Golubač (Greenfield 1986: 39). The plain of the Lower Morava is extremely flat and wide. Most of this river plain is dry but large sections are fertile.

The Morava river is the most important river system in the Balkans. It forms a part of the Middle Danube basin. In combination with the Vardar river, the Morava river valley forms a natural route or highway from north to south through the entire central and north Balkan peninsula (Mellaart 1975: 275; Greenfield 1986: 39).

Šumadija. The Šumadija region is found in the northern most extension of the Dinaric Alps (Greenfield 1986: 40). This region is high in altitude (1000 m), but gradually decreases as it hits the foothills and terraces of the Pannonian Plain (200-300 m) (McDonald 1970: 12; Navy 1: 1). Outcrops of rock thrust through soft Tertiary limestone, sandstone and shale (Greenfield 1986: 40). Soils in this region are primarily riverine soils, brown forest soils, and smonitsas (Manson 1990: 17). Gajnjača and brown forest soils are found in western districts of Šumadija. These areas have been noted to contain many prehistoric sites.

Relationship to Soil and Crop Agriculture

It is difficult to assess the past soil conditions for crop agriculture because of the constant changes in soil through time. By natural forces alone, soils will degrade, increase or decrease in fertility (Greenfield 1986: 52). Human impact on land also has detrimental effects on the composition of soil. Humans will intentionally or unintentionally alter the vegetation of a region either destructively or constructively. The result of human impact is a usually a combination of loss or gain, where forests are lost and pastures are gained (Turrill 1929: 88). In light of all these realities, it is difficult to reconstruct ancient soil conditions and agricultural potential. Additionally, there is no comprehensive study done on soil change through time. For this reason, we can only ponder on what the conditions "may" have been, based on recent finds and recoveries.

One method of assessing past soil conditions is through site catchment analysis, as practised by Higgs and Vita-Finzi (1972). Site catchment analyses are assessments of soil types within a 5 to 10 km radius around a site. Soils are divided into three categories (high, medium, and low), based on their arability. When Barker (1975) applied this evaluation system to Early Neolithic sites of Yugoslavia, he found that brown forest soils were the most arable soil types with a digging stick technology, followed by smonitsas and chernozems. The inclusion of ploughs would have made tilling and ploughing easier in smonitsa and chernozem soil but these implements are found until the Bronze Age (Sherratt 1980; Greenfield 1986: 52). The authors concluded that Neolithic settlements in Šumadija were found on alluvial, diluvial, brown forest, chernozem and smonitsa soil (Kaiser 1984: 31-33). Soils with a high clay content would have been utilised by early potters, and chernozems and smonitsas would have encouraged grassland growth and eventually large pastures, but would have require the used of deep ploughing (Manson 1990: 23).

CHAPTER VI:

EARLY NEOLITHIC ARCHAEOLOGY OF THE CENTRAL BALKANS

The Early Neolithic is defined as the time when food production (plant cultivation and stock breeding) sedentism and pottery production began (Childe 1957; Bogucki 1988; Benac et al. 1979; Manson 1990; McPherron and Srejović 1988). Farming first began in the Near East and eventually made its way to Greece (Thessaly and Macedonia) ca. 6500 BC. Less than 500 years after the establishment of these communities, food-producing groups appeared in the northern Balkans (Romania, Yugoslavia, Bulgaria, south-east Hungary), 250 km away from the first farming groups and across the Mediterranean littoral (Greenfield 1993). The first farming groups of the north Balkans (or temperate south-east Europe) adapted to environmental and climatic conditions very unlike that of the south Balkans (or the Mediterranean littoral including modern Macedonia, south Bulgaria, Greece, Albania) and remained stable for less than a thousand years (Garašanin 1979; Tringham 1971; Whittle 1985; Greenfield 1993). This is the first time farming was practised in the temperate zone of Europe. It required the re-adaptation of existing domesticated plants (wheat and barley) and animals (sheep and goat), as well as the domestication of new species indigenous to the area (cattle and pig) (Bökönyi 1974; Greenfield 1993).

The earliest Neolithic cultures of the Balkans are not recognised by a single common name, but rather a series of names. In the Mediterranean or south Balkans, the earliest Neolithic cultures are known as the Proto-Sesklo/Sesklo groups, typified by the Sesklo site near Volvos in Thessaly. In temperate south-eastern Europe (the north half of the Balkans), the cultures of the Early Neolithic are referred to by a series of names, Karanovo I-Kremikovci-Anzabegovo/Vršnik-Starčevo-Körös-Criş (Figure 6). Each name reflects the modern country where it is located: Karanovo I in Bulgaria, Kremikovci in south-east areas of the Sofia Basin in central Bulgaria, Anzabegovo-Vršnik in Macedonia, Starčevo in most of ex-eastern Yugoslavia (all references to Yugoslavia refer to the pre-1991 political entity), Körös in southern Hungary, and Criş in Romania. Some archaeologists believe these names largely reflect modern political boundaries rather than significant cultural variation (e.g. Gimbutas 1982: 27), while other archaeologists believe these names coincide with distinct regional styles (e.g. Barker 1985: 90). Below is a brief description of the chronology and settlement patterns of the different culture groups.

Early Neolithic Cultures of the Balkans

The Anzabegovo-Vršnik culture groups

This culture group is found in Yugoslavian Macedonia.. The best known sites of this culture are Anzabegovo and Vršnik. This region is hilly, cross-cut with meandering rivers and streams. Sites are in tell form (mounds), revealing thick habitation layers (see Whittle 1996). The earliest dates Anzabegovo-Vršnik slightly predate that of Starčevo (which lies directly to the north). Anza I dates to 6100-5900 BC (Gimbutas 1976: 70-71; 1991: 441; Manson 1990) which is slightly earlier than Starčevo. The Anza II-III phases date to 5950-5200 which fall within the Starčevo I-III range (5950-5200 BC) (Manson 1990: 138).

The Karanovo and Kremkovci culture groups

The Early Neolithic in Bulgaria is represented by two geographically separated groups, Karanovo I and II in south Bulgaria, and the WBPP (West Bulgarian Painted Pottery) in west Bulgaria. The latter is further divided into two subgroups: Gradešnica A in north-west Bulgaria, and or Kremikovci in central-western Bulgaria. Both groups (Karanovo and WBPP) are similar to Starčevo (Garašanin 1983). Prominent Karanovo and Kremikovci sites are: Nova Zagora, Azmak near Stara Zagora, Chevdar, and the Karanovo type site.

Karanovo I sites in south-central Bulgaria are located primarily in the plains areas, where Mesolithic groups did not previously settle. All sites are tells with thick habitation layers, usually more than one metre thick (i.e. Kremikovci - Tringham 1971: 91). There is some variability in settlement selection, particularly in terms of altitude (plains, foothills and mountains) and surrounding natural conditions. Most sites, however, are associated with land of high agricultural productivity.

The Early Neolithic chronology (relative and absolute) of Bulgaria is based on the accumulated deposits of the largest Early Neolithic tells: Karanovo, Chevdar, and Azmak. Ceramic styles of both south and west Bulgarian Early Neolithic can be stylistically linked to the ceramics found in horizons VI and VII of Chevdar tell. These horizons have been radiocarbon dated to 5815-5889 BC and both Karanovo I and WBPP fall within this range (based on stylistic similarities in ceramics) (Boyazaiev 1995: 161).

The Körös culture group

This culture is named after the Körös river in Hungary, and is found distributed around south-eastern Hungary, the western perimeter of Romania, and the northern perimeter of Serbia. The distribution of Körös is limited to the lowlands of the Pannonian (Hungarian) plain (Sherratt 1982). Körös settlements are found in areas typically favoured by Mesolithic hunter-gatherers, including river terraces or mounds of alluvial sand that have risen above waterlogged flood plains (Manson 1990; Tringham 1971: 92). This river network of dwellings was numerous but the occupation horizons at these sites is thin and may be the result of repeated shifting populations (Whittle 1996: 49). These short term settlements may indicate movement, impermanence and seasonal shifts in settlements.

Körös assemblages have been radiocarbon dated to ca. 5800-5200 BC (Ehrich and Bankoff 1991; Gimbutas 1976, 1991). According to absolute dates, Körös (I-III) sites appear to be contemporary with Starčevo II and III (Manson 1995).

The Starčevo-Criş culture in the central Balkans

It is important to understand that Starčevo-Criş represent two contemporary culture groups (Criş representing the Early Neolithic of south and south-west Romania; Starčevo in modern Serbia). For purposes of this thesis, Starčevo and Criş have been combined. The reason for combining these two culture groups are because (a) there are striking similarities in the material culture, and (b) one of the sites investigated for this thesis, Foeni-Salaş, falls within the border of the Starčevo and Criş distribution.

Both Starčevo and Criş have acquired their names through type sites of the same name. The type-site of Criş is found in the Transylvanian region of Romania, on the eastern edge of the Pannonian plain, and is also known as Crişanovo (Dumitrescu 1983). The type-site of Starčevo is found 20-km east/north-east of Belgrade (in the neighbourhood of Pančevo), and has also been referred to as "Starčevo-Grad" (Manson 1995: 65). The first excavations of Starčevo began in 1928 by Grbić, and again in 1933 by a Yugoslav-American team run by Fewkes. From 1969 to 1970 fieldwork at Starčevo continued but modern brick making activities obliterated the site (Manson 1995: 65).

Distribution

Starčevo-Criş is distributed over a wide area, with settlements found in eastern Croatia, eastern Bosnia, Serbia, south Pannonia, Transylvania and the Iron Gates. The southern borders of Starčevo-Criş extend southwards towards the Morava-Vardar watershed. Its westernmost periphery is the site of Obre I in Bosnia. Northwards, the Starčevo-Criş distribution extends across the south Pannonian plain and up to the river Tisza. It is found as far as north-west as the Drava drainage between Lake Balaton and Drava (Ehrich and Bankoff 1990: 380). All Early Neolithic cultures in the central Balkans, including Starčevo-Criş, are geographically restricted to south of the 41st parallel (Alexander 1971: 34).

Site settlement patterns

Climate, soil and forest cover undoubtedly played roles where early farming groups tended to settle (Barker 1985: 95; Srejović 1988), but there was no uniformity in what resources sites had access to or how settlements were chosen. Starčevo-Criş sites have been found on sloping plains, terraced slopes, or on ridges in the vicinity of springs and streams (Whittle 1985). Settlement selection in the central Balkans differs from what is found in Pannonia. In the central Balkans, which is the heart of the Starčevo distribution, site selection falls into two groups: first are river valleys, such as that of the Morava flood basin (Barker 1985: 96). These settlements are found in the immediate junction between forest soils and alluvial smonitsa. The second are sites in low hill regions such as Divostin (Barker 1985: 96) or Blagotin (Greenfield personal communication). All sites in these areas are located on soils and terrain that are easily to till and are not impeded by heavy soil that is difficult for farming (Sherratt 1980).

In Pannonia, the only systematic surveys of Early Neolithic sites have been done on the Körös culture of southeastern Hungary (Sherratt 1982). Early Neolithic sites are found along rivers and stream channels, usually in clusters. Settlement arrangement in these areas can vary. Narrow flood-plains in Pannonia have a linear arrangement of sites (over looking valleys) while broader flood plains have more of a clustering pattern (Sherratt 1982: 303). Most sites in this region are found on high areas where they are not susceptible to flooding. Soils on these higher levees are light and easy to distinguish (Sherratt 1983; Barker 1985).

There is considerable variation in the spacing of the Early Neolithic settlements. For instance, settlements found in the northern regions of Pannonia are spread much farther apart than settlements found in the Šumadija. Starčevo sites in the Šumadija region are varied (topographically) and found in linear arrangements but usually in dense clusters that are geographically restricted. The site of Blagotin, is surrounded by a stream, a mountain and river valley that restricts the spread of occupation. However, Starčevo sites found in the Morava and Sava river valleys, where they are not as geographically restricted, are widespread and spaced 7 to 10 km apart (Whittle 1986: 49). Therefore, it appears as though there was no uniform structure or distribution of sites. In wide open areas such as Pannonia, settlements are spread out as far as possible. The opposite occurs in areas such as the Šumadija.

Spacing and distribution of features

It is very difficult to make firm conclusions on the spacing (and size) of settlements since most Early Neolithic sites have not been excavated spatially, in wide horizontal exposures revealing the extent of feature distribution (Horvath 1989: 85).

Structures and features in Starčevo sites vary and sites are not known for their complexity or grandiose design. Most Early Neolithic sites tend to be modest and simple, reflecting a short-term occupation. Virtually all early Neolithic sites contain hearths and ovens in or outside of house structures. Sites such as Divostin have several architectural remains with surrounding features widely spread apart. Close to 30 storage pits and seven semisubterranean house units were recovered at Divostin (McPherron and Srejović 1988). Other Starčevo sites, however, do not contain high densities of architectural finds. The site of Foeni-Salaş contained only one storage pit and Blagotin contained none.

Architecture

Most Starčevo dwellings are pit dwellings, but there are no definite conclusions on this as of yet (Garašanin 1982). Most archaeologists regard Starčevo dwellings as semisubterranean pit houses or quadrangular surface structures (Manson

1995: 70). Dwellings contained ovens, pits, and large (possibly communal) grinding stones. Surface structures, on the other hand, are small rectangular or square dwellings with no internal divisions within the structures. Below is a brief description of the character of each house type.

Semisubterranean Dwellings. These dwellings are constructed in a simplistic manner. Pits are dug into soil (usually Pleistocene loess) in different sizes and shapes. Shapes can be oval to trapezoidal and do not contain internal features (i.e. Starčevo, Lepenski Vir and Divostin). Entrances to houses are by a ramp located on the side of the house (Manson 1990). Pit houses do not show great effort in construction and reflect a short-term occupancy (H. Greenfield, personal communication). Floors of these structures have shown no evidence of lining or plastering and roofs were most likely simply wooden coverings (Bogdanović 1988). Evidence of these types of dwellings have been found in many Early Neolithic sites, particularly Starčevo-Körös-Criş sites such as, Gora Bacului in Romania (Vlassa 1976), Donja Branjevina, Golukot in Yugoslavia (Srejović 1988), and Transdanubia in Hungary (Makkay 1978). The first pit houses were either circular or elliptical. By the middle Starčevo phase, they had become more trapezoidal or rectangular (Bogdanović 1988: 35-38).

Surface Structures. Surface structures are more frequently found in the later periods of the early Neolithic (Gimbutas 1991). These features were later used as middens or for burials and walls were made of wattle and daub, however there is variation in the size and shape of these dwellings (Tringham 1971: 86). At Divostin, six surface structures were recovered in either rectangular or square shape (Bogdanović 1988). Floors were covered with crushed sherds and charcoal and all houses had postholes surrounding them. At Karanovo, surface structures were rectangular in shape and contained one room with a hearth. Walls and floors were covered in a coating of clay (Garašanin 1982: 94). Rectangular surface houses or other such shapes are known in Gladnice near Gračanica (in Kosovo - Garašanin 1982: 101). There have been finds of both single and two story surface structures (the former in Körös areas) (Whittle 1986: 131-151). These structures are quite small and do not show any evidence for internal divisions (i.e. Anza, Zelinikovo, Gračanica, Vršnik) (Bogdanović 1988; Gimbutas 1976; Renfrew 1969; Tringham 1971; Makkay 1992).

Material Culture

(i) Pottery

Starčevo pottery is divided up into three categories, fine, ordinary and coarse. Pottery style differentiates culture groups of the early Neolithic even though the differences are minor and may only be variations of the same culture group. All ceramic cultures of the Early Neolithic in the Balkans contain each of the following categories.

1. **Thick, coarse, chaff tempered pottery**. The characteristic of this pottery is a poorly fired to a buff orange colour. Surface impressions are made of reed, finger or nails (Tringham 1971: 79). Variation of this pottery type is found in the Körös culture where non-slipped surfaces are usually painted and have vertical black strips with rustication. There is a predominance of coarse pottery over fine, the latter being grey, brown and rarely red in colour (Tringham 1971).

2. **Fine tempered pottery**. This pottery type contains less chaff then other

organic material, resulting in a fine surface, grey or buff in colour. The decor of fine pottery is usually dark striped patterns bordered with white lines. The surface has a slip of the same clay or contains a wash that has been polished or burnished (Tringham 1971: 79).

3. **Hard, well fired pottery**. This category contains most of the distinguishable elements that archaeologists use to differentiate culture groups. In general, the surface of the pottery is covered by thick, red or white slip paint before firing in either red, black or white patterns (or a combination thereof). Polishing is followed after the surface is fired.

(ii) Stone Tools

Stone tools typical of Starčevo and related contemporary groups are flat ground trapezoid ground polished stone tools and chipped stone tools. The former may have been used as an adze or axe and have been found all over the Balkans and central Europe (Tringham 1971: 75). These tools may have been used as woodworking implements such as cutting down trees and even in the manufacture of pit houses. By the middle Neolithic these tools become more refined (Tringham 1971: 75).

Chipped stone implements are found throughout all Early Neolithic assemblages. These blades are microlithic in size, never longer than 6 cm and display little or no retouching. These blades were most likely used for cutting, sawing, scraping, shaving for materials such as bone, wood, meat and skin. Valea Raii in south-west Romania contained antlers with slots most likely for the insertion of blades. These tools were then most likely used as sickles (Tringham 1971).

(iii) Figurines

There are many examples of plastic art in Starčevo. Figurines have extended necks with bodies present in stubby figures, or exaggerated breasts with low parts of the torso bell shaped, such as the "Venus of Starčevo" (Garašanin 1982: 102). Popular motifs of Starčevo were female figures hybridised with bird forms. Buttocks were exaggerated with the long body of a bird. Gimbutas argues that these forms may reflect regeneration (1991: 235-236). At Blagotin, artifacts were in the shape of large grains. These special artifacts may indicate the importance and relevance of crops, focussing more on nourishment rather than regeneration (Greenfield and Stanković n.d.).

Chronology

There are great problems in the chronology of Starčevo-Criş and of the Early Neolithic in the Balkans, as a whole. Chronologies and ceramic typologies established for one region, even with the use of radiocarbon dates, do not work in all regions. To date, there are very few radiocarbon dates and very few stratified sites. This results in a tendency for typologies to be based on type ceramic sequences with no attention paid to absolute chronology (Manson 1995: 66). The following is a review of the chronologies established by archaeologists based on both relative and absolute methods.

Relative chronological theories

Milojčić. The first person to attempt Starčevo chronology was Milojčić who devised a sequence of Starčevo pottery types from various Starčevo sites. The results of his analysis was a four phase-Starčevo chronology (I through IV). His chronology is still used today in parts of the former Yugoslavia-Pannonia.

Arandjelović-Garašanin. Garašanin uses the chronological system devised by Arandjelović-Garašanin who based her chronology on the seriation of 50,000 shreds from the contents of a pit located at the Starčevo type site (Pit 5A). The result was a division of Starčevo ceramics into four phases of pottery (I, IIa IIb, III) . The first phase reveals a strong preference of coarse pottery over monochrome pottery, and a total lack of painted ware. The IIa phase contains painting with dark colours with spiral ornamentation painted in white. The IIb phase has the same characteristics of IIa, but the white paint disappears. In the final phase (III), there is an increase in fine pottery and an increase in organised motifs (in Barbotine decoration), noted in an abundance of spiral patterns (1982: 104). The Arandjelović-Garašanin model has been criticised by archaeologists primarily out of logistical reasons. The contents of pit 5A at Starčevo-Grad has been considered poor in terms of stratigraphy. Also, the number of sherds used for the analysis is small in terms of total ceramic inventory (Manson 1995: 67).

Srejović. Srejović believes that the origins of Starčevo in the central Balkans starts in the Middle Neolithic (1988: 15). Using ceramic serration and the stratigraphic sequence at Lepenski Vir, Srejović devised a sequence for Starčevo resulting in four phases: Proto-Starčevo I, II, III and Starčevo. The first three phases are considered Early Neolithic.

Dimitrijević. Dimitrijević offers an alternative sequence to the Arandjelović-Garašanin chronology. His divisions are (1) Pre-classic - which includes monochrome pottery and white linear (linear A phase) decoration; (2) Classic - linear B phase decor and garland decor. This phase includes a large frequency of barbotine ceramics. Barbotine is characterised by dark painted linear designs with vertical bands, zig zags, triangles, and net motifs (Manson 1995: 67). The final phase is (3) Late Classic - this phase includes Spiraloid A (where spirals begin to appear) and Spiraloid B (where spirals appear in large frequency). The final phase is similar to that Arandjelović-Garašanin Starčevo phase III.

The sequence of Dimitrijević is not accepted in all regions as his sequence has only been found to work on north and west regions of the Starčevo distribution (Manson 1995: 69).

Absolute chronological theories

Manson. Manson believes that the Arandjelović-Garašanin sequence is the only sequence that takes into account chronological "controls" (1995: 69). Manson integrates archaeomagnetic intensity analysis with radiocarbon dates to provide absolute dates for the Arandjelović-Garašanin sequence. The resulting dates of her analysis are:

Starčevo I (5300 - 5200 b. c.) (ca. 6100-5950 BC)

Starčevo IIa (5200-4850 b. c.) (ca. 5950 - 5650 BC)

Starčevo IIb (4850 - 4500 b. c.) (ca. 5650 - 5400 BC)

Starčevo III (4500 - 4200 b. c.) (ca. 5400 - 5200 BC)

Manson claims this chronological sequence is a more refined chronology and an improved framework where behavioural patterns of Starčevo populations are reflected in the material remains (1995: 70). Although some have criticised the Garašanin sequencing, this sequence is the most widely accepted framework.

Manson's chronology has been criticised by archaeologists, particularly that of Ehrich and Bankoff (1990) who believe that the Arandjelović-Garašanin sequence is beset with stratigraphic and sampling problems. Considering that Manson based her dating upon the Garašanin model, her sequencing is questionable (see Ehrich and Bankoff 1990).

Ehrich and Bankoff. Using absolute dates and stratigraphic sequencing of Vinča and Anzabegovo sites, Ehrich and Bankoff (1990) believe there are only two major phases of the Starčevo culture, and each phase is divided up into two additional sub-phases. These authors believe that Arandjelović-Garašanin had misconceptions of the Starčevo type-site, and had little justification for her phasing. These authors believe that Starčevo I is contemporary with the Anzabegovo II phase. Starčevo levels are contemporary with the stratified sites of Anzabegovo II and III, Vršnik II and III, Obre I (levels II and III), Gornja Tuzla, Karanovo II and III (1990: 380). The dates for the entire range of Starčevo are 5970/5490 - 5515/5250 with an average date of 5705-5365 BC.

Gimbutas. Using the site of Obre and Anza (Starčevo sites on the westernmost and southernmost periphery of the Starčevo distribution), Gimbutas (1982: 22) formed her own Starčevo chronology based on ceramic typology and radiocarbon dates. She derived three phases of Starčevo. However, considering that her sequencing was based on sites located on the outskirts of the Starčevo distribution, archaeologists, such as Garašanin (1982) claim these sites are too far removed for Starčevo sequencing and reject her sequencing.

Inter-regional chronology in relation to Starčevo

Since the Starčevo-Criş culture is the focus of this thesis, other Early Neolithic sites are to be synchronised with the Starčevo-Criş sequence. For this thesis, the Garašanin sequencing will be used.

Körös Culture - The carbon-14 dates of this culture are ca. 5500-5300/5200 BC (Gimbutas 1976). Körös sites are contemporary with to Starčevo II and III, based on the Garašanin sequencing.

Criş Culture - There are no absolute dates for Criş. Since there is such a close affinity between Criş and Starčevo, the chronology devised for Starčevo is sometimes used for Criş as it will be in this study also. Therefore, this culture will be dated to 5950-5200 BC. Contemporaneity is based on ceramics similarities.

Karanovo I Culture - Carbon-14 dates from the site of Azmak are ca. 6118 BC, which is slightly earlier then Starčevo. However, the entire span of Karanovo ranges from 5950-5100 BC. which corresponds to Starčevo and is considered contemporary (Gimbutas 1991: 443)

Kremikovci Culture - Dates for this culture come from the site of Slatina. The earliest dates for this site is 5800 BC (Boyazaiev 1995: 191). This date is contemporary with those from the Early Starčevo culture sites.

Anzabegovo-Vršnik Culture - Radiocarbon dates from the site of Anza (phase I) are earlier than Starčevo, while those from phases II and III are contemporary. However, the first horizon at Anza I is somewhat earlier then the first phase of Starčevo (6100-6000 BC), but the second phase of Anza (phases II and III 5900-5200) match that of Starčevo II (Manson 1990: 138).

CHAPTER VII:

SITE DESCRIPTIONS OF BLAGOTIN AND FOENI SALAŞ

The following chapter will describe the sites of Blagotin and Foeni-Salaş along with the surrounding geography, investigative history, research objectives and excavation methodology. Emphasis will be placed on the distribution of features and remains as both sites will be compared (botanically) in later interpretation. Foeni-Salaş and Blagotin are similar in age (ca. 5500 BC) and both sites contain a short-lived Early Neolithic occupation which allow for a sound detailed comparison. Foeni-Salaş provides a good contrast to Blagotin. It is located in the Banat, a plains environment that is flat with moderate precipitation. Blagotin, however, is located in Šumadija, a region topographically different than the Banat. Šumadija is an area with a milder climate and is characterised by its lush, low-altitude (<1000 m asl) mountainous terrain. Both sites are in the temperate zones of Europe, but both have different and unique surrounding environs.

The site of Blagotin

Blagotin is a multi-period site, occupied in three major episodes: Early Iron Age (ca. 1000-500 BC), Early Eneolithic (ca. 3300-2500 BC) and the Early Neolithic Starčevo culture (ca. 6000 BC). The site Blagotin, is one of the earliest agricultural settlements in the central Balkans.

Blagotin is located in the geographic centre of modern Serbia (referred to as "*Šumadija*" in Serbian), in the southern section of a suburb of the same name, 2.5 km NW of the centre of the village of Poljna. This region is known as an area with intense Starčevo occupation (Greenfield n.d.: 5). All excavations have taken place on land owned by Vladislav Bradić. The village of Poljna is 12 km N of a slightly larger village, Velika Drenova, 50 km NE of the town of Trstenik, near the junction of the Lower, Western, and Southern Morava River valleys.

The site of Blagotin is located at the base of the Blagotin mountain. The valley in which the site is found has a reputation as being a major contact area between the valley of western Morava (*Zapadna*) and the interior of Šumadija, an area of intense Starčevo occupation (e.g. Divostin).

The site is located at the headwaters of the Blagotin stream on a hilly terrace overlooking the stream The Blagotin mountain towers above. The slope of the site has caused erosion in some sections, which explains why there is little or no Iron Age sediment lying above the Early Neolithic horizon on some divisions of the site. Other sections of the site, where the terrain is flat and there is little erosion, contain high concentrations and thick deposits of Early Iron Age material.

Soils

Blagotin is found on top of Brown Forest soils that are very typical of the region (H. Greenfield, personal communication). These are rich soils (agriculturally), but light enough to be worked with an Early Neolithic digging stick technology.

Climate

The valley where Blagotin is found has an extremely variable weather pattern and this is partly attributed to the surrounding environment. The Blagotin Mountain protects the site from climatic extremities, especially fierce winter winds from the east.

Vegetation

Up until a century ago, the modern vegetation around Blagotin was heavily forested by oak-park woodland. Today, the forests are restricted to the surrounding mountains and crests since much of the forest has been cleared for cultivation. Because of the warm climate, farmers in and around Blagotin grow commodities like grapes, wheat and barley. Small plum orchards, along with crops of alfalfa, cabbage and onions cover the entire surface of the site. Cultivation, however, has disturbed the top layer of soil, to approximately 30 cm deep. Large features deep below the surface (>20 cm) have not been entirely destroyed by ploughs (H. Greenfield, personal communication).

Investigative history

In 1984, Emilije Tomić of the National Museum (*Narodni Muzej*) in Kruševac placed four test trenches at Blagotin (which was referred to as Šupljaja in preliminary reports - Tomić 1988). The trenches were located with reference to the haphazard surface collections done in the early 1970's by Tomić and Nikola Berić. Of the four indiscriminately placed trenches, only two fell within the bounds of the settlement. There were no maps or drawings made of the location of any of the trench locations, except for the comments that one 5 x 2-m trench was located in an E-W orientation on land owned by Vladislav Bradić. The stratigraphy of this trench contained an upper horizon of Early Iron Age Halstatt material that was disturbed by ploughing, below which lay an undisturbed Early Neolithic Starčevo horizon. The Starčevo horizon revealed large vessels, pithoi, ritual objects, figurines, and other ceramic remains. There was also a high frequency of bone and stone tools. A possible living structure (*zemunica* - pit house) was also found, 0.80 m in diameter depressed into 20 cm of sterile soil. The depression was filled with ashes and surrounded by amulets, figurines, and pendants. The remarkable discoveries revealed in this one trench led Svetozar Stanković of the University of Belgrade to return to Blagotin in 1987. With the notes and the finds recovered at the site from 1984 by Tomić and Berić, an elaborate investigation of the site began in 1989 (Greenfield n.d.).

Further investigations at Blagotin began in 1989 under the direction of Svetozar Stanković. The excavation still continues today, following the death of Stanković in 1995. Only the developments and results that took place from 1989 to 1992 will be discussed here. A Canadian team, lead by Greenfield began collaboration with Stanković in the excavation of the site in 1991. In 1992, all Canadian and foreign affiliation with the project halted because of the political changes in Yugoslavia and the imposition of a scientific/cultural embargo on the new Federal Republic of Yugoslavia (Serbia and Montenegro). From this point, the project has been run by the University of Belgrade only (Greenfield n.d.).

The Blagotin project was divided up into three major research phases. The first phase took place from 1989 to 1990 where small test excavations were planted in various areas of the site to determine the overall stratigraphy. The second phase began in 1991 when intense surface and subsurface survey took place and small test trenches where placed to test the results of the survey. The final phase was in 1992 when extensive excavation took place on selected areas of the site based on the results of survey and previous excavations. The following description of Blagotin is based on the unpublished manuscript devised by Greenfield and Stanković (n.d.).

Chronology

Absolute. One of the goals of the Blagotin project was to obtain a large series of radiocarbon dates from a singe period site. Unfortunately, problems arose on many levels that prevented this from happening. Firstly, no large pieces of charcoal were found for radiocarbon dating, and secondly, funding was severed because of the embargo. As of yet, there are no absolute dates for Blagotin.

Relative. Blagotin appears to have been occupied during the earliest phases of the Starčevo culture (Greenfield per. comm.). This phase of the Early Neolithic Starčevo tradition has been topologically dated the proto-Starčevo I-II (see Srejović 1979) or Arandjelović-Garašanin's Starčevo I phase (see Garašanin 1979; Stanković and Greenfield 1992).

Investigative objectives

The goal of the Blagotin project is to reconstruct intra-settlement and household (socio-economic) organisation. Therefore, the excavation strategy at Blagotin was structured so that the distribution of artifacts and household features are clearly visible. Horizontal exposures of the site were required so that artifacts and structure distribution could be recorded or investigated spatially. The methodology used at Blagotin is similar to techniques used in most Palaeolithic or Mesolithic sites where trenches are large open areas, and stratigraphic horizons (or individual cultural stratum) are uncovered one by one. All artifacts are mapped in place once a new horizon is discovered. This allows for a spatial understanding of the artifact and structure distribution.

Pre-excavation methodology

Considering the research goals of Blagotin were to investigate the intra-settlement spatial patterns, the excavation methodology was similar to most Palaeolithic or Mesolithic sites; excavate in large, wide, horizontal exposures in order to define the edges of the site and of artifact and feature concentrations. In pre-excavation work, the entire site was divided into 20 x 20 m blocks and surveyed (methods for survey described below) in order to find concentrations of materials. Once a "hot spot" (concentration) was discovered and deemed worthy of excavation, a trench (labelled A, B, C, etc. in the order that it was found) was excavated. Each trench was divided into smaller 1 x 1-m units called quads (a, b, c). Each excavation level, or cultural horizon, was numerically labelled (01, 02, and 03) in the order that it was uncovered from the plough zone downward.

Features were labelled by a separate system. All features were recorded with the above information, but were assigned an additional abbreviation for the type of feature it represented: OB (*objekat*) for feature, JA (*jama*) for big pit, UK (*ukup*) for little pit, and ZM (*zemunica*) for pit house.

Intensive surface and subsurface survey

Survey at Blagotin involved the utilisation of several surveying techniques: topographic, systematic surface collection, magnetometer survey and soil auguring (coring). The ultimate goal of all these techniques was to (a) determine the size, shape, depth and boundaries of the site, (b) establish the nature of cultural deposits and, (c) determine the location of features and activity areas within the site. These survey strategies also aided in establishing where the highest potential of early

The use of several surveying techniques had complementary effects on the site. Interesting areas that were detected by one surveying technique could be verified by use of another (i.e. magnetometer and soil auguring). For example, the limits of the site noted by magnetometer were verified by the use of auguring and surface collection. The magnetometer survey in combination with auguring was also beneficial for distinguishing Halstatt structures from Starčevo pit houses (Figure 7).

Analysis of the surface ceramic distributions revealed two overlapping concentrations, one from Early Starčevo and the other Early Iron Age Halstatt culture. Based on surface collections alone, the size of the Starčevo site was found to be 200 m long by 100 m wide, oriented in an E-W direction along the terrace. However, the surface collections underestimated the richness of both occupation layers, especially the Starčevo occupation. When auguring was used to trace out the limits as indicated by surface collection, the northern half of the Starčevo horizon was found to be deeply buried and concealed by the Halstatt distribution. Surprisingly, the magnetometer survey parallelled the surface collection in terms of the extent of distribution and was helpful in pinpointing the high concentration areas of ceramics and where test trenches were to be placed (Greenfield and Stanković n.d.)

Excavation strategy

The intensive above ground survey of Blagotin was followed by excavations based on the results of the survey. Excavation units were opened up in 1 x 1 m blocks, and excavated according to natural stratigraphic levels. Artifacts remained *in situ* until the entire excavated block was drawn, and were photographed and elevated at an ASL level. Pits (*jama* and *ukup*) and features (*objekat*) were excavated in quadrants, and the contents of pits were carefully water sieved, noting the place of origin (three dimensionally) in the soil. Pits or features were designated with separate provenience numbers (i.e. pit house A), then sectioned into separate quadrants. When quads were sectioned, one section would be excavated following a natural stratigraphic horizon while other section was excavated in an arbitrary 10 cm levels, as controls.

Excavation results

Between 1989 and 1991, seven trenches (Serbian *sonda*), labelled A to G were opened. Because of the general slope of terrain and ploughing activity, the stratigraphy in each trench varied, as did their contents.

Cultural stratigraphic horizons

Five major stratigraphic horizons covered virtually all areas of the site: (1) plough zone, (2) Early Iron Age, (3) Eneolithic, (4) Early Neolithic Starčevo and, (5) Post-Pleistocene humus (sterile) soil. Not all strata were present everywhere because of erosion. Excavation was not difficult because features were easy to define and excavate. The following is a summary of each horizon.

Plough Zone Horizon. The top layer of soil was about 30 cm deep, but this varied because certain areas of the site were affected by erosion. This will be discussed more in-depth in later sections of this chapter. It is essentially a disturbed layer in which a mixture of Early Neolithic and Early Iron Age materials are found.

Early Iron Age Horizon. This horizon was found beneath the plough zone and covered the entire site, except for sloped areas where it was eroded away. The Early Iron Age inhabitants of the site settled for a long period of time, resulting in two superimposed Halstatt deposits. Trench A had both Halstatt horizons, whereas in trenches C and F-G had only the second Halstatt horizon was found. This is probably because of down slope erosion in the western half of the site.

Eneolithic Horizon. Unlike the Starčevo and Halstatt horizons at Blagotin, the Eneolithic occupation at Blagotin was deeply buried. It was concentrated in the centre of the site. Remains were found in trenches A, C, and F-G. There were no indications of an Eneolithic occupation from the surface collection. The remains of one collapsed Eneolithic house were recovered in trench C, as evidenced by a floor and collapsed wall and one pit in trench F-G (in 1992 was *ukup* 3). A low density of material remains were captured underneath the collapsed house wall, including a two-handled jug.

Starčevo Horizon. Underneath the Eneolithic horizon was the Starčevo horizon. Outside of the structures, only a single Starčevo horizon was found. Inside the structure, there were two Starčevo strata on the site, but both were not found in all areas. The earliest Starčevo horizon had a thickness of 10 cm and lay directly on the Pleistocene loess. The second Starčevo horizon, (found on top of the first horizon) had an average thickness of 20 cm. In trench A, F-G, two superimposed Starčevo horizons were found, but in trenches B-D only the lower horizon was found, probably indicating settlement contraction over time. It is likely that the second (later Starčevo horizon) in the pits represented the collapse of roofing material. It does not appear to be a second later occupational horizon. All pits and features recovered in the second horizon were embedded in the Pleistocene loess and post-Pleistocene humus. There was no evidence for surface houses in either Starčevo horizons. The differences between the two horizons were minor and discernible only with careful examination.

The differences were primarily of soil texture, with the lower horizon containing more sand and the upper horizon more clay (Greenfield and Stanković n.d.).

Trench summary

Because of the irregular nature of stratigraphy in this site, a brief summary of the stratigraphic horizons in each trench (trench) will be described. Emphasis will be placed on the Starčevo-Criş features and horizons.

Trench A. Trench A was the first test trench placed at Blagotin and was 6 x 4 m (NE-SW) in size, located on the plateau of the site. Since there was no erosion on this area of the site, trench A contained all stratigraphic horizons. The first recovered stratum was sterile soil, 1.6 m thick and directly underneath this layer was the Early Iron Age Halstatt horizon. There were four noted Halstatt horizons in this trench, the second horizon contained a Halstatt house (Halstatt house I) and the fourth horizon containing a second house (Halstatt house II). After the Iron Age horizons, a very thin Eneolithic Baden horizon was found followed by the first (upper) Starčevo horizon. The Starčevo horizon contained material scattered uniformly throughout the horizon. The second (lower) Starčevo horizon revealed a low concentration of ceramics that belonged to a pit house and was the first pit house found at Blagotin (ZM 1).

Trenches B-D-E. Trench B started off as a 5 x 3 m test trench 50 m south of trench A. This trench was placed on a slope and fell 75 cm north to south of the trench. This location contained a high amount of ceramics on the surface and the edges of two features were found on the north and south ends of the trench. Because of the recovered features, the trench was extended to the north and east end and to the north of trench D.

Because of erosion and the slope of trench B-D-E, Halstatt or Eneolithic cultural strata were not found. Thus, the first Starčevo horizon was discovered immediately below the plough zone. The deposits of trench's B-D-E can be divided into two phases of cultural deposition and are separated by a period of abandonment and erosional fill. The first Starčevo horizon was 20 deep, 20 to 40 cm below the surface. Within this horizon were two pit houses (ZM 2 and ZM 3), one metre apart. Pit house 2 was on the north end of trench B and south end of trench D. Pit house 3 was on the north end of trench B. Trench D contained one small Early Iron Age pit, ukup 1.

Trenches CH-I-J: These trenches were located about 50 m north of trenches B-D-E. The magnetometer survey of this area revealed a large concentration of ceramics and possible features. The surface collection revealed large amounts of Starčevo and Halstatt ceramics. There was no Eneolithic material found in surface collection.

The first horizon was the plough zone, which was 30 cm deep and contained Halstatt and Starčevo ceramics accumulated in both ends of the trench. This horizon was followed by a thin, disturbed Halstatt horizon. Next was the Eneolithic horizon. This horizon began at a depth of 40 cm below the surface and continued to 64 cm. It contained the remains of fallen walls of a house because of the steep slope of this part of the site. Underneath the Eneolithic horizon were two Starčevo features, ZM 4 and ZM 5. In the west end of the trench, the Starčevo horizon was found immediately under the plough zone. In the east end, the Starčevo horizon was sealed beneath an Eneolithic house. Both pit houses were dug to sterile soil in 1992.

Only ten percent of ZM 5 was excavated as the feature continued eastward beyond the walls of trench C. On the west end of the trench, ZM 4 was found. It was fully excavated on the upper level of this pit was a thick and dense concentration of Starčevo ceramics along with modified and unmodified bone. This concentration went beyond the walls of trench C (on the south and east ends). There was no daub associated with this pit house and the ceramics and bone were much better preserved in the 10th and 11th excavation levels than they were in the basal horizon.

All of ZM 6 was excavated. It had three internal cultural strata, following upon the model of ZM 2. There is a low step that separates ZM 4 from ZM 6.

Trenches F-G. Magnetometer survey revealed high anomalies in this area and surface collection found large mixtures of Starčevo and Halstatt material. During excavation, a number of occupational phases were found.

The plough zone in this area was 25 cm thick and contained rich Halstatt material in the east end of the trench and Starčevo to the west. The Early Iron Age material reached a depth of 45 cm. Underneath the Early Iron Age horizon was the Eneolithic horizon that extended up to 70 cm below the surface. A large pit, *jama* 3, containing Eneolithic material was found in this area. It contained large quantities of Badan-Kostolac ceramics and animal bones.

When excavation continued underneath the Eneolithic cultural horizon, large concentrations of Starčevo material were found, including ceramics, large fragments of daub, unworked stone and weathered bone. This concentration was found in the NW section of trench F and the north three-quarters of trench G. The capping horizon (the very top layer that seals the pit) was 30 cm deep. Concentrations of stone and ceramics were recovered (including pebbles and quartz). This complex was the top layer of the seventh pit house found at the site (ZM 7). Beneath this level, there were two sections to this pit house. One section was a clay platform and the other section a pit (JA 2).

Features within the Starčevo horizon

All Starčevo pits recovered on the site have two common traits: (1), all features are cut into sterile soil, and (2) within each pit there are three horizons, or layers; a bottom (basal) horizon, a middle sterile horizon and a top (capping) horizon. However, even with these similarities, all pits had their own unique character and varied on several levels. Some of these differences were: (a) variation in pit dimension, (b) lack of continuity between daub and artifact context within each pit, and (c) lack of patterning between pit features. A summary of each pit will be discussed separately here (Figure 8) (Greenfield n.d.).

(i) Pit houses

Pit house 1. The first pit house was found in trench A, cut 2.1-m deep (from the surface) in sterile soil. Few ceramic remains and some carbonised remains were found associated with the pit. In general, the contents of this pit were minimal and contained very few ceramics in comparison to the Starčevo horizon.

Pit house 2. Pit house 2 was located in the northern section of trenches B-D-E. The shape of the pit house was trapezoidal, typical of most of the Early Neolithic structures on the site. The entrance was on the west (elevated and downhill) side of the pit. The internal stratigraphy of pit house 2 followed the same pattern as the other pits on the site, containing a basal horizon, a sterile horizon and capping horizon. The capping horizon contained a large quantity of ceramics, bone and stone debris. The middle horizon was 20 cm thick and contained loose soil with small amounts of Starčevo ceramics, bone, daub, and charcoal. This layer was covered by a sterile horizon that may indicate a period when the pit was abandoned and erosional fill was left to accumulate within it. The basal horizon of pit house 2 was a thick deposit of soil that contained a large amount of Starčevo ceramics, animal bones and other artifacts. It represents the first use of the pit. Surprisingly, the contents of the pit were quite low in density as opposed to the capping horizon of the pit.

Pit house 3. Just beyond the south end of trench B and separated by a strip of sterile soil was pit house 3. The capping horizon of pit house 2 contained numerous amounts ceramics, bone and stone debris but very little of this covered pit house 3. Pit house 3 was slightly higher then pit house 2 (not excavated as deeply) and the capping horizon had eroded off. Little is known of its dimensions since most of the feature was not excavated.

Pit house 4. Pit house 4 was found in Trench C-H-I. It contained a thick concentration of Starčevo ceramics at the very top (capping horizon), along with modified and unmodified stone and bone. Within the pit there was a ground stone axe/adze along with several fragments of modified and unmodified quartz crystal and fine quality Starčevo ceramics. The contents of the lower horizon were much more sparse.

Pit house 5. This pit house was found on the eastern edge of Trench C. The capping horizon consisted of various stone, ceramics and bone. Underneath this layer was the basal horizon with light density of material (chert/flint and quartz flaked tools, animal bones and a few ceramics). Only a small portion of ZM 5 was excavated (ten percent).

Pit house 6. There are three thick cultural horizons in the pit. The upper capping horizon, middle and lower (basal) horizon with thick layers of bone, ceramic concentrations and many highly finished artifacts and figurines and bone tools.

Pit house 7. The largest and most elaborate pit found at Blagotin was pit house 7, located in trenches F-G. The capping horizon is 30 cm thick in the north end and 10 cm in the south end. Starčevo artifacts were found along with pebbles (concentrations of pebbles were found sitting on top of the scapula of *Bos taurus*), large amounts of mica schist, daub, and quartz stone fragments. All of these items were located on the capping horizon of the pit house. Once these items were removed, the seventh level of excavations revealed two idols superimposed on a daub (clay) platform. This pit house contained two associated features, a clay platform and a deep central put (JA 2).

All the pit houses found at Blagotin show that they surround a central pit feature, pit house 7. The pits surrounding pit house 7 are smaller in radii, not as deep, and contain fewer remains of ceramics and bone.

The Site of Foeni-Salaş

Foeni-Salaş is another multi-period site (Early Neolithic, Eneolithic, Bronze Age, Iron Age and Medieval), located in the western edge of the Romanian Banat at the border with the Serbian Banat. The Early Neolithic occupation dates to ca. 5900 BC, the Starčevo IIa phase according to the Garašanin sequencing. Excavations at the site confirmed the occupancy of a new Starčevo-Criş II settlement in this region and it is considered to be an "exceptional example of a single phase Early Neolithic agricultural settlement" (Greenfield n.d.). The site is located on a low mound and has a single, thin occupation horizon that allowed for easy excavation. The goal of the project was to understand the socio-economic and spatial organisation of an Early Neolithic settlement. Therefore, the site was excavated spatially, revealing the distribution of artifacts and structures. The site is relatively small, approximately half a hectare with the Early Neolithic section of the site even smaller (ca. 2000 sq. m). The Early Neolithic section of the site is oriented south, facing a paleochannel on the Timişat. In prehistoric times, this channel wrapped around the southern and eastern sections of the site. Today, the Timişat has been straightened and is 100 m east of the site.

Foeni-Salaş is located in the Banat region of Romania. It is 3 km north of the modern village of Foeni, 45 km south-west of the Banat's capital, Timişoara. The site sits on a low mound in a flat alluvial plain located in between the Timiş and Bega Rivers (approximately 3 km away from the Serbian border). The south-west half of the Banat plain naturally rises (SW to NE). Foeni-Salaş is located on a terrace overlooking the Banat plain (Greenfield and Draşovean 1994: 46). East of this rise is the bank of the Timişat, a tributary stream of the Timiş river. The Timişat contained slow-moving water in prehistory. Today, large quantities of molluscs (*Unio pictorum*) recovered on the site are evidence for slow moving water.

Foeni-Salaş is found on the Timiş plain of the Banat, a division of the Banat based on altitude and relief. The Timiş plain includes the flood plain of the Timiş, Bega, Moraviţa and Brzava rivers (Zăvoianu 1979: 23-28). This area is characterised as having a high water table. In combination with the low angle, the gentle slope of the plain contributes to frequent flooding of the rivers and the formation of swamps (Greenfield and Draşovean 1994: 46). Nineteenth century maps of this region reveal the Bega and Timiş rivers draining into large areas of the plain. In the past, the environment of the Banat could be characterised as swamp and marsh. Today this region consists of rich agricultural land (Greenfield and Draşovean 1994: 46).

Soils

The Foeni-Salaş region consists of hydromorphic soils formed by a fluctuating water table. Soils in this area consist of sandy loamy clay and are superimposed above Pleistocene loess. These soils can become salty from capillary action and if they are not channelled for drainage, it can lose fertility (Greenfield and Draşovean 1994: 47).

Climate

The temperature of this region ranges from very hot in the summer to very cool in the winter. In January the range is 0^0 to -15^0 C and in July the range is from 21^0 C to 22^0 C reaching up to 40^0 C in July and August (Greenfield and Draşovean 1994: 47).

West and south-west winds influence the climate of Foeni-Salaş. The latter stems from the Mediterranean and is very damp, but also contributes to a mild winter. The easterly winds come from the Russian and Ukrainian steppes and are much colder and drier. Most of the moisture from the easterly winds is absorbed by the Carpathians, leaving a predominantly cold dry wind that blows mostly during the winter (Greenfield and Draşovean 1994: 47).

Rainfall in the Banat occurs all year round, but is highest in July, October and

November. The average precipitation is 700 mm/yr. There are between 130 rainy days and 15-20 snowy days (Zăvoianu 1979: 38).

Vegetation

The original vegetation of the region has almost completely disappeared due to modern farming practices, draining of the surrounding marsh land, and cutting down of the ribbon forests that parallelled the water courses.. The entire site of Foeni-Salaş is located in the middle of a corn (*maize*) field. There are small tatters of weeds and plants *Chenopodium album* (Fat Hen), *Papaver rhoeas* (Poppy), and *Typha latifolia* (Bulrush) along the edges of the cornfields.

Investigation History

As in most districts along the Romanian/Yugoslavian border have not been thoroughly investigated for archaeological sites. The first survey to take place in this part of the Banat was in 1975, when a number of settlements and tumuli were found by Florin Medeleţ (Thracology Institute, Timişoara). In 1986, construction of a natural gas pumping station led to the initiation of a salvage survey, which was directed by Florin Draşovean (Banat Museum, Timişoara). The survey revealed 11 archaeological sites from different periods (Greenfield 1994: 48).

In 1991 excavations began at the Romanian orthodox cemetery in the village of Foeni by Florin Draşovean and Florin Gogalton (Museum of History of Transylvania, Cluj). These excavations continued in 1992 and brought the total of archaeological sites in this area to 16, one of which was Early Neolithic (Starčevo-Criş). Late Neolithic Petreşti and Vinča sites, Chalcolithic Baden, Bronze Age, Early Iron Age Halstatt, Late Iron Age La Tène and Medieval sites were also found. In total, 25 percent of Timiş County was field-walked.

In 1992 Draşovean and his crew were the first to record finds at Foeni-Salaş. Two concentrations of materials were present. One concentration contained fourth century AD, Iron Age and Bronze Age material. The other concentration of material was found on the southern part of the hill and contained a large quantity of Starčevo-Criş ceramics. This area was examined in 1992 by Haskel Greenfield (University of Manitoba) with the help of Ian Kuijt (Harvard University), who conducted test excavations in the same year. Excavations continued in 1993 by Greenfield with a student crew from the University of Manitoba and various specialists.

Chronology

Absolute. Five animal bones were radiocarbon dated at Foeni-Salaş. One was rejected completely (6900 BC calibrated). The second yielded a date of 5900 BC and the last three clustered in the earlier half of the 6th millennium BC (5200-5000) (Greenfield n.d.).

Relative. Based on the relative frequency of stylistic elements found on ceramics, Foeni-Salaş is dated to the second phase of the Starčevo-Criş (IIA and IIB) phase (using the sequence established by Arandjelović-Garašanin described above). This site is contemporary with other sites in the region; Timişoara-Fratelia, Cuina Turcului I, Gura Baciului, Ocna-Sibiu II and Lepenski-Vir IIIA (see Lazarovici 1984: 62; Paunescu 1979; Vlassa 1980; Srejović 1972).

Investigative Objectives

The research aims at Foeni-Salaş were similar to Blagotin. This was to reveal as much as possible about the distribution of artifacts and household features. Like

Blagotin, this type of investigation entailed a careful excavation methodology. Each of the strata were "peeled" away one-by-one, revealing large-scale exposures so that artifacts and structural distributions could be recorded spatially. This also required excavating by natural soil horizons, leaving all artifacts in situ and drawing and photographing each horizon.

Pre-Excavation Methodology

The entire site of Foeni-Salaş was subdivided into 20 x 20-m blocks. Each block was given a number, starting with 1 in the SW corner and increasing in a W-E direction. This grid sequence began off the mound of the site and extended into alluvium. Each 20 x 20-m block was then be subdivided into smaller 5 x 5-m units (trenches). Each trench was assigned a letter (A, B, C). Trenches were further subdivided into 1 x 1 m blocks and numbered 1 to 25 moving left to right across the trench, starting at the NW corner. For example, 129B quad 1 would represent block 129, trench B, quad 1 (Figure 9).

Intensive surface and subsurface survey

An intensive survey was implemented at Foeni-Salaş in order to fulfil the research aims and objectives (as described above). Similar to Blagotin, several surveying techniques were implemented at Foeni-Salaş: surface collection, magnetometer, and soil auguring. The aim of using all these techniques was to determine the extent of the site, the richness of deposits, and, if possible, locate features and activity areas.

All three techniques used at Foeni-Salaş revealed significant results. Soil auguring was useful at establishing the location of surface features. However, because of the light and sparse density of features, much of the area was not located by the auger. The cores established a general pan site stratigraphy: plough zone, Medieval, Early Iron Age, Starčevo-Criş and the Pleistocene loess horizon.

In 1992, the magnetometer survey was used as an aid to decide where to place trenches. It was not used in 1993 because of malfunctions.

The surface collection established that Foeni-Salaş was a multi-period site and showed where Starčevo "hot-spots" were found and the extent of each period of occupation.

Excavation strategy

Trenches were excavated using a combination of natural and arbitrary (10 cm) levels. All quadrants were excavated separately and once opened, were taken down to sterile soil. In general, after removing the plough zone material (which was full of mixed cultural debris) with shovels and picks, the natural soil horizon was carefully excavated using trowels. All dirt was sieved using a 0.5-cm mesh (in 1992), which was later replaced with a 1-cm mesh because of clogging. Levels were excavated in arbitrary 10-cm layers, unless there was change in soil colour or texture. All artifacts were left *in situ* until the entire unit was drawn to scale. Photographs were taken at every excavation level. Soils samples were continuously extracted in areas concentrated with artifacts and features for flotation and general sieving.

Excavation results

All stratigraphic units at Foeni-Salaş were assigned locus numbers. In general, a change in soil colour or texture would receive its own locus number. Feature areas, artifact concentrations (i.e. pits, activity areas) would be assigned locus numbers.

There were five stratigraphic horizons (strata) at Foeni-Salaş that extended across the entire site (Figure 10):

locus 1 - plough zone;

locus 4- Early Iron Age;

locus 2 - Starčevo-Criş;

locus 5 - initial post-Pleistocene humus horizon; and

locus 12 - Pleistocene loess horizon. These five strata were cut by various features from different periods.

In some cases, this resulted in period overlap (as strata is cut by different occupations) and micro-strata. In general, however, excavation was not difficult. Features, when stumbled upon, were easily defined by different soil colour and texture and were not complicated to excavate.

Since the objectives at Foeni-Salaş were to reveal a spatial distribution of finds in each horizon, every excavation unit was excavated until sterile soil (Pleistocene loess) was reached. Because of this strategy, all pits and features were excavated, regardless of period or temporality. The following is a summary of the features and loci found in each horizon. Emphasis will be placed on the Starčevo-Criş occupation.

Cultural stratigraphic horizons

Modern Plough Zone. The material found in locus 1 (plough zone) was a mixture of cultural debris from all periods present at the site, including Early Medieval (11-12th century), Late Roman period (3-5th century AD). The plough zone is 30 cm thick.

Medieval Horizon. Beneath locus 1 was locus 4. This locus contained Medieval Early Iron Age (Halstatt), Eneolithic and Starčevo material. No artifacts found in this horizon were *in situ*. They were destroyed by the ploughing by the medieval occupants. This is a Medieval plough zone stratum. A major feature within the Medieval occupation was the fortification ditch (locus 8) that ran in an E-W direction across the site and turned north-south at the west edge of the site. It was stratigraphically connected with locus 4 and contained a low density of Starčevo-Criş and Halstatt ceramics. Seven Medieval pits were also excavated, two of which were semi-subterranean structures (loci 21, 27, 42 and 43), two small storage pits (loci 29 and 47), five bell shaped pits (features 4, 5 and 6, loci 46 and 35), and three graves (graves 1, 2 and 3). Virtually all of the pits had a low density of remains. Most of these features were found in the southern section of the site with no determinable pattern or organisation.

Early Iron Age Horizon. Underneath the Medieval occupation and plough zone was the Early Iron Age Halstatt horizon (ca. 1000 BC). However, because of Medieval ploughing, much of the Early Iron Age material was disturbed and Early Iron Age material was found in locus 4. Only the semisubterranean features were preserved. The Iron Age inhabitants of this site constructed many features, all of which were concentrated in the south half of the site. Pits of various shapes and functions were found in several locales around the site. In total, there were five storage pits, loci: 11, 28, 31, 32, 33, 34, 37, 39, 45, 54. There were also five possible pit houses loci: 18, 30, 40 and 44. Locus 40.1 contained post-holes with fallen wall daub and two sub-strata: locus 40.1 was the upper strata (and light grey in colour), and locus 40.2, the basal fill. A daub floor separated the two loci.

The second pit house (locus 44) was found in trenches 129E (quads 3-5, 8-10) and 129F (quads 5 and 10) and had two sub-strata present. The first is locus 44.1, which is the upper fill of the pit. The lower stratum, locus 44.2, was separated from locus 44.1 by a fallen daub wall. The lower stratum was the basal fill of the pit.

Early Neolithic Horizon. Several loci were associated with the Early Neolithic Starčevo-Criş horizon. There were six pit houses, one storage pit and an exterior living surface were found (Figure 11).

Locus 2. This locus represents the pan-site Starčevo-Criş horizon that stretches across the entire site. The density in material was very low in comparison to pits and features. In total, five pits were found, two of which were pit house complexes in this locus.

Locus 7. This Starčevo pit house complex was found in trench 131F. Within this pit were three separate strata, loci 14, 16 and 17.

Locus 14. This locus represents the upper fill of the Starčevo-Criş pit complex. The fill of this pit began at an average depth of 79.88-m ASL, approximately 40 cm below the surface. It probably represents the collapsed roof of the structure.

Locus 16. This locus represents the middle fill of the Starčevo-Criş pit complex. The contents of this level of the pit were mussel shell, Starčevo-Criş ceramics and animal mammal bones. Judging by the contents of the fill matrix, especially the high frequencies of snail shells, it appears as though this level is a post-occupational deposit of redeposited by snail activity.

Locus 17. This was the basal and living horizon of the pit. Material remains consisted mostly of Starčevo-Criş ceramics and animal bone. The structure may have enclosed a trapezoidal area, approximately 5 x 4 m (N-S: E-W).

Locus 10. This was the second pit house feature found in trenches 149L and 150I. It also had a trapezoidal shape similar to locus 7. The upper levels of the pit were distinguishable from the basal living horizon. This locus also represents a one-time occupation and use. This locus was found under locus 4 and above locus 5.

Locus 23. This was the largest Starčevo pit house complex and was found in the centre of the circle of pit houses. It is in trenches 129C (quads 5, 10, 15, 20, 25), 129D (quads 1-25), 130A (quads 1, 2,6,7,11,12,16,17,22) 149P (quads 16-25), 150M (quads 16, 17, 21,22). This was also trapezoidal in shape and contained several superimposed strata. The basal horizon (levels 8-10) contained a large dome-shaped oven and a central fire pit. Levels 6-7 were filled with fallen roof and post-occupational redeposited debris. Levels 4-5 were heavily mixed with later EIA material probably because of EIA ploughing activities. A later Early Iron Age fire pit (locus 23 hearth) and a medieval fortification ditch (locus 8) destroyed part of this locus.

Locus 24. This trapezoidal shaped pit feature was found in trenches 130D (quads 1-3, 6-8), 150P (quads 1-25), 150O (quads 10, 15, 20, 25), 150L (quads 21-24) with a fire-pit in the southern end. An Early Iron Age pit (locus 30) was dug into the centre of locus 24, and destroyed most of the centre of this large Starčevo pit house complex. A possible small Eneolithic pit disturbed the southwestern edge. Only the basal horizons of this pit (130D levels 8-10; 150P levels 5-6) remained undisturbed.

Locus 25. Locus 25 was a small Starčevo-Criş storage pit in the bottom part of trenches 130A (quad 5) and 130B (quad 1). It was 1 metre in diameter, circular in shape, and 1 metre deep. Stratigraphically, locus 25 connected to locus 2. No remains of botanical material were recovered from this storage pit.

Locus 41. The last excavated Starčevo-Criş pit feature was found in trenches 129E (quads 14, 15, 18-20, 23-25), 129F (quads 11, 16, 21), 129I (quads 3-5) and 129J (quads 1, 2). A few postholes were noticed in this area along with a central hearth. This feature appeared to be virtually empty of debris unlike other pits found in this horizon. This feature however, was badly disturbed by locus 44.

Locus 50. This sixth pit house feature was identified on the last day of the field season and was not excavated. Extensive coring took place and remnants of snail shells, animal bones, and Starčevo-Criş ceramics were recovered. The shape of the feature was probably trapezoidal and extended to a depth of c. 2 m below the surface.

Locus 51. This locus represents surface deposit surrounded by postholes in 130B and 130C. This area was not assigned a locus number in time, but was recognised as a late Starčevo-Criş surface structure. It was circular in shape and may had a special function. Few animal bones, but many ceramics (Starčevo-Criş) were recovered in it.

Locus 52. This locus represents the remains of a possible corral in 130E. This area of uneven surface and extreme compact soil. It was surrounded by postholes. It was circa. 8 m in diameter, circular in extent.

Locus 53. This locus represents a surface concentration of daub without any associated architectural features or artifact concentrations. It was located in 131F and extended east and west into 130E and 130G. The remains may reflect a surface or above ground daub structure.

Conclusions

This chapter described the investigative history, research objectives and excavation methodology of Blagotin and Foeni-Salaş. The objectives and methods of each site are comparable which warrant a detailed comparison of botanical assemblages. The two sites are comparable because each is a single Early Neolithic occupation and the occupants did not spend much time in modifying or bettering their environments. Structures are in the form of pit houses. There are few permanent features, such as ovens and storage pits. The dwellings in both sites appear to surround a central larger pit house and a communal open-air (plaza) area. In conclusion, Foeni-Salaş and Blagotin appear to be short term settlements as the inhabitants did not invest much time into their living quarters.

CHAPTER VIII:

FIELD AND LAB METHODOLOGY FOR FOENI-SALAŞ AND BLAGOTIN

During excavation at Blagotin and Foeni-Salaş soil samples were collected for flotation, pollen, and phytolith analysis. The methods used for soil sample collection. flotation and macrobotanical analysis employed at each site are described below.

Field soil sampling

In any excavation, it is impossible to collect and float all soil, therefore, a soil sampling strategy must be implemented. At Foeni-Salaş and Blagotin soil sampling strategies were constructed so that all areas could be examined for cultural remains in the most time and labour efficient way possible. A method was constructed to maximise the volume of soil so taxonomic diversity would not be sacrificed. The following discussion will describe the soil sample strategies used at each site.

Blagotin: soil sampling

During excavation in the plough zone levels, soil samples were rarely collected for flotation due to the high probability of contamination. Once excavation proceeded below the plough zone, a systematic soil sampling strategy was implemented. In general, two litre soil samples were extracted from selected units in a checkerboard pattern from every level of every trench and removed for flotation. These samples acted as controls; no attention was paid to feature or special areas with this method. However, if features or large concentration of artifacts was found, the entire portion of soil matrix was collected and floated on site. This approach is similar to the "blanket sampling" method described by Pearsall (1989: 95), where large volumes of soil are extracted from features, classes, soil types and cultural components and not just hearth areas or features where high seed contents are expected.

After samples were extracted from the trenches, they were laid out to dry for a few days in the shade to ensure that all carbonised remains would be dry enough to float. There had been a great deal of fear in 1991 that carbonised remains would become too water-logged to float. During drying time, all pertinent information about the sample was recorded on a flotation form, including provenience, artifact associations, litres of soil extracted and a small sketch describing where samples came from in the trench.

The method described above was used in 1991. In 1992, however, although samples were extracted using the same method, no flotation forms were kept on the samples. Therefore, the amount of litres floated from non-control contexts is unknown.

The flotation devise used at Blagotin in 1991 and 1992 was a manual flotation system constructed by Greenfield and his crew. This system consisted of a large oil drum with a spout on the rim of the drum and water intake valve near the bottom. Within the drum were two large sieves, a 2.00 and 1.00 mm to capture the heavy residue. The drum was filled with water from a hose connected an intake valve. Water would pour out of a spout on the top of the drum through a set of graduated 1.00 mm and 0.50 mm sieves. The dry soil sample was emptied into the barrel and the carbonised remains floated upwards and spilled out into the sieves with the running water. The 1.00 mm and 0.50 mm sieves captured all the carbonised remains, including wood and seeds. The carbonised remains (light fraction) would be placed on plastic bags in the open to dry for a day. Once dry, the carbonised sample was transported to the Anthropology labs, University of Manitoba, where they were sorted and identified. The heavy fraction, or the residue caught in the sieves within the tank, consisted of rodent bones, and smaller artifacts such as ceramic sherds and lithics. These remained in Yugoslavia for further analysis. All artifacts in the heavy fraction were be counted and sorted in the field. Unfortunately, the Balkan war interfered with the completion of the analysis of the heavy fraction.

Foeni-Salaş: soil sampling

The soil sampling method used at Foeni-Salaş was similar to Blagotin. Some differences, however, exist. For example, it was not feasible to float control samples from every second quad as was done at Blagotin. Therefore, the control sampling system was modified to some extent. It was the duty of the trench supervisor to make sure that samples were taken from around every feature as well as within each feature, and to take random samples from every level within each trench. Samples were extracted from all feature areas, artifact concentrations and soil colour changes were floated in their entirety whenever possible, or extensively sampled.

When soil samples were brought in from the field, they were laid out on a tarp to dry in the shade for a few days. During this time, all pertinent information about the sample was recorded, such as provenience, soil composition etc. on a soil processing form. Once the sample was dry and all information was recorded, it was ready for processing.

There were some differences between years of fieldwork at Foeni-Salaş. In

1992, a small portable flotation system was used at Foeni-Salaş. This system consisted of: (1) a bucket with a bottom mesh (1.00 mm), (2) a mesh scoop, and (3) a large basin of water. The bucket with the mesh bottom was held in the large basin of water, partially immersed. The dry soil sample to be floated was slowly poured into the bucket and agitated by hand so the carbonised remains would float to the top. Once the carbonised material was suspended in the water, a mesh scoop gathered up the charred remains. The carbonised material collected in the scoop were placed on a piece of cloth and hung up to dry. The remains caught in the bucket, the heavy fraction were laid out to dry and then sorted in the field. Although this portable system was simple and easy to manufacture, it could not withstand large volumes of soil, and only a few samples (max. 15) could be processed each day. This system was abandoned in 1993 - 1994 when the facilities in Romania improved and the following system was employed.

In 1993 - 1994, a flotation tank similar as that used at Blagotin, was constructed. The devise consisted of a large metal barrel (oil drum) with a set of 2.00 mm and 1.00 mm sieves to capture heavy fraction remains. A water intake valve located on at the bottom of the barrel filled the tank up with water until the water spilled out from a spout located on the rim of the drum. Once the drum was filled and running with water, the sample was poured into the drum. The light fraction was caught in 1.00 mm and 0.50 mm sieves when the running water poured out of the through the spout. The rest of the procedure follows the Blagotin method (above).

Laboratory analysis

All samples processed at Blagotin and Foeni-Salaş were transported to the Anthropology Laboratory, University of Manitoba, where all flotation forms and field data were imputed into a spreadsheet by the author or volunteer students at the University. All processed samples were prioritised by period and loci. All Early Neolithic samples were completely sorted. Few samples that are not Early Neolithic (Medieval, Iron Age and Eneolithic) have been analysed to examine if the remains found are different from Early Neolithic. Examining all samples from every context is well beyond the scope of this thesis.

Procedure

(1) Before each sample was sorted, all provenience information, including the weight of the floated sample was recorded on a Seed Identification Form. This information included all provenience information, the weight of the sample (before and after processing), the date it was excavated, and the date it was sorted.

(2) The sample was placed on a petri dish and sorted under a light optical microscope (a magnification range from 10x to 40x). All charred and uncharred material was extracted from the sample, sorted by type, counted and/or weighed. This included bone, shell, seeds, charcoal, gastropod eggs and fungal sclerotia. All sorted material were then placed in labelled vial for storage and further analysis. All information was recorded on the Seed Identification form.

(3) Seeds were identified in a number of ways. Most material was identified using reference material in the seed processing room at the University of Manitoba. The reference material includes charred and uncharred specimens of cereal, weed and fruit

seeds. A generous donation of charred and uncharred cereal, legume and European fruit remains was made to the Botany department by Helmut Kroll (Universität Kiel. FRG). Constant referral was also made to seed identification manuals such as Scohch, Pawlik and Schweingruber's *Botanical Macro-Remains* (1988) and Delorit's *An Illustrated Taxonomy Manual of Weed Seeds* (1970). More problematic materials were taken to the herbarium in the Botany Department at the University of Manitoba where seed parts could be compared to mounted plant specimens. The major problem in identifying Eastern European specimens is that access to comparative collections is difficult. There is a strong reliance on reference manuals and seed drawings for identifying unknown seed types which may or may not be accurate.

(4) All information was recorded on flotation forms (from the field), plus all information on the seed identification form was imputed into excel spreadsheets. Spreadsheets allow for easy statistical manipulation and provide an analyst with a relative idea as to how seeds are distributed across the site.

CHAPTER IX:

RESULTS OF ANALYSIS: FOENI-SALAŞ AND BLAGOTIN

This chapter will describe all recovered plant species and the location of each species within each site. Additionally, this chapter will describe the distribution of remains from each feature area or loci from each site separately. All items discussed here are carbonised and assumed to be so as a result of prehistoric activity. Non-carbonised seeds will not be considered in this discussion because they are considered modern and intrusive.

At Blagotin, 13 taxa were recovered from Early Neolithic contexts along with three unidentifiable seeds. This came to a total of 32 whole seeds and 19.5 seed fragments (Table 1). This yielded a total of 51.5 seeds, including all domestic, wild and weedy types. At Foeni-Salaş, 17 taxa were recovered along with four unidentifiable seeds, yielding a grand total of 53 whole seeds and 63 seed fragments from Early Neolithic contexts (Table 2). Counts of fragments are divided in half in order to be tallied resulting in a total of 121 charred seeds.

In this chapter, the distribution of each taxon recovered by flotation at Foeni-Salaş and Blagotin are examined. The different taxa will provide the basis for evaluating the nature of crop processing and the cultural importance and economic significance of plants to the inhabitants at each site.

The distribution of plant remains by taxon at Blagotin

A total of 51.5 seeds were recovered from Early Neolithic deposits at Blagotin (Table 1). The Early Neolithic seed assemblages at Blagotin resembled Foeni-Salaş, but slightly differed in terms of composition and variety. At Blagotin, 42 percent of the botanical remains were domesticates, 44 percent were gathered seeds and 14 percent were weed seeds (Figure 12). Below is a discussion of the charred seeds found and the distribution of each type.

Fruit and Nuts

***Cornus mas* (Cornelian cherry).** In all cases, the pits of *Cornus mas* were found associated with either Starčevo pits or Starčevo living horizons. It is not unreasonable to assume that this fruit was gathered from the surrounding environment and consumed at the site. Pits of *Cornus mas* were found in several locations around the site. The highest concentration of finds were from pit house 6 where five pits and four fragments were recovered, in levels 3, 4 and 5. This concentration of pits was the largest concentration of gathered fruits anywhere on the site and the Cornelian cherry is the highest gathered species represented in the botanical finds. Other pits of *Cornus mas* were found in pit house 7 (levels 14, 17 and 18) where three pits and one fragment were recovered. Two pits were found in pit house 4, levels 1 and 2. Random remains of this species were found around the pit, in trench D, quad p, level 3 (one pit and three fragments), and pit house 2 which had one pit. In all cases, the pits of *Cornus mas* were found associated with either Starčevo pits or Starčevo living horizons. It is not unreasonable to assume that this fruit was gathered from the surrounding environment.

***Malus pumila* (Apple).** Wild apple was found in one context at Blagotin, pit house 2. This area contained three individual pieces of apple (mesocarp and endocarp). It is concluded that the remains reflect at least three individual pieces based upon the size and shape of each fragment. Apple parts included the mesocarp, endocarp and seed. One fragment was in level four, part of pit house 2, and one fragment in KS 1 (cultural level 1). Another fragment was found in KS 3 of the same pit house (Trench D).

***Pyrus mas* (Pear).** One seed belonging to a pear was recovered in pit house 6 (Trench J, quad h, level 3).

***Rubus fruticosus* (Blackberry).** Two seeds of *Rubus fruticosus* were recovered. One complete seed was found in pit house 6 (trench J, quad l, level 5) and the other in pit house 2 (trench D, unknown quad, level 8).

<u>Weeds</u>

***Chenopodium* sp. (Goosefoot).** *Chenopodium* sp. was recovered from two areas at Blagotin: pit house 2 (trench D, unknown quad, level 8). One fragment of *Chenopodium* sp. was found in trench D, immediately next to pit house 2 from quad p, level 3, and another complete seed in trench G, quad b level 7 (in the top capping levels of pit house 7).

***Papaver* sp. (Poppy).** Two fragments of *Papaver sp.* were recovered at Blagotin. One fragment each was found in pit house 6 (trench I, quad f, level 2) and pit house 7 (trench G, quad e, level 7 - the capping horizon).

***Polygonum* sp. (Knotgrass).** One seed of *Polygonum sp.* was found in pit house 2, trench E, quad l, level 10 (the basal horizon).

***Silene* sp. (Champion).** A single charred seed of *Silene* sp. was recovered from a living horizon on the edge of pit house 2 in trench D quad p, level 4.

Grass Grains and Domesticates

***Triticum monococcum* (Einkorn).** *T. monococcum* was the most common cereal grain recovered at Blagotin (as well as Foeni-Salaş). Finds of this grain came from several feature and non-feature areas: pit house 2, level 2 (one grain) and pit house 7 (level 7) where one fragment was found. Non-feature areas include trench C (level 7, quad t), and trench G (level 7, quad e) with one grain, respectively.

***Triticum dicoccum* (Emmer).** Only one grain of *T. dicoccum* was recovered at Blagotin: trench G, level 7, quad e (above pit house 7).

***Hordeum vulgare* (Barley).** One grain of barley was recovered from Early Neolithic pit house 6 (level 2).

***Lens sp.* (Common Lentil).** In Early Neolithic pit house 6 there where two complete caryopses of *Lens* sp. found in level 2 and level 4.

Gramineae Family. In addition to the cereal grains identified, there were grains of Gramineae that could not be identified to a species level because of high degrees of degradation and charring. These grains were charred under very high temperatures in prehistoric times which resulted in high attrition on the dorsal and ventral sides. Seven small fragments and four complete grains were recovered in pit house 6, all badly worn and unidentifiable. The remaining unidentifiable cereal grains were found in trench C (level 8) with six small fragments, trench E (level 3) and two small fragments and trench G (level 7, the capping horizon) with three small fragments.

Unidentifiable. Five fragments of seeds that were highly charred and badly degraded could not be identified. These seeds were found in the following Early Neolithic contexts:

Pit house 2, feature section 2, level 8.

Pit house 2, feature section 1, level 6.

Pit house 2, feature section 1, level 2.

Distribution of Early Neolithic plant remains amongst loci at Blagotin

In general, the charred seed remains recovered from Blagotin are very similar to Foeni-Salaş, particularly in terms of their sparse distribution. The composition of seeds in the samples at Blagotin contained more wild fruits than domesticated plants, especially the Cornelian cherry (*Cornus mas*). This section will describe the distribution of remains from Blagotin by feature.

Feature areas

Pit house 2: This feature area contained a wide array of wild fruit remains: *Cornus mas*, *Rubus fruticosus* and *Malus pumila*. Although *Cornus mas* and *Rubus fruticosus* were present in single quantities in this area, two seeds of *Malus pumila* were found in cultural level 1, one seed in excavation level 4 and two fragments in cultural level 1 and cultural level 3. Three small fragments of *Chenopodium* sp. were found in excavation level 8 and one grain of *T. monococcum* in excavation level 2. Three unidentifiable weed seeds were recovered (one each in excavation levels 8, 6 and 2). The majority of remains from this feature come from the lower levels, or basal living horizon of the pit. Excavation of the basal living horizon revealed a thick deposit of soil, containing large amounts of Starčevo ceramics, bones and other artifacts.

Pit house 4: Two complete pits of *Cornus mas* were present in this feature.

Pit house 6: This feature area was the most plentiful in terms of carbonised seed remains. A mixture of fruits, grains, legumes and weeds were recovered. Twelve degraded grains of domesticated Gramineae were found (one seed and seven fragments from excavation level 2; one grain from excavation level 5, and two grains from an unknown level). In addition to this, a single grain of *Hordeum vulgare* (excavation level 2) and three complete seeds of *Lens sp.* (two from level 2 and one from excavation level 4) were recovered. Other charred botanical remains include a fragment of *Papaver* sp. (excavation level 2), one seed of *Pyrus* sp (excavation level 3) and one seed of *Rubus fruticosus* (excavation level 5). A concentration of gathered *Cornus mas* fruit seeds (five pits and four fragments) came from excavation levels 3, 4 and 5. This pit house stands out from the rest by the number and variety of the botanical remains. It is difficult to make any conclusions about the functions of this pit feature based on the botanical remains other than that this pit house was not used for a specific crop processing.

Pit house 7: Two concentrations of remains were recovered in pit house 7. In the capping horizon, one fragment of *Papaver sp.* and three fragments of Gramineae were found (Trench G, quad 3, level 7). Associated with these fragments were two complete grains of *T. monococcum* and *T. dicoccum* and one weed seed of *Chenopodium sp.* (trench G, quad e, level7) , QUADS, LEVELS). In the lower (basal) levels of this pit, three complete pits, one fragment of *Cornus mas* (one each in levels 14, 17 and 18, trench F, quads k, o, u, w).), plus a small fragment of *T. monococcum* (trench G, quad e, level 14) were found.

<u>Non-feature areas</u>

At Blagotin flotation samples were extracted from non-feature areas. These samples were primarily controls to see if samples within feature areas differed from what was found outside of them. No remains were found except in immediate proximity to pit house features. Below is an account of all recovered remains from non-feature areas.

Trench D: Two fragments of *Silene* sp. and *Chenopodium sp.* were recovered from trench D with one complete pit and three fragments of *Cornus mas.* All these remains were recovered in quad p level 3. This trench was in the immediate proximity of pit house 2 and may represent wild blown or spilled over botanical remains from the pit.

Trench E: Two fragments of a Gramineae were found in quad m level 3 and along with one complete seed of *Polygonum* sp. These remains were also in immediate proximity to pit house 2.

Conclusion of Blagotin remains

The quantity and nature of botanical remains at Blagotin were similar to those from Foeni-Salaş. Almost no remains were found outside of the pit houses, except in close proximity to pit houses. These probably represent overflow or wind-blown deposits from the pit houses. In general, the quantity of remains was quite low and almost all deposits of botanical remains were heterogeneous in composition, containing a variety of domestic, gathered and wild seeds. However, with the low quantity of remains recovered at Blagotin makes it difficult to distinguish specific botanical activities, such as refuse, disposal or crop processing. Judging by the types of remains recovered, agricultural or agricultural products were only a part of the diet at Blagotin. To what extent, or how important was agriculture, is difficult to determine.

Even though the spatial distribution of remains is sparse, the distribution of certain botanical taxa are spatially discrete. Pit house 2 is characterized by an abundance of fruit remains and weeds. Only one grain of *T. monococcum* was found. Only fruit seeds were found in pit house 4. Pit house 6 and 7, in contrast, had higher quantities of domesticated cereal grains. In pit house 7, the capping horizon contained a mixture of weeds and domesticated grains. In contrast, the basal living horizon contained a mixture of gathered fruits and domesticated grains. The botanical remains from Blagotin are dominated by gathered fruits and domesticated grains.

Foeni-Salaş

In total, 121 charred seeds were recovered from Early Neolithic contexts. The breakdown of Early Neolithic remains analysed consist of 19 percent domestic seeds, 66 percent gathered seeds, and 15 percent wild and weedy seeds (Figure 13). Gathered seeds are defined here as plants that were intentionally collected by the inhabitants of this site, as opposed to wild seeds which are accidentally reaped, harvested and charred, not for the use of consumption. The taxa analysed from Early Neolithic contexts will be discussed along with and their distribution amongst all feature and non-feature areas.

Fruit and Nuts

Cornus mas **(Cornelian cherry).** *Cornus mas* was the most frequent fruit recovered at Foeni-Salaş. Two fragments were found in locus 16, 131F, quad 18, (level 79.73-79.40) and one fragment from locus 17, 131F, quad 17 (level 79.48).

Quercus sp. **(Acorn).** The *Quercus* sp. cotyledon, or acorn, was present at Foeni-Salaş in remarkable quantities. Most of these remains were found in concentrated areas of locus 23, both in the Iron Age hearth feature and in Early Neolithic contexts. In the Early Neolithic horizon, in 129D, level 4, quad 5 five fragments of the acorn cotyledon were recovered. In level 6, the quantity of these remains increased and 43 fragments were recovered. In this study, the number of fragments is divided by half to represent complete seeds. This is a typical method used among Paleobotanists (T. Shay, personal communication). Therefore, in level 6, there were 21.5 acorns present. Level 7 of 129D contained the largest number of *Quercus sp.* cotyledons. In this level, there were 48 fragments and one whole piece, representing 25 complete pieces of acorn. These finds were recovered from quads 6, 7, 8, 11, 13 and 22. In level 8 of the same trench, there were 9 fragments recovered (4.5 whole pieces) and in level 9 there was another nine fragments (4.5 whole pieces). In the bottom-most level of this pit, there were four fragments and fifteen complete pieces of Quercus sp., yielding a total of 17 whole pieces. This large quantity of remains most likely represents that the inhabitants at Foeni-Salaş gathered and consumed acorns from the surrounding environment. Finds of *Quercus* sp. are not rare in Early Neolithic sites as they have been recovered from the Starčevo type site (Nikolić 1988: 39-44) and in the Greek Early Neolithic site of Achilleion (Renfrew 1989: 307-310).

<u>Weeds</u>

***Chenopodium* sp. (Fat Hen).** Three seeds of *Chenopodium* sp. were recovered in the locus 7 pithouse. One was found in locus 14, 131F, quad 7, level 79.82, and locus 14, 131F, quad 11, level 79.58-79.48. The third was found in sub-locus 17, 131F, quad 18, level 79.40-79.21.

***Galium palustre* (Marsh Bedstraw).** Two seeds of *Galium palustre* were recovered:

one in locus 24, 150P, quad 18, level 6, the other in locus 23, 129D, quad 25, level 7.

***Malva/Galium* (Mallow/Marsh Bedstraw).** *Malva* and *Galium* are difficult to distinguish from each other when charred and degraded. Thus, one type of *Malva/Galium*, was recovered in locus 2, 130B, quad 7, level 6.

***Papaver* sp. (Poppy).** Two seeds of *Papaver* sp. were found in locus 23, 150M, quad 21, level 8.

***Prunella vulgaris* (Self-heal).** One seed of *Prunella vulgaris* was recovered from locus 23, 150M, quads 16, 17, 21, 22 (combined), level 8. This soil sample was extracted from a soil scraping from the top horizon of level 8.

***Sambucus nigra* (Dwarf elder).** Two seeds of *Sambucus nigra* were recovered in locus 24, trench 150P, quad 8, level 5 and quad 17, level 5.

***Silene vulgaris* (Bladder Champion).** Two seeds that are similar to *Silene vulgaris* were recovered in separate areas: One seed each was found in locus 2, 131J, quad 11, level 79.78-79.68.

***Sonchus asper* (Prickly Sow-Thistle).** One seed of *Sonchus asper* was recovered in locus 23, 129D, quad 16, level 8.

<u>Grass grains and domesticates</u>

***Avena sp* (Oat).** One seed resembling *Avena* sp. was recovered in locus 23, trench 150M, quad 21, level 8.

***Hordeum vulgare* (Barley).** A grain of barley was found in locus 23, 129D, quad 16, level 8.

Leguminosae (Lentil Family). One seed belonging to the Leguminosae family was recovered in locus 2, 130B, quad 7, level 6.

***Panicum miliaceum* (Broomcorn Millet).** Two grains of millet were recovered. One grain was found in locus 2, 131F, quads 16, 17, 21, 22, (combined), level 7. Another grain resembling that of millet (cf. *Panicum miliaceum*) was recovered in locus 14, 131F, quad 17, (79.78-79.68).

***Poa/Phragmites* (Kentucky Bluegrass/Common Reed).** A very small grass grain, that was too fragmented to identify specifically, was recovered in locus 23, trench 150M, quad 21 level 7. A small fragment of the same type was also recovered in locus 24, 150P, quad 18, level 6.

***Triticum dicoccum* (Emmer).** Two grains of this species were recovered in: locus 2 (new locus 51), 130B, quad 1, level 6, and in locus 24, 150P, quad 18, level 6.

***Triticum monococcum* (Einkorn).** Six grains and a rachis fragments were found scattered amongst Early Neolithic features around the site. In locus 24, two grains and a rachis fragment were recovered (one grain and rachis fragment in 130D, quad 1, levels 7 and 10) and one grain in 150P, quad 2, level 5. A single grain was recovered in the Early Neolithic context of 129D quad 7, level 7 of the. Two grains were found in locus 2 (trench 130B, quad 1, level 7) and another trench 150E, quad 6, level 5. A single grain was also recovered in locus 23 (trench 150M, quad 21, level 7).

Gramineae Family. There were several cereal grains of Gramineae recovered from Foeni-Salaş that were too fragmented or degraded to be identified to a genus or species level. This degradation is attributed to high temperature burning that occurred in prehistoric times and not from environmental decomposition. As with most of the cereal remains found at Foeni-Salaş, most Gramineae grains come from either locus

23 or 24. A few come from other contexts. Below is a listing of all Gramineae grains.

locus 23, 150M, quad 16, 17, 21, 22 level 8 (one grain)

locus 2 (capping level of locus 23), 129D, quad 7, level 5 (three fragments)

locus 2 (capping level of locus 23), 129D, quad 6, level 5 (one grain)

locus 24, 150P, quad 17, level 5 (one fragment)

locus 24, 150P, quad 2, level 5 (one grain)

locus 24, 150P, quad 17, level 6 (one grain)

locus 24, 150P, quad 16, 17. 21, 22 level 3 (one grain)

locus 24, 150P, quad 7, level 5 (one grain)

locus 2 (new locus 51), 130B, quad 1, level 6 (one grain)

Unidentifiable. Several species of seeds that could not be identified to a further species level because of high levels of charring, fragmentation and degradation. All of these finds were small fragments of seeds that were beyond species assignments:

locus 2, 131F, quad 16, 17, 21, 22, level 7.

locus 2, 130B, quad 7 level 6.

locus 7, 131F, quad 17, 79.78-79.68.

<u>Distribution of plant remains amongst loci at Foeni-Salaş</u>

This section will summarise the botanical remains recovered from all loci examined. The data are examined to provide insight into the distribution of plant remains by individual structures or loci. Remains from closed and open contexts are discussed, but only features and primary deposits provide a prime source of information on activities in particular locations.

Feature Areas

Locus 7 (sub-loci 14, 16 and 17): Botanically, this is the richest Early Neolithic pit house locus. In total, the quantity of seed remains out of this Starčevo pit feature area (loci 17, 14, and 16) is small, even when all three strata are combined together. Therefore, it is not likely that this feature represents a stage of crop processing. It may, however, represent a refuse area as the composition of plant remains consists of domesticates, gathered fruits and weed seeds. The data are discussed by sub-loci:

1. Locus 14 is the upper fill of the pit house complex. It is probably the capping horizon (collapsed roof). The botanical remains from this area include one *Chenopodium sp.* seeds (quads 11, level 79.82, two fragments of *Cornus mas* (quad 18, level 79.40-79.21), and two *cf. Panicum miliaceum* seeds, a complete and a fragmentary seed, in quad 17, level 79.78-79.68. Also, one unidentifiable fragment was found in quad 17, level 79.78-79.68. The remains in this level are spatially dispersed.

2. Locus 16 represents the middle fill of the pit house. It is highly disturbed by snail activity. Two fragmentary seeds of *Cornus mas* were found in quad 18, level 79.73-79.40.

3. This locus represents the basal fill and living horizon of a Early Neolithic pit house. One *Chenopodium sp.* seeds was found in quad 18, level 79.40-79.21 and quad 7, level 79.58-79.48 and one fragment of *Cornus mas* in quad 17, level 79.48. The remains in this level are spatially clustered in the center of the feature.

Locus 10: No remains were recovered from this pit house.

Locus 23: Locus 23 is the largest pit house complex found at the site. Unfortunately, a major portion of this feature was destroyed in the Early Iron Age by a large Iron Age hearth/pit that cuts into the centre of this feature. This preserved Early Neolithic feature is a large circular structure containing numerous post-holes, a dome-shaped oven and a central fire pit. It might be expected that in contexts such as this, there would be a rich botanical sample. Extensive sampling took place in this area. Flotation yielded few botanical finds. The distribution of remains found in Early Neolithic contexts are far enough from the intrusive Early Iron Age hearth and are not intrusive. Two weed seeds of cf. *Silene vulgaris* were recovered in locus 23, 150M, quads 21 and 22, level 7. From the same area, 150M, quad 21, level 8, a single grain of Gramineae and a weed seed of *Prunella vulgaris* were found. There were also single grains of *Poa/Phragmites* (150M, level 7, quad 21), *T. monococcum* (150M, quad 21, level 7) and *Avena sp.*, (150M, quad 21, level 8) along with two weed seeds of *Papaver sp.* (150M, quad 21, level 8). Immediately next to the cluster of remains in 150M, a fragment of *Quercus sp.* was found in the capping horizon of locus 23 (originally called locus 2), in 149P, quad 23, level 5. This concentration of remains is a definite cluster in the northeastern corner of the pit house. It contains a mixture of weed and domesticated cereal grains.

Other remains were found in the capping horizon of locus 23. They were found in a small cluster on the other side of the pit house (northwest corner), including one whole rachis fragment and three seed fragments of Gramineae in quads 6 and 7, level 5.

The presence of domesticated cereal remains indicates that the occupants were using wheat agriculture. Which types of processing activities were conducted in this area cannot be determined from so few remains.

Locus 24: Trenches 130D, 150P. Locus 24 is a trapezoidal shaped pit house feature with a fire pit located at the southern end. It was badly degraded by an Early Iron Age pit. In 130D, quad 1, level 10, a grain of *T. monococcum* was found. In 150P, both domesticated and non-domesticated species were recovered. In level 5, two seeds were recovered: a single grain of *T. monococcum* and a degraded Gramineae grain (both in quad 2). In quad 7, level 5, another single Gramineae grain was also recovered and close by in quad 8 (level 5) was a weed seed of *Sambucus nigra.* Quad 17 (level 5) contained a Gramineae grain and another *Sambucus nigra* weed seed. In level 6 of the same trench, a grain of Gramineae was recovered (quad 12) and in quad 18 (level 6) a fragment of *Poa/Phragmites*, a single seed of *T. dicoccum* and a weed seed of *Galium palustre* were recovered.

The seed remains in locus 24 are spread all over the pit house. No clustering of remains are apparent, in contrast to locus 23. The wild grass remains may represent an unclean, or inefficient harvesting system or the early stages of crop processing. It is unclear as to the nature of activities that may have been conducted in this area since the botanical remains are a mixture of weed seeds and domesticate seeds. The low quantity of finds makes it difficult to distinguish the type activity may have taken place here.

Locus 25: No remains were recovered from this small storage pit.

Locus 41: There were no carbonised seeds recovered from this pit house feature.

Non-feature areas

Locus 2: Locus 2 is the Early Neolithic pan-site cultural horizon. A few clusters of remains were collected from this locus. There were no isolated remains. The samples were large enough for a detailed statistical analysis. The highest concentration of remains found in this horizon come from trench 130B, quad 7, level 6, where six seeds were recovered. These remains include one badly degraded grain belonging to the Gramineae family, one grain of *T. monococcum*, one grain of *T. dicoccum*, one weed seed of *Malva/Galium*, a lentil (cf. *Lens culinaris*), and a small unidentifiable grass. This concentration stands out from the rest by its quantity and diversity of material. There are no features associated with this concentration in contrast to all other concentrations. Two other isolated clusters of remains were found. Each was in close proximity to an Early Neolithic pit house. Three fragments of *Triticum monococcum* were found next to locus 10, 150E, quad 6, level 5. Two *Silene vulgaris* seeds found next to locus 7, in 131J quad 11, level 2. The latter two clusters are distinct from the first cluster with respect to the internal homogeneity of taxa in the samples.

Conclusions of Foeni-Salaş remains

It was originally hoped that the large pit features would contain samples of botanical remains rich enough to allow stages of crop processing to be identified. However, the distinguishing characteristic for the botanical remains at Foeni-Salaş (and at Blagotin) is the sparsity of remains. In general, there were far fewer carbonised remains than found at contemporary sites in the southern Balkans. This has made it difficult to observe spatial patterning in the data. Most finds are located within the pit houses, in both the basal (occupation) and in the fill from the collapse of the superstructure. None were found in the Early Neolithic storage pits. It is interesting to observe that carbonised botanical remains were only found in the pit houses with evidence for internal ovens (loci 7 and 23). Locus 24 was badly disturbed by the Early Iron feature, but had evidence of a hearth (130D, quad 1-2, level 10). Hearths were also found in locus 7, 23, and 41. No botanical remains, ovens or fire-pits/hearths were found in locus 10.

The richest botanical sample comes from the locus 23 pit house. It contained a mixture of domesticated and wild seeds scattered throughout several levels in low frequency. The large Iron Age pit feature (locus 23) that cuts through the centre of the Early Neolithic pit house disturbed the center of the Early Neolithic locus 23 deposits.

Quantitative Discussion

One of the goals of this thesis was to establish the primary crop products of Foeni-Salaş and Blagotin by distinguishing the crop production and processing methods that may have taken place at each site. Chapter IV described three methods of establishing processing techniques and the primary crop products of a given assemblage through the use of multivariate analysis. It was my intent to do this also. However, as can been seen by the results obtained, the quantity of remains from both Foeni-Salaş and Blagotin are very small. This rules out the use of a complex statistical technique, such as multivariate analysis as advocated by Dennell (1978), Hillman (1981, 1984) and Jones (1987). Even when statistics of the nominal scale such as chi-square were applied, it was not possible to find any pattern or correlation between weed seeds, gathered seeds and domesticates nor was it possible to find patterns in the composition of seed remains when features were compared. Therefore, it is not possible to test with the three models which crop processing methods may have existed at each site.

<u>The primary plant products of Foeni-Salaş and Blagotin</u>

Although it was not possible to test what the crop processing methods were at Foeni-Salaş and Blagotin, it is still worth investigating what the primary products were at each site. This part of the investigation is important because both sites contain evidence of gathered plants, and it is important to evaluate the dominance/importance of certain seed types. To establish the primary plant products of Foeni-Salaş and Blagotin, I have decided to use Ubiquity, or Presence Analysis. This method disregards the absolute count of a taxon because it assumes that absolute counts are influenced by the degree of preservation. Therefore, Ubiquity analyses the number of samples where each taxon appears. In this case, loci are used as a substitute for samples because of the low number of seeds found per sample. The number of zero cells would otherwise skew any statistical analysis. Each taxon is scored present or absent in each locus and the score of one taxon does not affect the score of another. Therefore, scores of different taxa can be evaluated independently. Thus, Ubiquity scores can provide information on the relative importance of taxa per locus (Popper 1988:61).

When presence analysis was applied to Foeni-Salaş and Blagotin, interesting results emerged. For Foeni-Salaş, the plant species with the highest ubiquity was *T. monococcum*, present in 42% of the Early Neolithic loci. This is followed by the family Gramineae (42 percent). *Quercus, sp., P. miliaceum, Silene sp., T. dicoccum,* *Cornus mas, Chenopodium* sp., and *Poa/Phragmites* all had identical scores of 29 percent (Table 3). The remaining seeds at Foeni-Salaş had the same score of 14 percent.

The trends are slightly different for Blagotin. The most dominant plant at Blagotin, by far, was *Cornus mas* with 83 percent ubiquity. The next prominent group of plant taxa was Gramineae with 50 percent. The third highest ubiquity included *T. monococcum*, *Chenopodium sp., Rubus fruticosus* sp. and *Papaver sp.* All were found in 33 percent of the loci. The remaining seeds received scores of 16 percent (Table 4).

The results of the ubiquity analysis (Tables 3 and 4) indicate that domesticates were found in more types of contexts in Foeni-Salaş than at Blagotin. At Foeni-Salaş, domesticated grains were found in 57% contexts and 60% of pit houses. Fruits are found only in 29% of all contexts and 50% of pit houses and weeds in 57% of contexts and 60% of pit houses. At Blagotin, fruits were found in almost all contexts (83% ubiquity; 100% of all pit houses), while domesticated grains were found in only 67% (50% of pit houses) of contexts. It is not unreasonable to assume that gathered fruits at Blagotin were significant to the diet and this may either be a reflection of poor crops (in which case the diet was supplemented with gathered fruits) or that gathered fruits were readily available to the inhabitants and consumed freely and frequently. It is difficult to distinguish the between the two options. Although *T. monococcum* has the highest ubiquity score at Foeni-Salaş, the remaining seed types are a strong mixture of domesticate, gathered and wild seed. These results tell us that at Foeni-Salaş, gathering was taking place and was an important supplement to the diet.

At Foeni-Salaş, more different types of botanical remains are found in the central pit house (locus 23) than in all of the surrounding peripheral pit houses combined. This is not the pattern at Blagotin, where the central pit house (7) has a very restricted range of types. The most common types are found in two of the peripheral pit houses (2 and 6).

Post-depositional effects on seed assemblages

As seen from the previous chapter and the description and interpretation above, there was a dearth of charred seed remains from Foeni-Salaş and Blagotin. The absence of finds is surprising, but nonetheless significant. This section will discuss several issues that may account for the absence of charred botanical material, including whether or not the absence of remains is a result of taphonomic processes, or whether the scanty finds reflect plant use among the inhabitants of Blagotin and Foeni-Salaş.

Preservation

Preservation prevents the breakdown of plant remains by decomposers. Charring, water-logging, and mineralization are natural forms of preservation that take place depending on environmental conditions and human activity (Cappers 1995:251). However, it is difficult to estimate the quality of preservation at a site. A major uncertainty of preservation is that of soil acidity, or pH. Foeni-Salaş and Blagotin were both tested for soil acidity. The higher the pH, the more acidic the soil and the more likely botanical remains will decompose. Testing at both sites demonstrated a weak acidic to neutral soil (5.5-7.0), very typical for the North Balkans (Greenfield 1991:166; personal communication). The bones at both sites did not bear any sort of attrition that is also indicative of the high pH. The bones at Blagotin were remarkably well preserved, while at Foeni-Salaş they were more subject to erosion because of the sandy soil conditions. Therefore, soil conditions could not account for the small quantity of remains at both sites.

Sampling

The sampling strategy applied at Blagotin and Foeni-Salaş was systematic and rigorous and should not account for the small amount seed of recoveries. Descriptions of each strategy have been discussed in chapter eight. To reiterate, all feature areas (pit houses, storage areas, etc.) had soil extracted from them in extensive amounts. In many cases, 100% of the sediment was floated. This type of sampling method should have recovered as much of the carbonised seed material in the feature areas as possible. Therefore, sampling should not account for the small quantity of remains.

Taphonomy

The taphonomic problems that affected both Blagotin and Foeni-Salaş were numerous. One major source is modern ploughing. Both sites were located on farmed land that underwent annual ploughing. However, aside from small sections at Blagotin, the Early Neolithic horizon at both sites was deep enough so that feature areas could not be damaged by modern ploughing. Most features were dug into the Pleistocene loess horizon, too deep for modern ploughs to reach. Thus, ploughing cannot be considered a taphonomic activity that would affect the Early Neolithic horizon at each site. Ancient ploughing at Foeni-Salaş affected only the top-most level of the Early Neolithic settlement (Greenfield n.d.)

Another source of taphonomic activity is rodents. There is no doubt that rodents were a concern at both sites, particularly at Foeni-Salaş. In ancient times, it is highly likely that rodents were attracted to areas where food was being stored or cooked. At Foeni-Salaş, rodents were highly destructive to the site, altering the shapes of pits and contaminating feature areas with burrows. Although there are no storage areas in either Foeni-Salaş or Blagotin, the refuse areas undoubtedly attracted rodents and may have affected the quantity of charred seed remains. However, the quantity of chewed bones is small and it is not likely that rodents would have destroyed carbonised samples enough to distort seed assemblages.

Modern rodent activity at Blagotin and Foeni-Salaş, particularly the latter, was characterised by extensive burrowing. At Foeni-Salaş, it was found that large pieces of bone were occasionally carried far from their original locale. It is difficult to say to what extent the effects of modern rodents had on the charred seed remains. It is likely that some charred seed debris was carried away from pits and features by burrowing creatures. It is likely that rodents were more of a problem at Foeni-Salaş than they were at Blagotin. But it could not affect the wild to domestic distribution between the two sites.

<u>High temperature burning</u>

Heating above 500^0 C destroys seeds by turning them to elemental carbon (ash). Some seeds could not be identified to a species level because they were degraded by high degrees of firing. Therefore, we know that high parching and cooling was taking place. However, no large ash deposits were found at either of the sites. This would imply that little parching was taking place.

Most Early Neolithic sites that have yielded high amounts of botanical remains are sites that have been completely burnt down. Prime examples of this are the sites of Chevdar and Azmak in Bulgaria. Foeni-Salaş and Blagotin, however, do not show any evidence of large scale burning. A very low frequency of the bones, daub and ceramics at each site were burned. Most botanical remains within and outside structures were not exposed to any fire and decomposed after the sites were abandoned. Because of this, the potential for finding charred seed remains is lowered.

The advantage of finding carbonised botanical material from unburned structures is that its accumulation will be the result of food processing/preparation accidents that are repeated with some degree of frequency and regularly through time. Such samples, "will be little affected by short-term fluctuations in the availability of plant species, and the frequency of particular processing activities" (Hally 1981:738). However, the botanical material recovered from sites that have been fully consumed by fire may represent taxa that are not usually exposed to fire during processing or at disposal (Popper 1988:57). Post-depositional burning would have increased the quantity of charred weed seed remains. However most of the taxa represented are from species that would have been exposed to fire during the occupation of the site. It is not false to assume that the remains recovered are representative of plant use on the site during occupation.

CHAPTER X:

INTERPRETATION, COMPARISON AND DISCUSSION OF FOENI-SALAŞ AND BLAGOTIN

This chapter will interpret, compare and discuss the results of seed analysis from Foeni-Salaş and Blagotin and compare the botanical finds obtained from other Early Neolithic sites in the Balkans. This chapter will also address the three working hypotheses of this thesis as outlined in chapter I.

Hypothesis I

The presence of cereal grains at Foeni-Salaş and Blagotin indicate that agricultural products were used. However, it is difficult to assess the scale and importance of agriculture because no distinguishable stages of crop processing and production were identified in the paleobotanical samples. Both sites reveal a wide range of plant species (in terms of domesticates and wild species), but many seeds appear as single counts. This does not warrant a detailed analysis of crop processing as described by Jones (1984), Hillman (1981, 1984) and Dennell (1978) (see chapter IV). All recommended methods to reconstruct stages of crop production and processing require large quantities of seeds, which are not present in Blagotin or Foeni-Salaş.

The results of the research indicate that agriculture is only a part of subsistence. Gathered plants were a supplement to the diet at Foeni-Salaş. At Blagotin, gathered plants were more prominent than domesticated plants. Weeds recovered at both sites were found in single counts and dispersed widely. Since there are only single seeds present, it is likely these seeds were accidentally reaped with crops. The weeds, although edible, were probably not used for subsistence. If there were large concentrations of homogenous weed seeds, I would conclude that these weeds were used for subsistence.

The lack of artifacts related to plant use, such as grinding stones and storage facilities, indicates that both sites were short term settlements and agriculture, although a component of the diet, was not the major source of subsistence. Foeni-Salaş contained one storage pit but the lack of botanical remains within it may indicate that this storage area may have had a function unrelated to crop storage or processing. The importance of agriculture, however, cannot be evaluated without fully examining other aspects of the economy of both sites, such as the exploitation of animals.

Hypothesis II

The second working hypothesis states that the spatial distribution of botanical remains will reflect cultural phenomena, such as crop processing, refuse and/or storage activities. It is not possible to establish cultural patterning with the dearth of remains recovered at Foeni-Salaş and Blagotin. It would be erroneous to assume that the botanical remains dispersed at these two sites reflect a particular function or specific pattern. All charred seed remains recovered from Foeni-Salaş and Blagotin in the Early Neolithic horizon are distributed sparsely around each site with no specific pattern, uniformity or homogeneity. Since there are few botanical remains present at Foeni-Salaş and Blagotin, it is impossible to find a particular distribution of botanical remains.

Another method of interpreting the botanical remains is to examine how the remains are dispersed *within* each pit rather than how they are scattered spatially throughout the site. Two variables to consider for this type of interpretation are the botanical composition of a pit or feature (domesticates vs. gathered seeds) and the deposition of seeds in a pit. Botanical material can be deposited several ways, but it is important to note that botanical material found in pits and features has little bearing on the original function of each pit. There are several ways in which botanical material can be deposited in pits, refuse is a good example of one (Kreuz 1990:67). Therefore, to interpret the function of pits it is necessary to consider (a) how pits become filled (b) what form is the botanical fill of a pit (i.e., are they found in thin layers, are they concentrated in one area of the pit or randomly distributed), and, © what are the actual contents (botanically) of each pit.

I have adopted Kreuz's (1990) method for interpreting pit features in Linearbandkeramic sites in central Europe and have elaborated on some of the details. I will use this method to interpret the pits at Foeni-Salaş and Blagotin. According to Kreuz, there are six possible ways botanical material can be found within a pit or feature.

1. Botanical material concentrated on the bottom of a pit (basal horizon) and covered by fill. The botanical remains in this situation can be found as either homogeneous or heterogeneous deposits (in terms of botanical remains). The botanical make-up of the pit will reflect the type of activity with which it was involved. If a heterogeneous situation occurred, it would most likely reflect non-specific refuse that slowly accumulated. A homogenous situation would reflect processing activity. This situation entirely depends on the type of composition that is found in the pits. A heterogeneous situation of weeds, chaff and domesticates however, would indicate a processing activity.

2. Botanical material concentrated in the middle of a pit. This situation represents three layers of fill, the initial fill of the pit that is virtually sterile of botanical material, the middle horizon of the pit that consists of botanical material, and a top horizon that is sterile of botanical material. The remains found in this pit may be the products or by-products of botanical activities that have once again slowly accumulated. It is worth considering that the pit did not start off as a botanical refuse area.

3. Botanical material concentrated on the top of a pit. As noted by Kreuz, a paleobotanist should be skeptical of botanical material that is found on the top horizon of a pit because it may represent windblown debris or may be a mixture of material from the top horizon of a site (1996:68). Therefore, to prove the legitimacy of the botanical samples from the pit, it is required that samples be extracted from areas immediately apart from the pit complex (as controls) and examined to see it the botanical remains differ from the pit samples. If the remains of the pit appeared to be truly unique than what is found apart from the pit, we can assume the deposits are not the result of mixture from the top horizon or wind blown debris.

4. Plant material deposited in thin layers within the pit or feature. Each of these layers, as described by Kreuz, represents "single activity refuse" or refuse that is deposited from a specific activity. These deposits occur over short periods of time which explains why they are found in thin layers within features. However, if the pit is opened for a long period of time, other debris will mix with the botanical material resulting in a disturbed mixture of remains.

5. Plant material found throughout an entire pit or feature in low quantities. If the plant remains are found randomly throughout the pit in a heterogeneous manner, the debris will most likely represent an accumulation over a long period of time. A homogenous composition would reveal that the deposits reflect a one time deposit of a specific activity. A mixture of remains would indicate a long accumulation of various activities and refuse.

6. Plant material found throughout an entire pit or feature in high quantity. This final scenario is similar to the contents just mentioned. The remains are much more dense and appear as though they were deposited all at once, virtually dumped into an empty hole in the ground. These remains are also remnants of single activity refuse. The remains were either filled in a single episode or the refuse was deposited from a single activity.

The first three situations represent long periods of time during which the pit slowly fills. The fourth situation may represent several rapid periods of activity, where quick deposits were made followed immediately by deposits of sterile soil in repeated intervals. The fifth situation represents a slow accumulation of botanical debris, probably used as an open refuse pit. The sixth situation is a heterogeneous composition as is situation five, however, the fill in this deposit is large and done by a single activity. Asides from the difference of "time" between the last two situations, the quantity and density of seeds differs. The last situation (number six) will consist of more seeds that situation five.

Additional possibilities for interpretation are not only the position of remains in the pit, but the composition (domesticate vs. non-domesticate) and the quantity. For instance, botanical remains that are completely homogenous (in domesticated grains) would probably reflect the remains of a processing activity. They could be further investigated for the type of crop processing activities it may reflect.

With these situations in mind, I will summarise the material from pit features at Foeni-Salaş and Blagotin considering situations described above. It is possible that different activities involved in agriculture (production or processing) or subsistence affects the way charred plant materials are deposited in pits. Also, a new model must be considered in this analysis since the models reviewed in chapter four cannot be used.

Botanical distribution at Foeni-Salaş

To interpret the botanical remains from Foeni-Salaş, all context and feature areas must be considered. At Foeni-Salaş, there were nine Early Neolithic pit/storage features (loci 7, 10, 23, 24, 25, 41 and 50) of which only six were sampled extensively. Locus 50 was noticed on the last day of excavation and not excavated. However, the following will attempt to analyse feature areas (that have been sampled), according to the method outlined in this chapter.

Locus 7: The locus 7 pit house complex contained three very sub-strata (loci 14, 16 and 17), but locus 16 was the thickest. In locus 16, a one litre soil sample was extracted, in locus 14 a three litre sample was extracted, and in locus 17 a three litre sample was extracted. The three substrata of this pit contained very few botanical remains. The quantities of botanical remains are clustered in the center of the pit, but found in all sub-loci. They consist of a mixture of wild and domesticated seeds. The distribution of botanical remains seems to match Kreuz's condition 5.

Locus 10: No remains were found in this locus.

Locus 23: There are two clusters of remains in this locus. One cluster comes from the northeast corner of the pit, while another from the northwest corner. In addition, a few seed remains were found in the collapsed roofing horizon (capping horizon). A mixture of domesticates and weeds were found. I will conclude that the remains of this pit were part of a one time deposit, or a single activity refuse. The capping horizon material may represent condition 3, while the two basal clusters resemble condition 4.

Locus 24: Locus 24 was the second feature at this site to contain a seed assemblage of five seeds in one horizon. The seeds found in this locus were concentrated in two clusters near the bottom of the pit house (in level 5 of trench 150P - quads 2 ,7 and 8, and 17), and consisted of a mixture of domesticated (two Gramineae and one grain of *T. monococcum*) and weed seeds of *Sambucus nigra*. The distribution of seeds appears to resemble Kreuz's condition 1, and similar to that found in locus 23.

Conclusion on Foeni-Salaş

The botanical remains at Foeni-Salaş are found in thin scatters of selected strata within the pits. The composition of botanical remains in the pit features is a mixture of domesticated cereal grains, weed seeds and gathered fruits. The remains in each pit house features, in terms of composition, were very heterogeneous. These deposits may reflect short term use of botanical material to the inhabitants. The paucity of domesticated remains may imply a weak reliance on plant agriculture or that the settlement was not occupied for a long enough period of time to allow pits and features accumulate large amounts of botanical remains. The presence of gathered fruits, such as the Cornelian cherry, indicate that gathering was taking place.

Botanical distribution at Blagotin

All Early Neolithic features at Blagotin appeared to reach a similar depth from the original surface as at Foeni-Salaş and all features appeared to have similar stratigraphy: the bottom basal horizon, the middle fill and the top capping horizon. The following discussion will focus on these features and their botanical associations.

Pit house 2: This pit feature had botanical remains in several horizons. In feature section 1, level 2 (capping horizon) and levels 4 and 6 (middle horizon) contained small concentrations of botanical remains. Starting with level 2, a grain of *T. monococcum* and an unidentifiable weed seed were recovered. In level 4, a complete seed of *Malus pumila* was found followed by an unidentified weed seed in level 6. In feature section 2, level 8, a small concentration of seeds was recovered: a grain of *T. monococcum* and seeds of *Cornus mas* and *Rubus fruticosus*. In feature section 4, cultural horizon 1 (the capping horizon), two apple seeds (*Malus pumila*) plus one fragment were recovered along with another fragment of the same species. It appears as though the contents of this pit were deposited as a slow fill, in long episodes and not as single activity refuse. What is unique about this feature is that only levels 2 to 8 (which are the capping and middle horizons) contained botanical remains out of twelve levels that were excavated. Considering that the composition of remains in this pit are heterogeneous in nature, with wild seeds, gathered fruits and domesticated grains, this pit could have been a feature that initially (at its construction) was used as possible a domestic/processing area and then later used as a refuse area for food waste. It is difficult to say if the remains that have accumulated in this feature area were intentionally placed in the pit or if the remains ended up in the pit with other refuse.

Pit house 4: This feature area only had two pits *of Cornus mas*. It is not possible to interpret the function or activity of this pit based on so few finds.

Pit house 6: This pit was completely excavated, layer by layer, with various botanical remains found in each level. In level 2, several remains of domesticated and non-domesticated plants were recovered, including: *H. vulgare*, two seeds of *Lens* sp. a fragment of *Papaver* sp., fragments from the Gramineae family and pits of *Cornus mas*. This level appeared to have the highest quantity and richest variety of remains and considering that the next level (level 3) contained only two seeds (*Pyrus mas* and *Cornus mas)*. It is possible that the remains reflect a single activity deposit. Level four contained two seeds (*Cornus mas* and *Lens* sp.), while level five contained several species of seeds: two pits of *Cornus mas*, a seed of *Rubus fruticosus* and a grain of *T. monococcum*. The interpretation of this pit is difficult because remains are found throughout the feature, but some cultural levels contain more seeds than others. Therefore, this pit may have been opened for a longer period of time than other pits, and may have undergone a slow accumulation of botanical remains in repeated intervals broken up with short intervals of large deposits of refuse. This pattern , is a combination of situation number four and five.

Pit house 7: The contents of this pit are interesting. Firstly, this pit was very deep and contained many levels. Botanical material was found in the capping layer and towards the bottom of the pit. These remains include *Cornus mas, T. monococcum*, and various Gramineae. This situation matches scenario one, where a mixture of botanical material is found accumulated towards the bottom of the pit.

<u>Conclusion on Blagotin</u>

The remains at Blagotin take on various forms and compositions. Of all pit features investigated, the quantity and distribution of wild and domesticated seeds is roughly equal. There are no features that contain remains where only cereal grains (domesticates) are present, nor are there areas that contain remains of gathered fruits only. This mixture may represent a subsistence system that equally uses both domesticated crops and gathered plants.

The pits at Blagotin appears to be open longer than those at Foeni-Salaş, based on how the materials are dispersed in the pits. Unlike Foeni-Salaş, the remains at Blagotin were found in two forms: in thin layers, concentrated in areas (Pit house 7 or 4) or throughout the pit feature (Pit house 2 and 6). What this implies is that some of the features may have been opened for a long period of time where botanical remains slowly accumulate (Pit house 2 and 6), while other areas appear to be single activity refuse deposits (Pit house 7). However, with the few remains that have come out of the pits, it is very difficult to make a firm conclusion.

<u>Comparison of Blagotin and Foeni-Salaş charred seed remains</u>

Using Kreuz's method of interpreting the botanical remains, it is now possible to test the first hypothesis of this thesis: does the spatial distribution of botanical data reflect cultural phenomena and is this patterning a reflection cultural behavior? Both sites will be compared and contrasted according to the criteria outlined in this chapter and in terms of botanical composition.

There are many similarities between Foeni-Salaş and Blagotin. First, neither of the sites contain large homogenous seed deposits or large concentrations of seeds. The lack of seed remains is the most striking feature of both of the sites. It is difficult to suggest that this is typical for most Early Neolithic sites in the region because botanical remains at other sites of this nature have not been systematically or spatially investigated. It is very different than the situation at Greek and southern Bulgarian sites. As demonstrated above, taphonomic and sampling issues were not the cause of this scarcity. Therefore, the dearth in comparison to Greek and Bulgarian Early Neolithic samples can be suggested to reflect the low contribution to the diet.

The second similarity between Blagotin and Foeni-Salaş is that both sites appear to contain a mixture of wild and domestic seeds. This is significant because no pure homogenous pit or feature areas contain the end-products of agricultural activity, such as chaff or rachis fragments and unique weed seeds. What this implies (in terms of subsistence) is that an agricultural system was in place, but not primary to subsistence. It appears as though subsistence was heavily supplemented with gathered items, such as the Cornelian cherry. Therefore, what is the role that gathered plants played in subsistence? Were they integral to subsistence or casually collected foods for variety? Considering the ubiquity of items, such as the Cornelian cherry, at Blagotin, it is difficult to assume this plant was just a haphazard supplement. It is found in nearly as many contexts as domesticated cereals. The situation is slightly different at Foeni-Salaş where Cornelian cherry is the only gathered species represented and is found in one context only. This may indicate that gathered plants were either not used as much or simply were not around for use. Although some weeds recovered at Foeni-Salaş and Blagotin have known ethnographic uses (i.e. *Chenopodium* sp.) weeds are not considered as additional food sources in this study. Reason for this is because most of the weeds in this study are found in single quantities and usually in association with domesticated cereal grains. Additionally, the weeds represented in this study are commonly found growing in fields of wheat or barley.

The third significant feature common to both sites was that all domesticated remains were "clean" in terms of chaff or fused parts, such as rachis or stem fragments. At Foeni-Salaş, only one rachis fragment was found (locus 24). At Blagotin, no such remains were recovered. What this absence indicates that grains were processed and clean of debris. None of the remains were connected to stem fragments or other seeds. Therefore, all domesticated seeds from Foeni-Salaş and Blagotin represent fully processed and cleaned samples. This may imply that processing took place elsewhere and the remains in these sites were either brought or traded to them by agriculturists from elsewhere.

The fourth major similarity between the two sites was that the botanical remains had no major charcoal associations. This phenomenon is unique on several levels because charcoal indicates that the deposits were associated with cooking areas or a hearth feature. Although there were small fragments of charcoal or ash in all the samples, there were no large pieces of charcoal. Nor were substantial amounts of charcoal found concentrated in particular areas. If at least the weed seeds been associated with amounts of charcoal, we could assume that weeds were being used as kindling for firing purposes. This absence, therefore, may indicate that firing or cooking/processing activities were not taking place in the pit houses but possibly elsewhere on the site. But considering the presence of hearths and ovens in locus 23, 7 and 24, this is unlikely.

The fifth commonality between Foeni-Salaş and Blagotin is that there were no artifacts, such as grinding stones, or storage areas typical of agricultural settlements. Both sites yielded very small quantities of microlithics (with sickle sheen) indicating that cultivation was not a primary focus of subsistence (Dinan personal communication). Storage facilities would indicate that each settlement had large investments in their land and that there was enough surplus for storage and long term residence. Although Blagotin has not been as completely excavated as Foeni-Salaş, storage facilities have not been recovered to date. Therefore, based on the absence of botanically related features and implements, agriculture does not appear to be of major importance to the economy.

The sixth major trend witnessed is that the weed seeds represented at both sites are (a) plants that produce reproductive parts (seeds) in the fall, and (b) are weeds associated with crop stands. The weed seeds recovered at both Foeni-Salaş and Blagotin, although small in quantity, reveal that crop agriculture was taking place in the summer time and harvest was taking place in late summer or early fall. Therefore, there was enough knowledge of agriculture that crops were planted in a time of year that was optimal for agriculture. For instance the seeds of *Papaver* sp., *Polygonum* sp., and *Silene* sp. that are found mixed with some of the cereal remains produce their reproductive parts during late summer/early fall.

The final and most striking and relevant feature about the seed remains collected is that none of the feature areas (pits) reflect specific crop processing activities. The fact that different species of cereal grains were present refutes the idea that no consumption of agricultural products were taking place at the sites. The only major difference found between Foeni-Salaş and Blagotin deals with the composition of botanical remains.

The botanical remains largely found at Foeni-Salaş were found in thin lenses or in certain levels within the pits. Almost all features appear as if they were opened for short periods of time, allowing for a quick deposit and then filled up again. These types of deposits reflect short term activity. However, this does not take into account the fact that pits at Foeni-Salaş may have been covered up (by boards) or that processing and refuse activities were taking place elsewhere. At Blagotin, some pits contained botanical material scattered throughout the levels of the entire pit feature (e.g. pit house 5). Other feature areas at Blagotin (such as pit house 7) had botanical deposits concentrated in the centre of a pit. These features were open for a period of time to let material accumulate, and then filled with other cultural debris. Pit house 2 was short term while pit house 5, was opened for a longer period and slowly accumulated with botanical remains. Some of the pits at Blagotin were opened for longer periods of time than pits at Foeni-Salaş. This sole difference may indicate that the site of Blagotin was occupied somewhat longer than Foeni-Salaş, but this conclusion is only tentative. Other aspects of the economy such as animal exploitation need to be explored before a firm conclusion can be made on this.

The inhabitants of Blagotin gathered more plants than cultivated domesticates and kept their pit houses open longer. Foeni-Salaş, on the other hand, contained a slightly higher degree of domesticated plants than collected foodstuffs, but most of the botanical deposits in the pit features appeared to be more rapid and quickly filled. Plants collected from the surrounding environment could supplement a population and increase the longevity of a site. The inhabitants at Blagotin were able to supplement their food supply with gathered fruits. This may have contributed to a longer stay. Foeni-Salaş appears to be shorter lived than Blagotin. The deficit of long term features and long term accumulation of botanical remains supports these conclusions based on the botanical items. Other forms of analyses would verify or refute these conclusions.

Hypothesis III

The third hypothesis of this thesis states that the subsistence orientation at Foeni-Salaş and Blagotin, as reflected by the botanical remains, will reflect who these inhabitants were, either colonists from the south or indigenous groups of the north. Chapter two of this thesis reviewed some well-known theories on the origins of European agriculture. One of the leading questions to be investigated here is whether agriculture evolved independently in this area of the world or if it entered Europe as a complete package with domesticated plants and animals from Greece and the Near East. Before such conclusions can be reached about Foeni-Salaş and Blagotin, it is worth comparing our results to other Early Neolithic sites in Greece and the rest of the central Balkans.

Although many prehistorians have studied the origins of agriculture in Europe for some time now, the quantity and quality of paleobotanical data for the central

Balkans are poor. There are several reasons for this. The first reason is that there have not been many attempts made by archaeologists to recover paleobotanical data from sites located in the Balkans. The second reason is that problem in analysis arise when publications and excavation reports vary in quality, language, and are inaccessible (not widely dispersed outside of the home country). This is immediately apparent in former Communist countries where it is difficult to hunt down old reports. The final reason is the variation in academic training and technique. Many schools of the Eastern block have placed more emphasis in reconstructing regional histories and ceramic typology, and less emphasis on other aspects of the archaeological record such as paleobotany.

In Romania, the oldest finds of paleobotanical remains were collected in 1895 by Buschan at the site of Cucuteni. Asides from this, development of this field is of recent date (Wasylikowa et. al. 1991:208). The most recent identifications that have been done in this area are by the Institute of Archaeology in Bucharest by M. Cârciumaru and some identifications by Hopf (Zohary and Hopf 1988:149; Wasylikowa et. al. 1991:208). However, the oldest finds of cultivated plants in Romania are connected to Starčevo-Criš. Plant remains associated with this culture are einkorn (*T. monococcum*), emmer (*T. dicoccum*), spelt (*T. spelta*), millet (*Panicum* sp.) and wild grass (*Aegilops* cf. *speltoides*) (Wasylikowa et. al. 1991:210).

In eastern Yugoslavia, although no spatial investigation of botanical remains exist in this country, few botanical reports have been written. Botanical finds have been gathered from only three Early Neolithic sites (Renfrew 1979, table 5): Anza (Renfrew 1976), Divostin (Grüger and Beug 1988), Obre I (Renfrew 1974), and

Vršnik (Hopf 1961). Some of these sites lay on the periphery of the Starčevo-Criš distribution (see chapter six), and most of the botanical finds obtained from these sites were collected by hand (see Renfrew 1979: 263). However, this information can at least provide some comparison with the results obtained from Foeni-Salaş and Blagotin. Both of these sites have evidence for emmer and einkorn wheat, and barley. Both Anza and Obre also revealed evidence of gathered fruits, such as the Cornelian cherry. Anza is the only site to have undergone systemic flotation and sampling. It has a similar inventory of botanical remains to that of Foeni-Salaş and Blagotin. The remains gathered from the Anza II to IV phase contained close to 165 seeds in a combination of domesticate, wild and weedy types. Although the quantity of seeds is higher than Foeni-Salaş and Blagotin, the composition of remains is quite similar. The most dominant seeds from Anza are emmer followed by einkorn, spikelet fragments of wheat (unspecified), barley, lentil, pea, vetch, hazelnut (in Anza III only), fat hen (*Chenopodium* sp.) and dock (*Rumex* sp.). The majority of these remains are from a pit found in the Anza II phase (pit I) and the remainder of remains is found scattered throughout the site. This mixture parallels the remains recovered at Foeni-Salaş and Blagotin. The analysis from Anza does not indicate the distribution and nature of the seed remains (rachis, spikelets, chaff, etc.) preventing a comparative detailed analysis to be performed. Unfortunately, the results obtained from other sites, such as Vršnik, Obre, and Divostin, do not indicate the sampling method used to collect the finds, and the quantity and context of the remains. The only conclusions that can be made about these sites are that *T. dicoccum* is the predominant seed type found followed by *T. monococcum* and *Hordeum* sp.

In Bulgaria, the paleobotanical record is much more complete than in all the other south-eastern European countries combined. Paleobotanical research in this area has been investigated since the 1930's by both foreign scholars (Dennell 1972, 1974, 1976, 1978; Renfrew 1979; Hopf 1973) and Bulgarian scholars, such as Arnaudov (1937-1938a, b, 1940-1941) and more recently by Popova (1985, 1991), Bozhilva (1985), Chakalova (1980, 1981, 1984) and Surbinska (1989). Evidence of the first cultigens in Bulgaria comes from the sites of Azmak and Karanovo I. The samples from these sites were collected without flotation and studied by Renfrew (1969) and Hopf (1973). Samples later recovered from Chevdar and Kazanluk were collected by froth flotation by Dennell (1978). The most prominent crop from both Chevdar and Kazanluk was einkorn, followed by emmer, bread-wheat, barely and vetch.

The results obtained by Dennell from Early Neolithic sites are remarkable and unique. Both of the sites examined for his investigation were fully consumed by fire. As a result, all the above mentioned species, along with weed seeds of *Rumex crispus, Rumex acetosella, Polygonum aviculare, Galium aparine, Galium mollugo, Chenopodium sp., Malva sp., Avena sp., Potentilla sp., Verbascum sp.* were found at Chevdar and at Kazanluk. Additional species, such as *Solanum sp., Chenopodium album, Arenaria sp., Astragalus sp., Medicago sp.* and *Brassica sp.*, were also recovered. These weed seeds most likely represent plants that were growing as weeds, and were accidentally cultivated and harvested, and were deliberately separated by processes of winnowing and threshing.

It was my intent here to include a ubiquity chart of all examined loci at Chevdar and Kazanluk and compare them with Foeni-Salaş and Blagotin. Both of these sites were fully consumed by fire the quantity and frequency of weed taxa far exceed that of Foeni-Salaş and Blagotin. Unfortunately, the report does not allow for a ubiquity analysis since only contexts containing botanical remains are described.

There were distinguishable stages of crop processing at each of these sites yielding strong evidence for cultivation, processing, and consumption of domesticated grains. At Blagotin and Foeni-Salaş, all contexts revealed mixtures of gathered fruits, wild weeds and domesticates. At Chevdar and Kazanluk, there were spatially discrete deposits of domesticates and weeds, reflecting different stages of crop processing being conducted in different areas of the settlement. Also, the quantity of domesticates clearly argue for a subsistence base heavily reliant upon crop agriculture. Foeni-Salaş and Blagotin did not reveal this pattern at all. Plant subsistence was based on both gathered and cultivated crops, and there was no evidence of local crop processing.

Greece also has to be discussed here because it serves as an important link in the spread of farming from the Near East and Europe. However, it is yet to be resolved whether agriculture in Greece was the result of massive migration from the east or if it was adopted by Mesolithic inhabitants. There are no wild progenitors of einkorn and emmer in Greece, and this concept alone implies the introduction of agriculture. Botanical evidence found in Franchthi Cave hint at a Mesolithic pre-adaptation. There was a predominance of gathered foods, such as pistachio, almond, and pear. Towards the end of the Mesolithic, there was an increase in wild barley and oats. Franchthi Cave suggests the adoption of domesticates by indigenous foragers during the Early Neolithic (Halstead 1996: 301). In the Aceramic Neolithic levels at

Franchthi, there is a rapid switch from wild barley and oats to emmer, einkorn and barley (Hanson 1988). The lithic assemblage at Franchthi Cave reveal an Aceramic chipped stone assemblage which continues into the ceramic Neolithic (Perlès 1990). It appears that the adoption of domesticated plants into the indigenous Mesolithic cultures was slow and gradual at Franchthi. Aside from Franchthi, there are very few sites that reveal an adoption of agricultural lifestyles by indigenous Mesolithic peoples. The extreme rarity of Mesolithic sites in Greece and the rest of south-east Europe makes the conclusion of a widespread an indigenous adoption of domesticates difficult. Evidence gathered from the Mesolithic sites of Balma Margineda (Andorra), Grotta dell' Uzzo (Sicily), Franchthi Cave (Greece), Lepenski Vir (Danube Gorges), Noyen-sur-Seine (France), Friesak (Germany) and Starr Carr (England) have clearly shown that Mesolithic groups were mobile, adaptable, knowledgeable and flexible and traveled great distances in the acquisition of materials (i.e.) obsidian. Therefore, the adoption of herded animals and cultivated plants may have broadened the spectrum of subsistence and resources already exploited (Geddes 1985). Adopting plants and animals would not stop a mobile lifestyle but would offer secure resources to share and store (Whittle 1996:43). Therefore, these "Aceramic" Neolithic groups can be viewed as small scale, trying to maintain a foraging way of life while enhancing subsistence with new ideas and traits.

Even in the area of densest Early Neolithic settlement in Greece, there is little agreement concerning the origins of farming. Whittle (1996) claims that Neolithic settlements found in Thessaly were the result of gradual development of settlement by indigenous groups. However, van Andel and Runnels (1995) view the same data differently - as a result of migration by Near Eastern farmers. Yet, the plethora similarities between Near Eastern and Thessalian farming communities (in terms of crops, animals, architecture, material culture) argue strongly for some kind colonisation in at least isolated circumstances. These colonists, then, had to coexist with indigenous groups, who more slowly adopted agricultural lifestyles.

The remains from southern Bulgaria are reminiscent of Thessaly and argue for colonisation. The Early Neolithic tell sites of Chevdar and Kazanluk sustained large populations and relied on a subsistence strategy based on emmer, einkorn and six-row barley. All of the evidence points to the Near Eastern pattern of long-term sedentary settlement. Tell sites in Greece and south-central Bulgaria are large in size, i.e., Sesklo and Argissa are 1 ha in size, and contained square, multi-roomed, houses, almost all of which contained ovens. Therefore, the spread of agriculture through Europe occurred by a processes of acculturation and limited colonisation.

The remains recovered from Foeni-Salaş and Blagotin are not comparable to the Early Neolithic sites in southern Bulgaria or Greece. Foeni-Salaş and Blagotin were not able to sustain their population through intensive agriculture. Foeni-Salaş and Blagotin lack large above-ground square structures. Their people live in pit houses and their sites are short-term settlements. If sites such as Chevdar and Kazanluk are sites that depict the Near Eastern "Neolithic package", then Early Neolithic sites such as Foeni-Salaş and Blagotin reflect either an indigenous adoption of agriculture or something else. Given the presence of pit houses and their implication for mobile economies (Jongsma 1997), the presence of a heavily domesticated animal component to the subsistence regime (Greenfield n.d.), and the presence a widespread material culture horizon from the southern to the northern Balkans all point to mobile domestic economies - heavily reliant upon pastoralism. It is unlikely that the indigenous Mesolithic inhabitants so rapidly took on the accoutrements of domestic lifestyles. It is more likely that we are seeing the rapid spread of early agriculturalists from the south moving into and exploring a new environment - temperate southeastern Europe in which they had to readapt their domestic economies.

Conclusion

It appears as though the concept of the "Neolithic package" of domestic plants and animals is misleading. Sites in the central Balkans appear to have mixture of gathered plants, weeds and domesticate cereals. Most sites throughout the Balkans are small scale, revealing a mixture of a horticultural regime. I will conclude that cop agriculture, although a component of the subsistence strategy at Foeni-Salaş and Blagotin, was not the dominant subsistence mode in the central Balkans. The economic processes at work on the Early Neolithic groups of the Mediterranean littoral are different than those in the temperate zone of the central Balkans and the differences between the two areas should not be glossed over in our efforts to understand the origins of farming in Europe.

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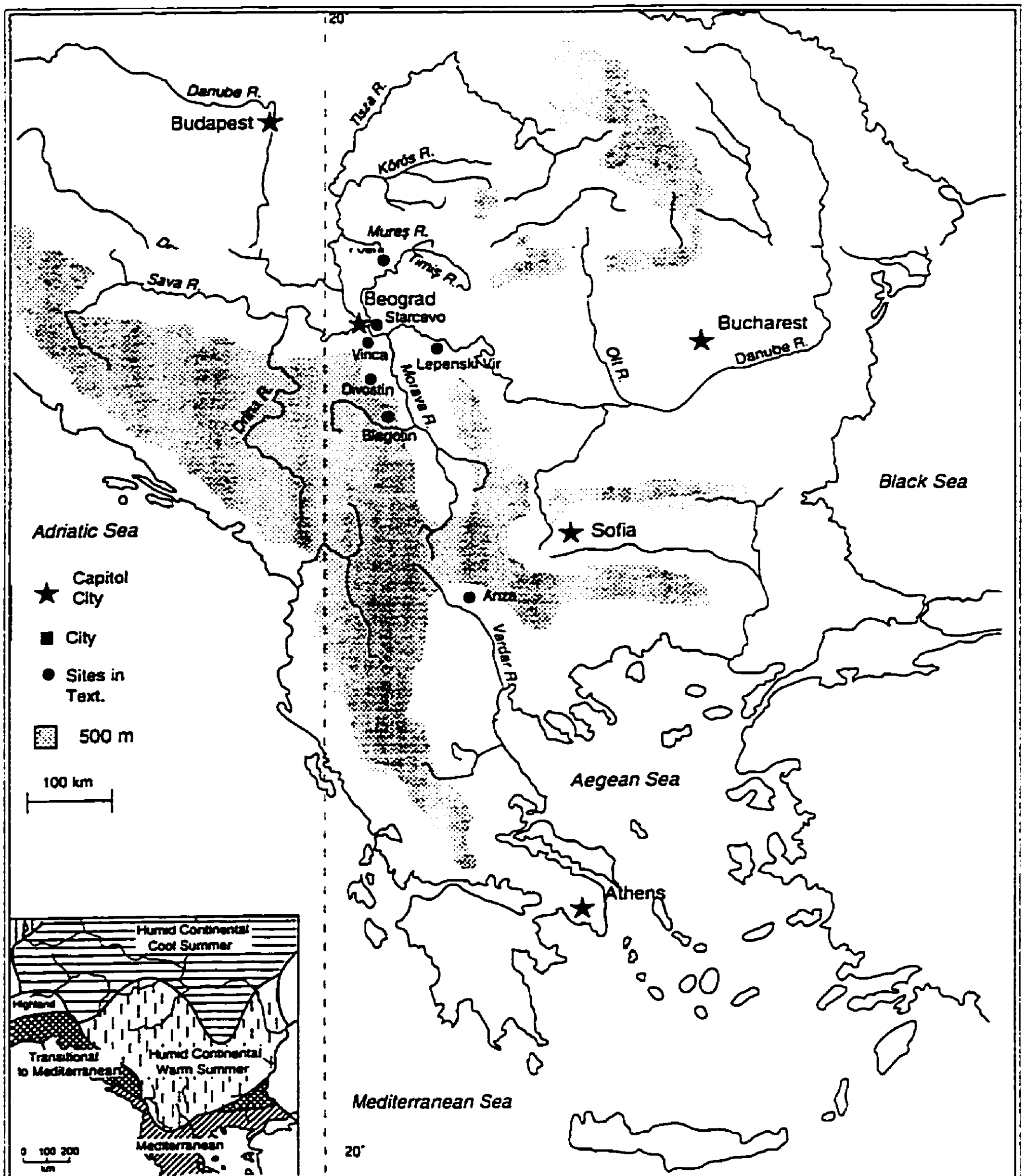

Figure 1. Map of southeastern Europe.

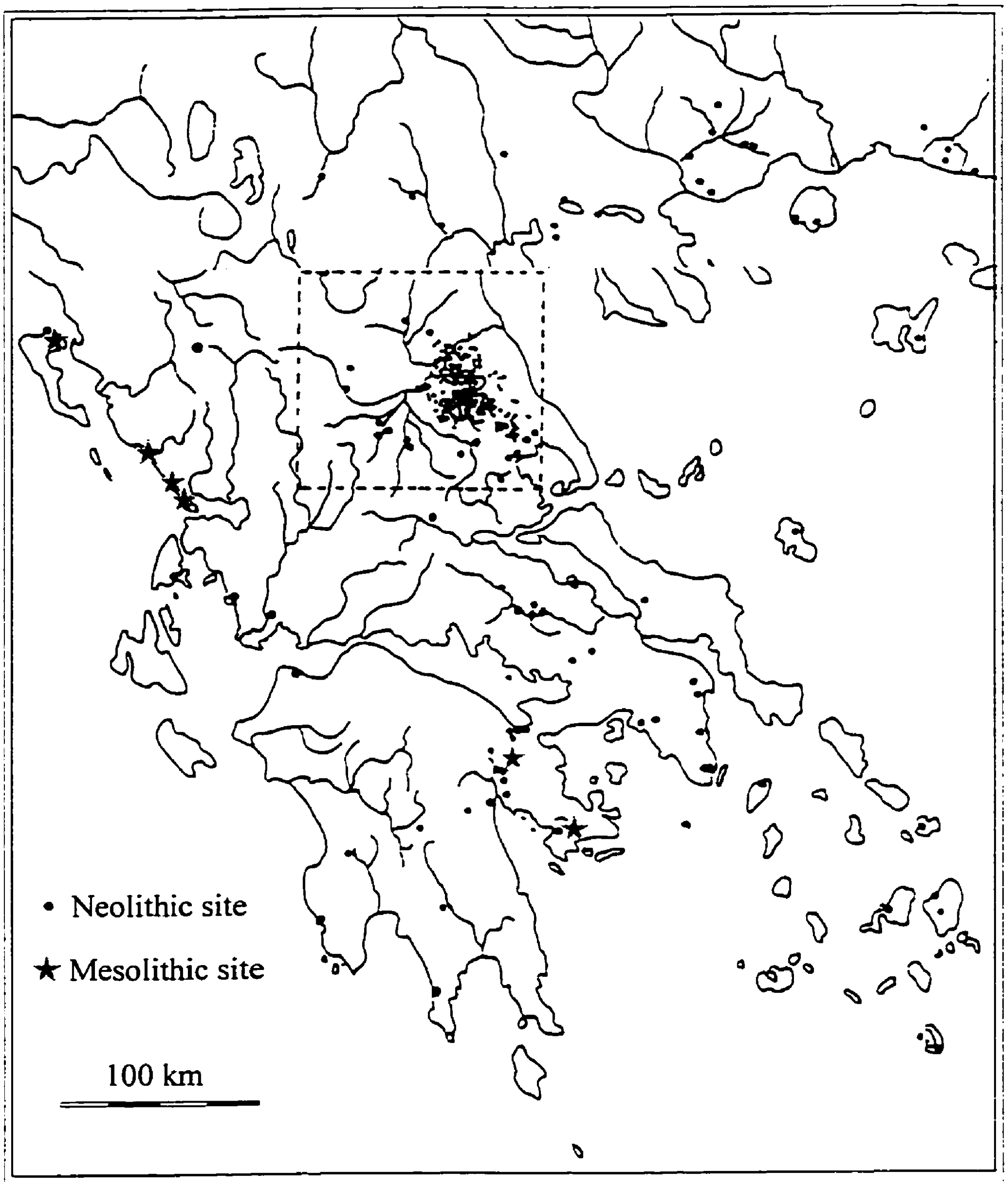

Figure 2. The Larrisa Basin in Thessaly.

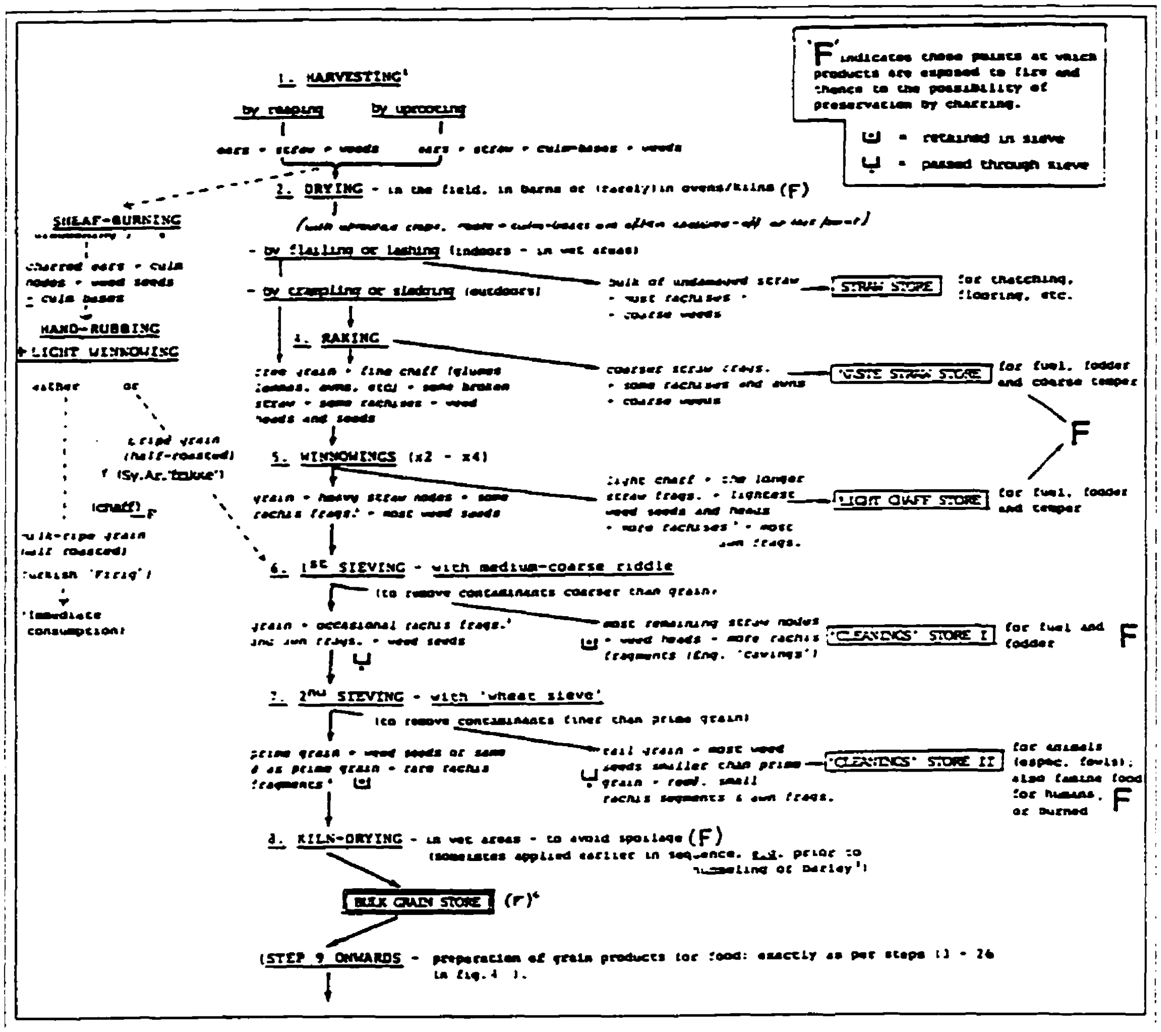

Figure 3. The traditional processing of free-threshing cereals e.g. bread-wheat, rye (and barley) and the composition of their products when harvested together with the straw.

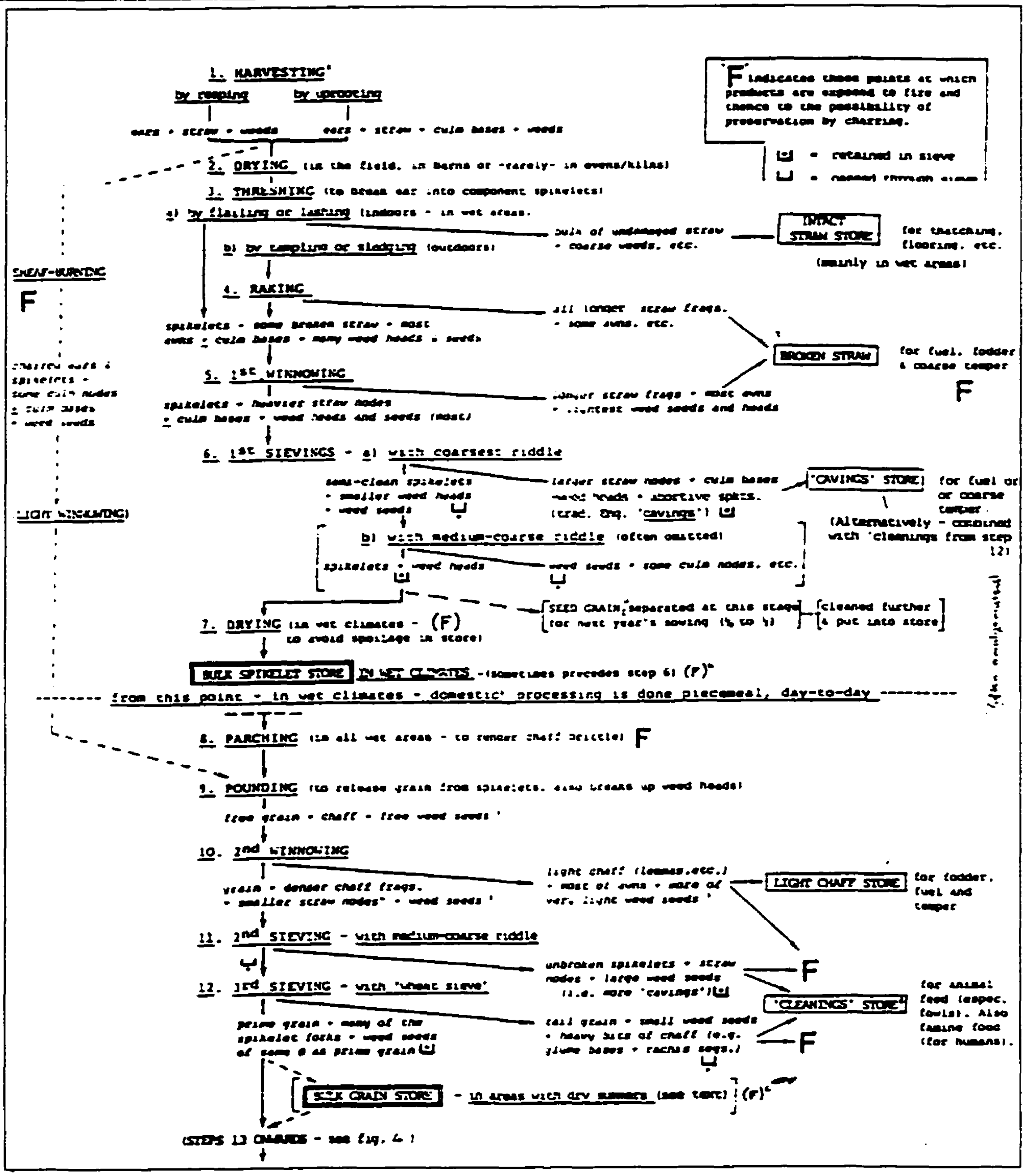

Figure 4. The traditional processing of glume wheats e.g. emmer, spelt and einkorn and the composition of their products when harvested together with the straw.

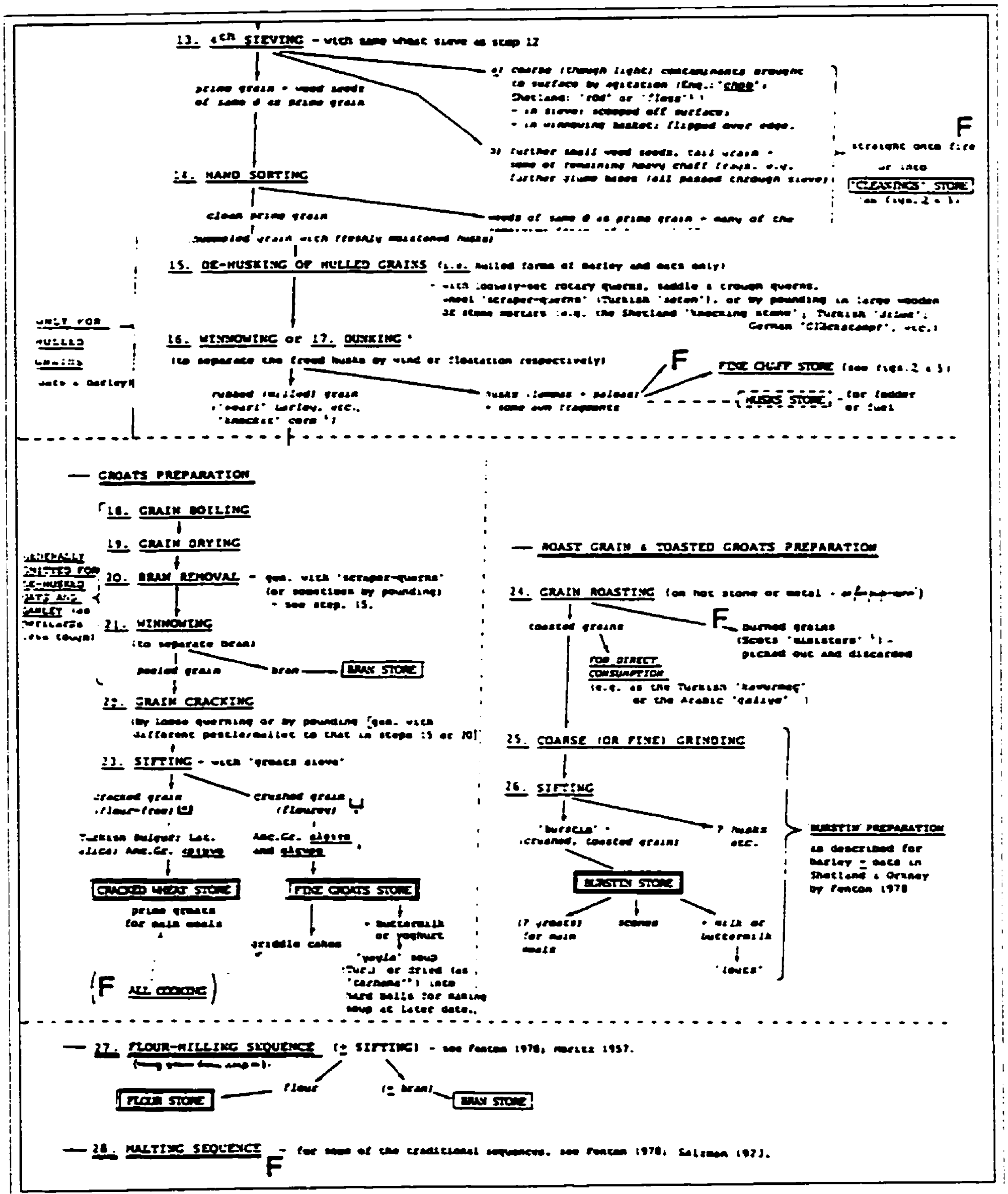

Figure 5. The final stages of grain processing (continued from Figures 3 and 4).

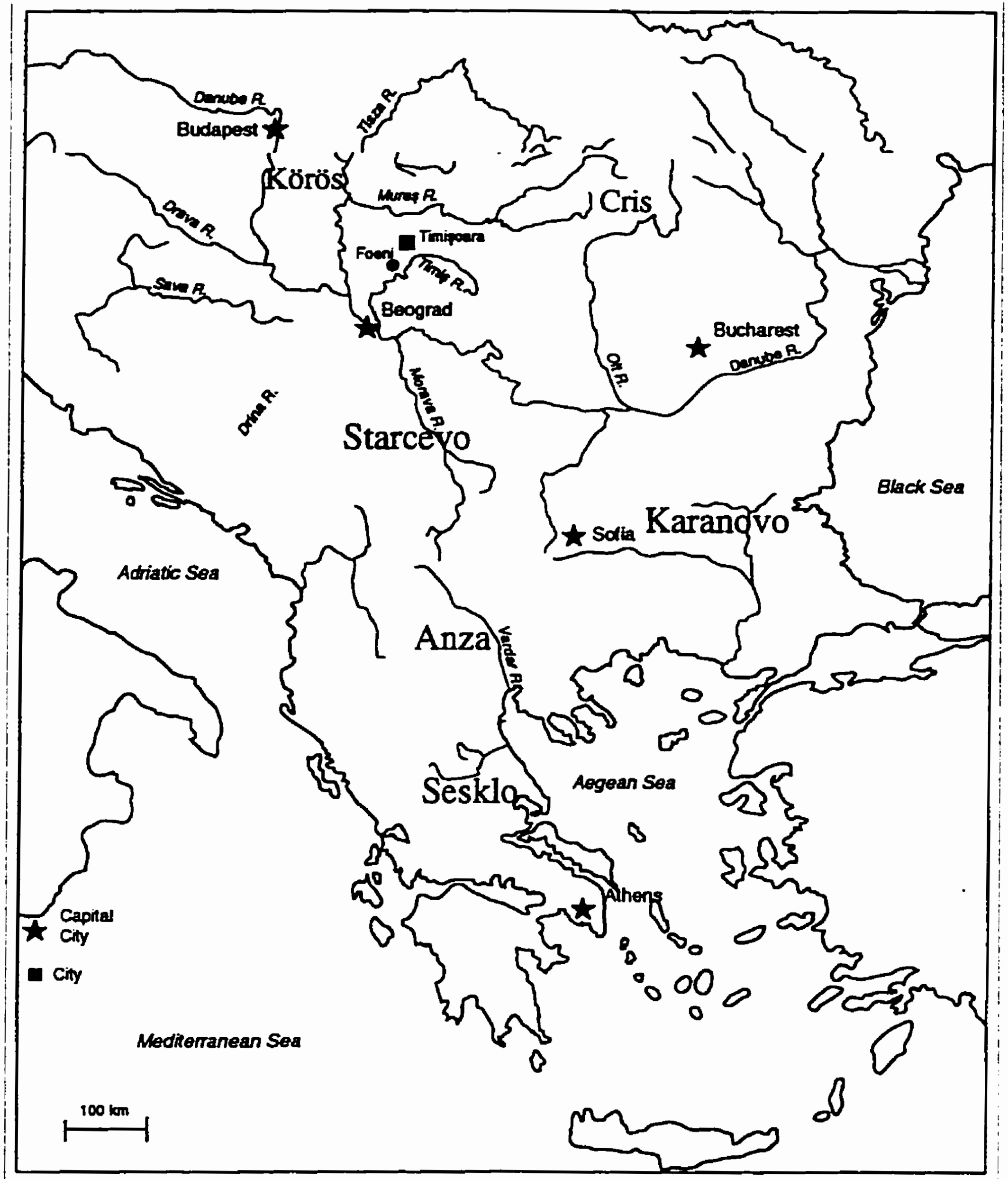

Figure 6. Early Neolithic Culture Groups of Southeastern Europe.

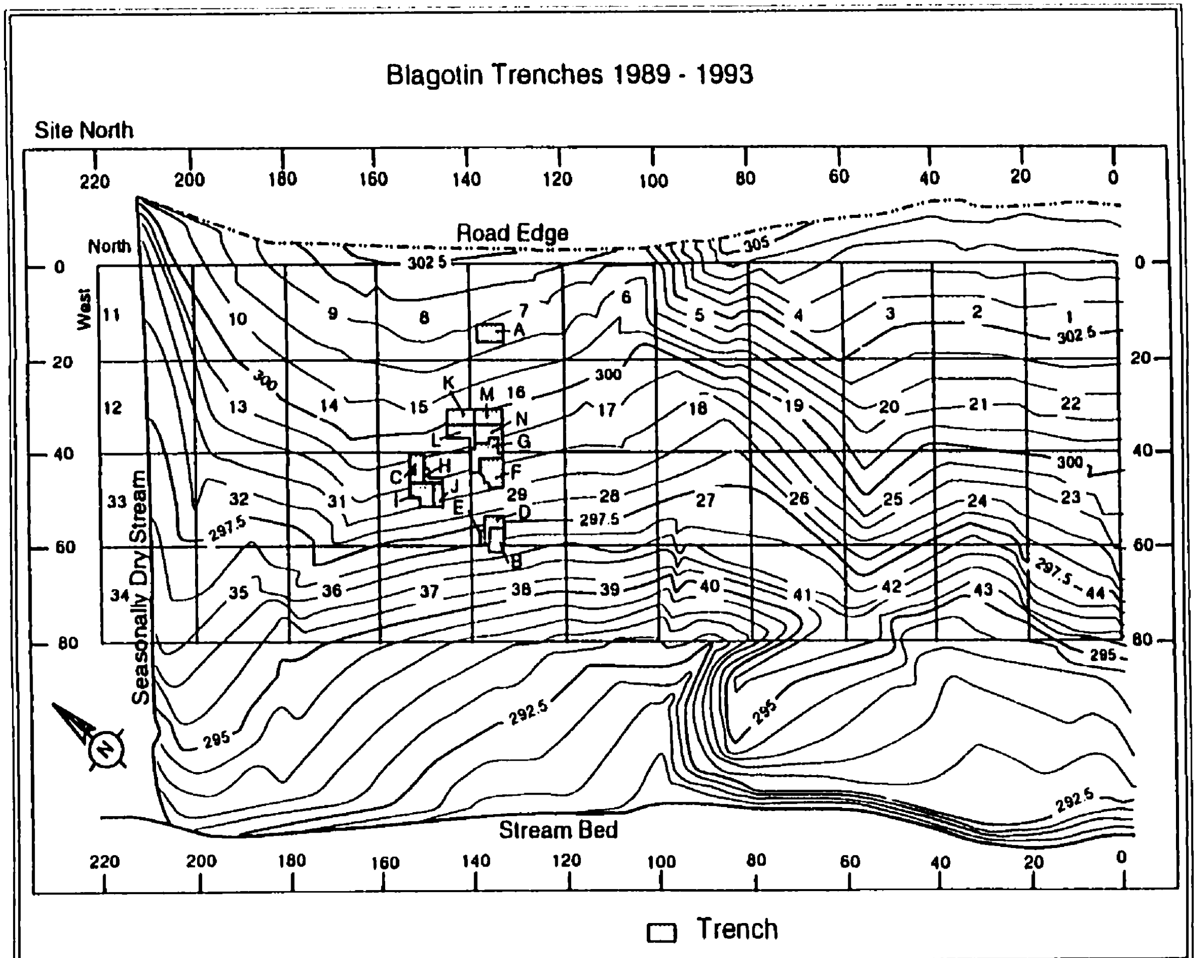

Figure 7. Topographic map of Blagotin and trench locations.

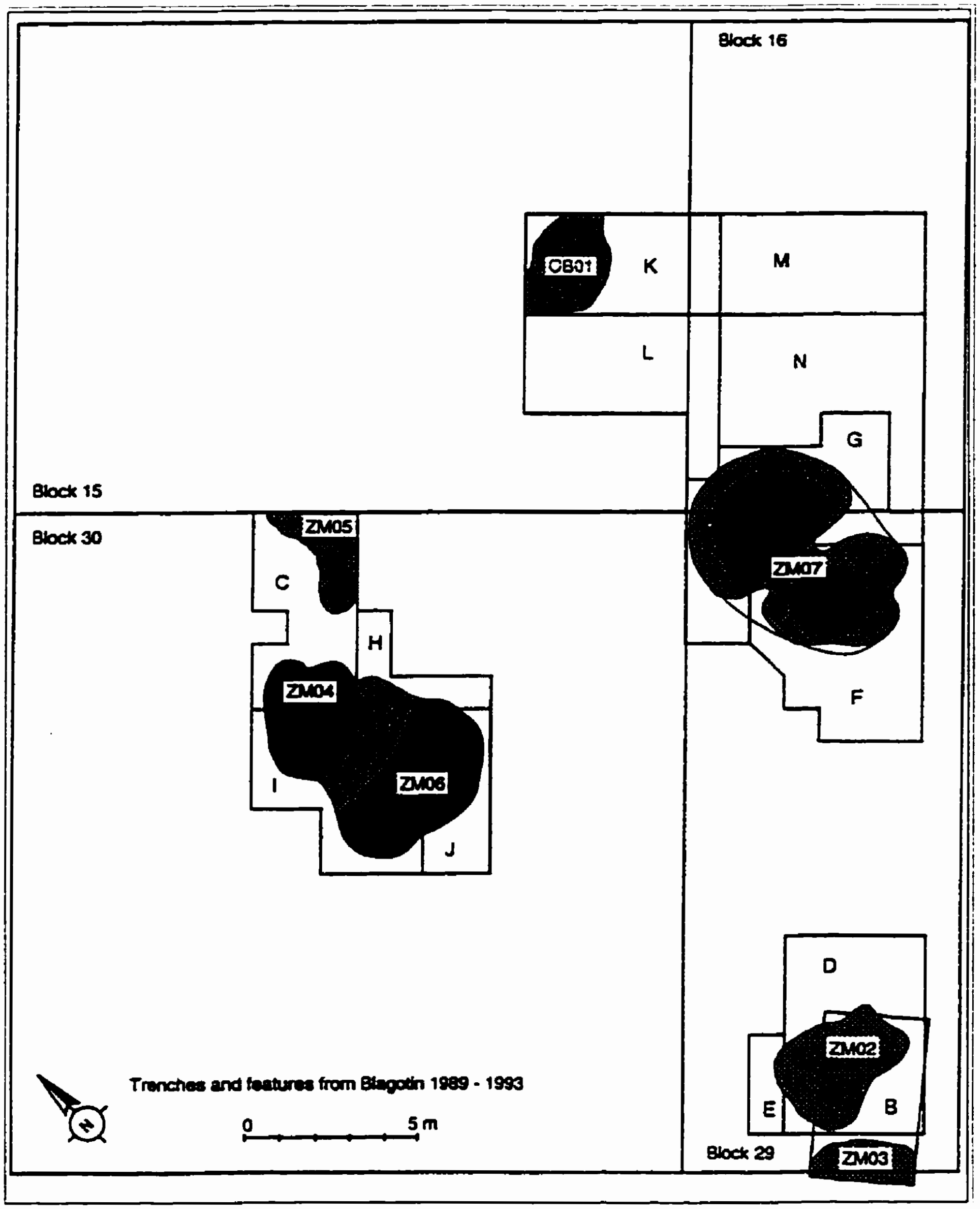

Figure 8. Spatial distribution of excavated Early Neolithic features at Blagotin.

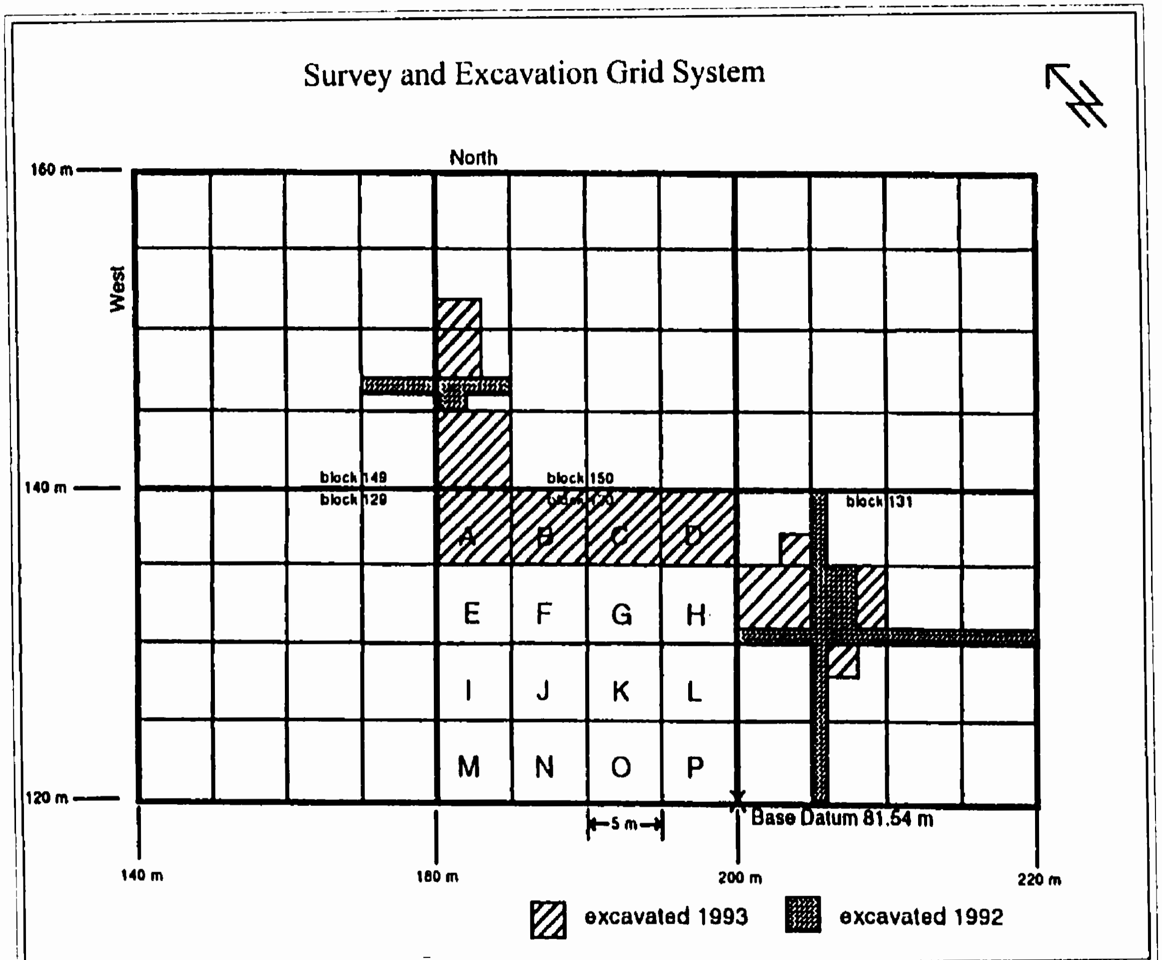

Figure 9. Survey and excavation grid system at Foeni-Salas during 1992-1993 seasons of excavations.

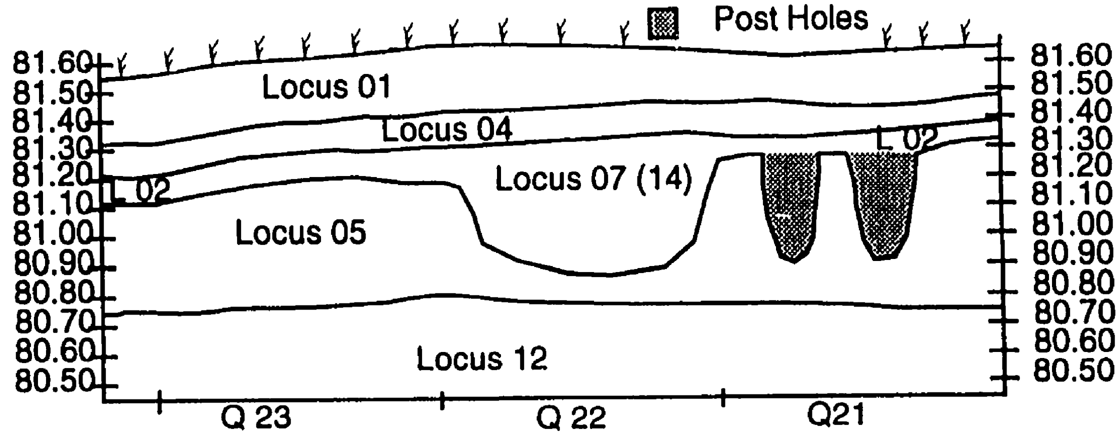

Figure 10. Stratigraphic profile of pan-site horizons (loci) at Foeni-Salas. Quads are in one meter intervals.

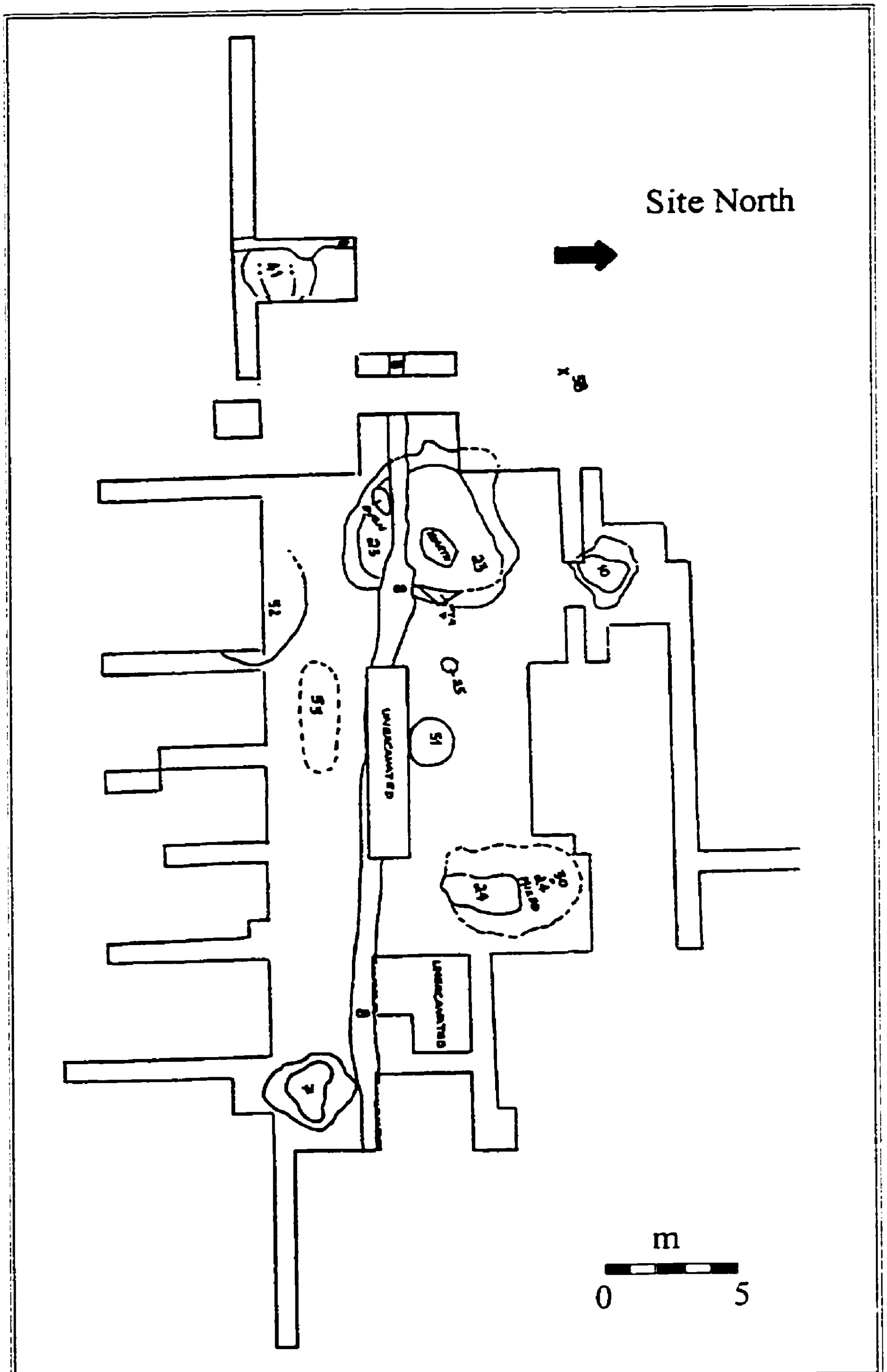

Figure 11. Map of Starcevo-Cris loci at Foeni-Salas.

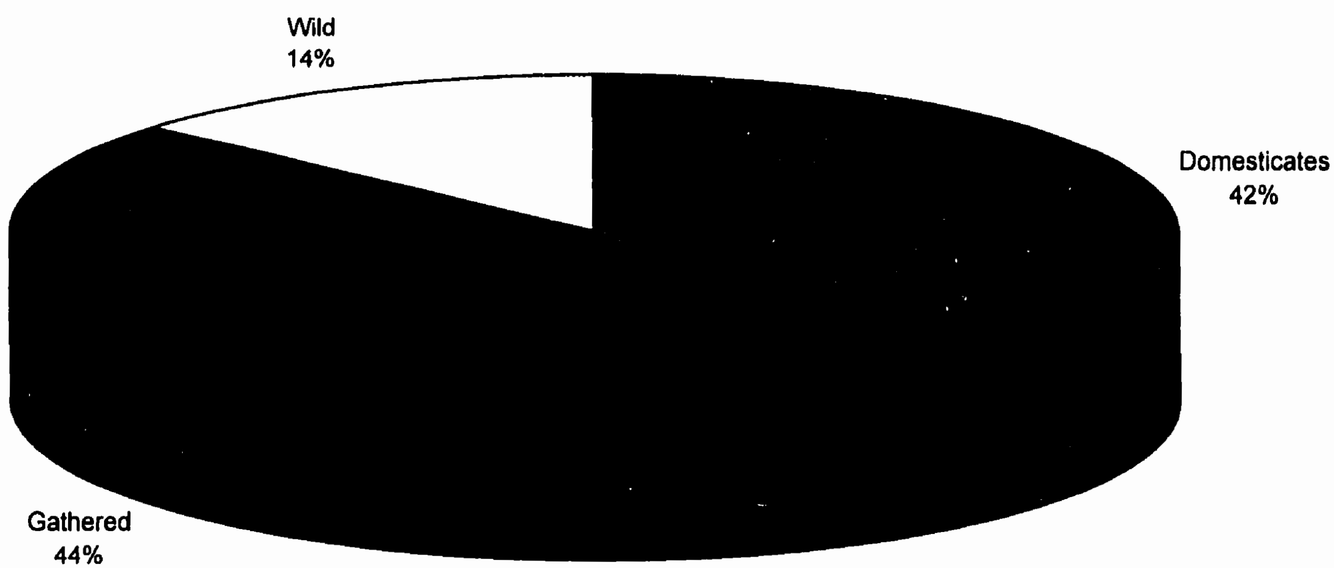

Figure 12: Percentage of botanical remains recovered from Early Neolithic contexts at Blagotin

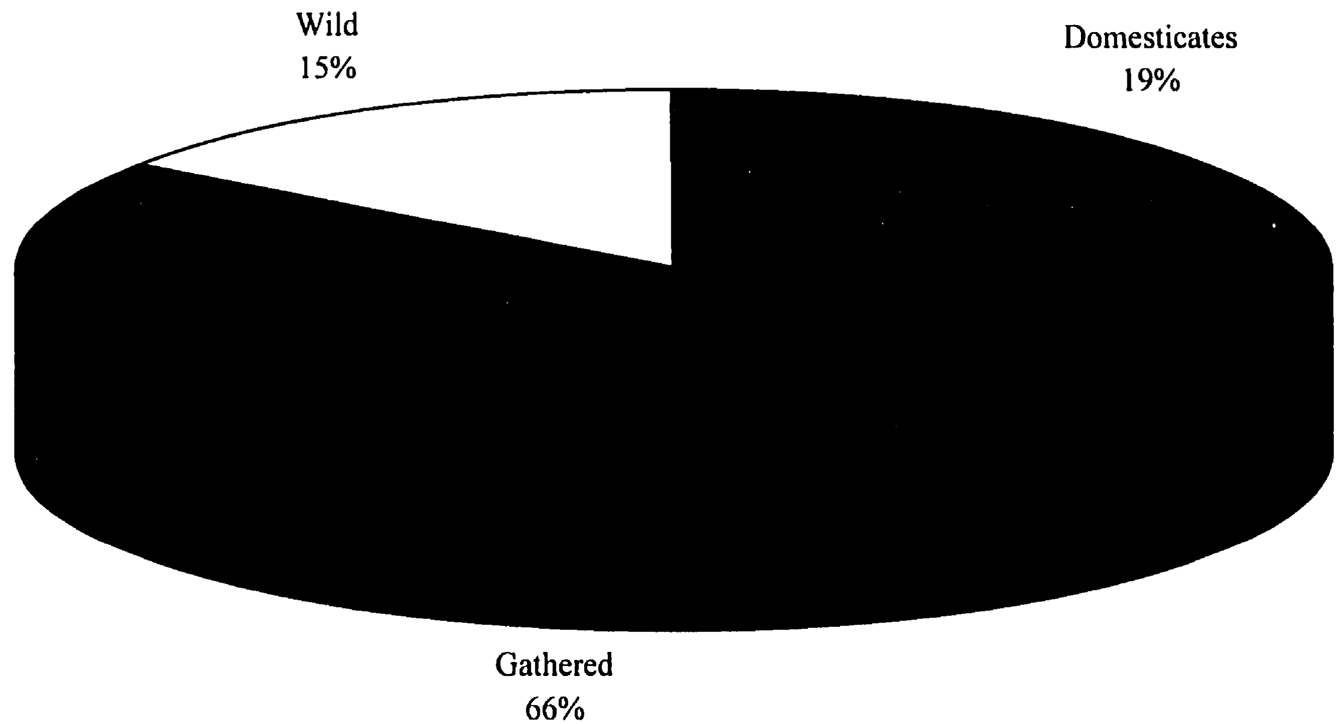

Figure 13: Percentage of botanical remains recovered from Early Neolithic contexts at Foeni-Salas

Table 1: Distribution Chart of all recovered seed remains recovered from Blagotin (Early Neolithic)

	Domesticates					Gathered		Weeds									
	Gramineae	T. monococcum	T. dicoccum	Hordeum vulgare	Lens sp.	Cornus mas	Pyrus sp.	Rubus fruticosus	Malus punila	Polygonum sp.	Chenopodium sp.	Papaver sp.	Silene sp.	Unknown 7	Unknown 8	Unknown 9	Totals
Total Whole	4.00	3.00	1.00	1.00	3.00	12.00	1.00	2.00	3.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	32.00
Total Fragments	9.00	0.50	0.00	0.00	0.00	4.00	0.00	0.00	1.00	0.00	2.00	1.00	0.50	0.50	0.50	0.50	19.50
Total Seeds	13.00	3.50	1.00	1.00	3.00	16.00	1.00	2.00	4.00	1.00	3.00	1.00	0.50	0.50	0.50	0.50	51.50
Percentage	0.25	0.07	0.02	0.02	0.06	0.31	0.02	0.04	0.08	0.02	0.06	0.02	0.01	0.01	0.01	0.01	1.00

Table 2: Distribution chart of all recovered seed remains recovered from Foeni-Salas (Early Neolithic contexts)

	Domesticates								Gathered		Weeds													
	Gramineae	T.monococcum	T. dicoccum	H.vulgare	Lens culinaris	Avena sp.	P.miliaceum	cf. Panicum sp.	Cornus mas	Quercus sp.	Sonchus asper	Malva/Galium	Galium sp.	Chenopodium sp.	Sambucus nigra	Papaver sp.	Silene sp.	Poa/Phragmites	P.vulgaris	Unknown 1	Unknown 2	Unknown 3	Unknown 4	Totals
Total Whole	6.00	7.00	2.00	0.00	1.00	1.00	1.00	1.00	2.00	17.00	1.00	0.00	2.00	3.00	2.00	2.00	3.00	1.00	1.00	0.00	0.00	0.00	0.00	53.00
Total Fragments	2.00	1.50	0.00	0.50	0.00	0.00	0.00	0.50	1.50	59.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50	0.50	0.50	0.50	68.00
Total Seeds	8.00	8.50	2.00	0.50	1.00	1.00	1.00	1.50	3.50	76.00	1.00	0.50	2.00	3.00	2.00	2.00	3.00	1.50	1.00	0.50	0.50	0.50	0.50	121.00
Percentage	0.07	0.07	0.02	0.00	0.01	0.01	0.01	0.01	0.03	0.63	0.01	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	1.00

Table 3: Ubiquity Table for Foeni-Salas - Early Neolithic Contexts Only

Taxa	Locus 2	Locus 7	Locus 10	Locus 23	Locus 24	Locus 25	Locus 41	Scores
T. monococcum	x			x	x			42%
Gramineae	x			x	x			42%
Poa/Phragmites				x	x			29%
T. dicoccum	x				x			29%
Cornus mas		x		x				29%
P. miliaceum	x	x						29%
Silene sp.	x			x				29%
Quercus sp.				x				14%
Chenopodium sp.		x						14%
Lens sp.	x							14%
Avena sp.				x				14%
Hordeum vulgare				x				14%
Malva/Galium	x							14%
Galium sp.					x			14%
Sambucus nigra					x			14%
Papaver sp.				x				14%
Sonchus asper				x				14%
Prunella vulgaris				x				14%
Unknown 1		x						14%
Uknown 2								14%
Unknown 3					x			14%
Unknown 4	x							14%

Taxa	Locus 2	Locus 7	Locus 10	Locus 23	Locus 24	Locus 25	Locus 41	Scores
Total Domestic	x	x		x	x			57%
Total Weed	x	x		x	x			57%
Total Gathered		x		x				29%

Table 4: Ubiquity Table for Blagotin - Early Neolithic Contexts Only

Taxa	ZM2	ZM4	ZM6	ZM7	Dp3	Em3	Score
Cornus mas	x	x	x	x	x		83%
Gramineae	x		x			x	50%
T. monococcum	x			x			33%
Chenopodium sp.	x				x		33%
Papaver sp.	x		x				33%
Rubus fruticosus	x		x				33%
H. vulgare			x				16%
Lens sp.			x				16%
Pyrus sp.			x				16%
Malus punila	x						16%
Polygonum sp.						x	16%
Silene sp.					x		16%
Unknown 7	x						16%
Unknown 8	x						16%
Unknown 9	x						16%

Taxa	ZM2	ZM4	ZM6	ZM7	Dp3	Em3	Score
Total Domestic	x		x	x		x	67%
Total Gathered	x	x	x	x	x		83%
Total Weed	x		x	x		x	67%

IMAGE EVALUATION TEST TARGET (QA-3)

150mm

6"

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