

DAYR 'ALLĀ REGIONAL PROJECT: SETTLING THE STEPPE FIRST CAMPAIGN 2004

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Introduction

The long term archaeological study of Tall Dayr 'Allā, a Joint Project of Leiden University and Yarmouk University, in close cooperation with the Department of Antiquities of Jordan, has resulted in a view of the complicated varying use of the site during the Bronze Age and Iron Age. Use of the site should not be studied in isolation, but in connection with the archaeology of the total surrounding landscape, including other settlement sites. In order to study and explain the existence and character of for example the Middle Bronze IIC or Late Bronze Age town it is necessary to know about other settlements in the surrounding steppe region, and about the other kinds of landscape use. Especially the complicated and unstable use of the site during the Iron Age II and III periods (Van der Kooij 2001) should be explained in combination with a study of the use of the surrounding landscape and other settlement sites. Considering the phytogeographical steppe character of this part of the Jordan Valley and the need for irrigation in case of intensive agricultural activities, the relationship with the Mediterranean zones to the east and west of the Valley should also be connected with this study.

In order to examine explanations for the settling and use of the steppe a comprehensive project was designed and granted financial support by the Netherlands Organization for Scientific Research (NWO). It started in March 2004 under the title: *"Settling the Steppe; the archaeology of changing societies in Syro-Palestinian drylands in the Bronze and Iron Ages"*. This project, directed by Gerrit van der Kooij and Diederik Meijer, combines current research by Leiden University in the Syrian Jazīrah and in the Dayr 'Allā Jordan Valley region, but also has a wider scope and purpose (see below).

After some local preparatory activities in Spring 2004, the first season of fieldwork in the Dayr 'Allā region took place from October 7th till November 20th, 2004 and this report gives a gen-

eral outline of the archaeological framework of the survey project and the preliminary results of this season.

The 'Settling The Steppe'-Project

Introduction

The Near East consists for the large parts of arid regions, like steppe and desert zones. Habitation in these areas is often difficult as precipitation is usually not sufficient for rain fed agriculture. The efforts involved in successfully maintaining a society in such an area are significantly higher than those in a more favourable region like the Mediterranean zone. Yet many people live in such a marginal area today and did so in the past. In an attempt to contribute to the global discussion on the habitation of drylands from an archaeological point of view and based upon two current major archaeological research projects, Leiden University started this 'Settling the steppe'-project. Thus, the project aims to explain this feature in two site-and-landscape clusters, namely Tall Dayr 'Allā in the Eastern Jordan Valley and Tall al-Hammām at-Turkmān in the Syrian Jazīrah, during the Early Bronze through the Iron Ages (ca. 3000-400 BC).

The Project

Aim and Research Questions

In archaeology, geography, and sociology the habitation in drylands has received significant attention. In archaeology themes like climatic change and diachronic settlement histories have been the focus of research (Miller Rosen 1995; Finkelstein 1995). The study of modern societies in drylands has shown that usually complex relationships exist between individuals, communities, institutions and the landscapes with which they interact (Barker and Gilbertson 2000:15; Van der Leeuw and Redman 2002). Archaeology should be able to fully appreciate such relations between people and the environment. The aims of the *Settling the Steppe-*

project are to get an insight into how and with what reasons people settled in an arid region like the steppe zone and by what means they were able to sustain a living for a certain period of time. The research questions that are studied to achieve these aims can be phrased as follows:

- How and why people came to live in the steppe zone and how and why did they abandon it?
- How did people maintain a successful and stable society and what was its character?
- What was the relationship of these societies in the steppe zone with their neighbours in the more favourable Mediterranean zone?

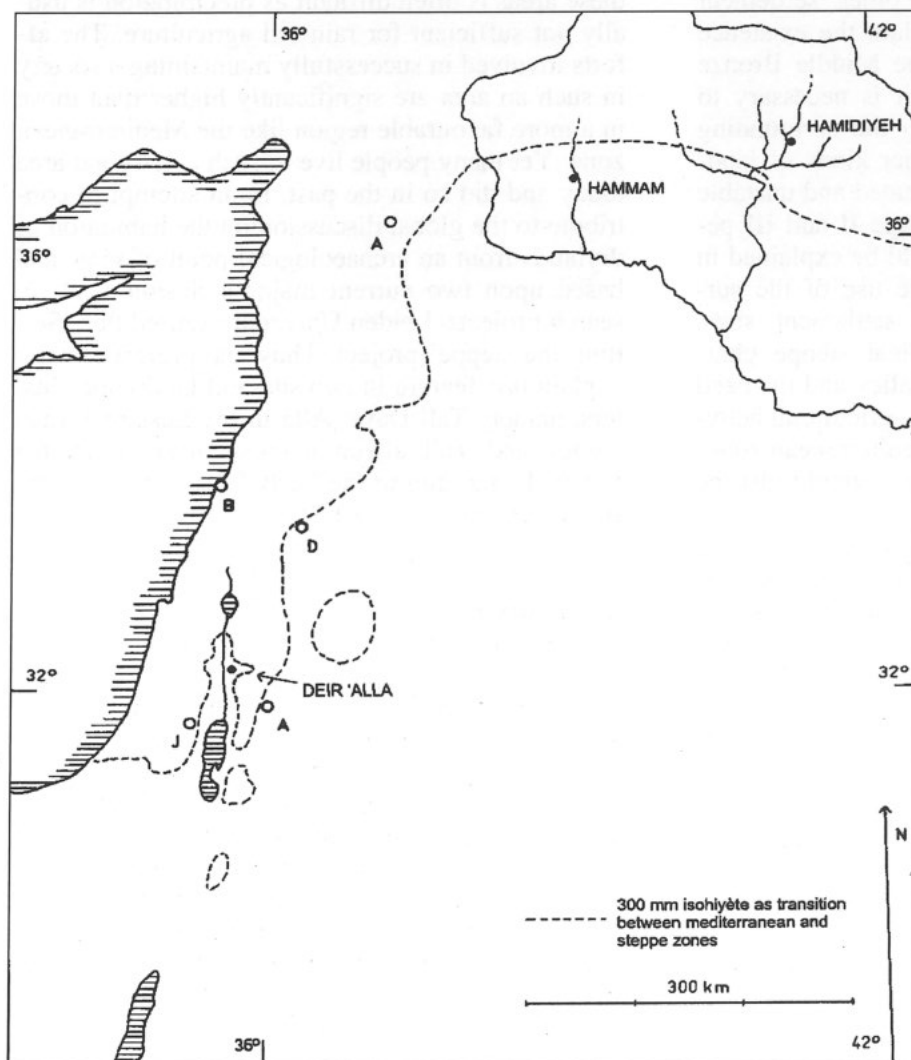
In order to answer these questions two regions are being investigated, i.e. the area around Tall Dayr 'Allā in the Eastern Jordan Valley and parts of the North Syrian Jezirah (**Fig. 1**). In both clusters the region will be studied as a totality and not as consisting of several isolated topics. In an interdisciplinary and highly integrated fashion the archaeological, geographical, geomorphologic and

biological aspects of the landscape in the Bronze and Iron Ages will be studied. The Jezirah-component focuses on the Bronze Age, while in the Dayr 'Allā region focus lies upon the Iron Age.

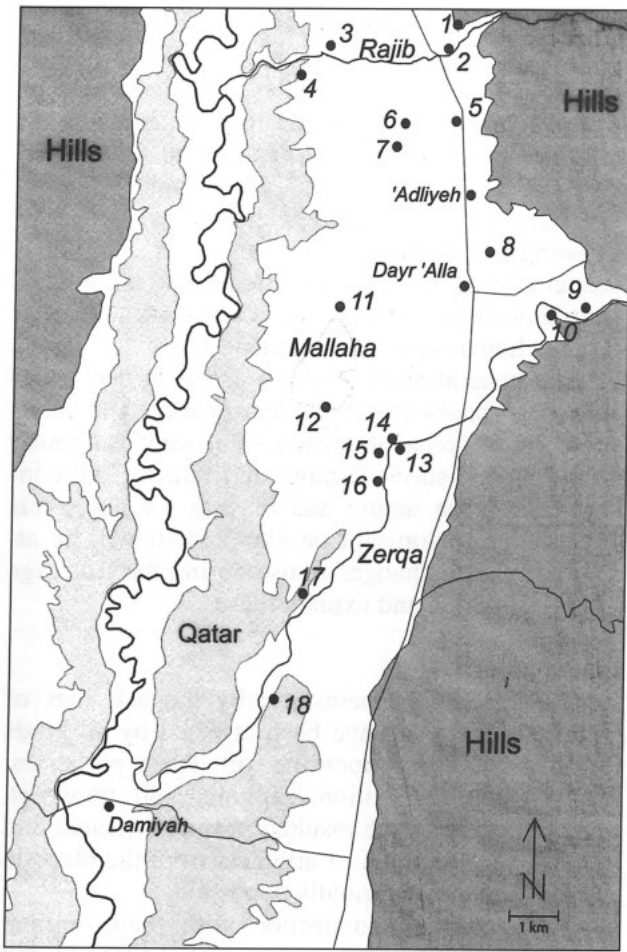
The two regional clusters will in part be dealt with separately, but always from the same theoretical background and purpose. The results will be combined and integrated into a comprehensive view on settlement of steppe zones.

The Tall Dayr 'Allā Cluster

The research area lies between the Wādī Rājib in the north and the az-Zarqā' River, with Tall Dāmiya in the south, comprising approximately 72km², and usually regarded to be the southernmost extension of the regularly settled part of the Jordan Valley (**Fig. 2**). Previous survey teams, e.g. Nelson Glueck (Glueck 1951) and the East Jordan Valley Survey (Ibrahim *et al.* 1976, 1988), have presented thorough overviews of the different tall sites in this region. No emphasis has, however,



1. Map of the Near East showing the steppe zone and research areas.



2. Map of the Dayr 'Allā region with Iron Age tall sites

1. Tall Qaws; 2. Tall 'Ammata; 3. Khirbat Buwayb; 4. Tall Buwayb; 5. Tall Abū 'Ubayda; 6. Tall al-Ghazāla; 7. Tall al-Mazār; 8. Tall al-Qa'dān North; 9. Tall al-Ḥimma; 10. Tall Abu az-Zighān; 11. Tall ar-Rabī'; 12. Tall 'Arqadat; 13. Tall Ramayla; 14. Tall al-Bashir; 15. Tall Shahwan; 16. Tall Zakari; 17. Tall Umm Hammad al-Sharqi; 18. Tall al-Murabba'.

been placed on the archaeological remains present within the landscape. The present research therefore incorporates a more systematic survey focusing on the region as a whole. The landscape is considered here as a complex palimpsest of the results of physical, biological and human activities in the past.

Tall Dayr 'Allā is taken to be the centre of the research area not only in a geographical sense but also methodologically as a reference site. The study by Leiden University in the 1960s and the subsequent excavations as a joint project with the Department of Antiquities of Jordan (since 1976) and Yarmouk University (since 1980) has provided us with a mass of valuable information (Franken 1969, 1992; Ibrahim and Van der Kooij 1997; Van der Kooij and Kafafi in prep.). Especially the sequence of villages dating to the Iron Age II and III

periods provide an ideal starting point for the study of the habitation of the Steppe Zone. In this period (ca. 1000-400BC), a sequence of settling, habitation and abandonment that recurs several times is visible (Van der Kooij 2001). *The Settling the Steppe* project investigates the reasons and character of this recurring settlement cycle. This is studied — as a branch of the Joint Dayr 'Allā Project and led by Gerrit van der Kooij and Omar al-Ghul — through limited excavation at small sites around Tall Dayr 'Allā (Lucas Petit) and systematic surface survey (Eva Kaptijn). These archaeological investigations are combined with geomorphologic (Fuad Hourani) and (archaeo) botanical research (Ellis Grootveld). The results will be compared with those of similar projects in the more favourable Mediterranean zones as well as with already excavated and studied sites in the research area, namely Tall al-Mazār, excavated by the University of Jordan (Yassine 1984, 1988), and Tall al-Ḥimma, as part of the Joint Dayr 'Allā Project (Van der Steen 2001, 2004; Veldhuijzen and Van der Steen 1999). It should be added that a regional study of this area has become an urgent matter in recent years, since agricultural and demographic developments are putting a high pressure on the archaeological heritage, causing irreversible changes and “damage” to both the archaeological remains in the landscape and tall sites.

The Jazīra Cluster

The Syrian component of the project concentrates on the Balikh valley in Northern Syria, where the important Bronze Age site of Tall Ḥammām al-Turkman is located. This site has been excavated first by the University of Amsterdam under the direction of Maurits van Loon and later by Leiden University, directed by Diederik Meijer (Van Loon 1988; Meijer 1996, 2000a and 2000b). Furthermore a tall-based survey has been conducted in this valley by Peter Akkermans (Akkermans 1984). The data of both the excavation and the survey will, in combination with already published research in the area, be used to come to a better understanding of the reasons why people came to settle in this arid region. The investigation of the tall sites and their surrounding landscape will be undertaken by archaeologist Arne Wossink and will be combined with geomorphology (Fuad Hourani) and archaeobotany (Ellis Grootveld). The geographical situation differs, however, from the Jordan Valley where the low-lying, arid valley is part of the steppe zone but the slopes to both the east and west enter the Mediterranean zone. In the Jazīra the valleys with their

higher groundwater table must be regarded as the most suitable places for habitation. The areas further away from the valleys are very arid and habitation has been concentrated within reach of the higher groundwater of the Balikh. In order to get a good insight into the specific character and problems of habitation in the steppe zone the Balikh Valley will be compared to the Upper Khabur Valley through fieldwork in the form of both survey and excavation, starting in 2005. Preliminary results will be published in the near future in the *Annales Archéologiques Arabes Syriennes*.

PRELIMINARY RESULTS AND SPECIFICS

During October and November 2004 the first of three seasons of fieldwork in the Tall Dayr 'Allā region was conducted. The preliminary results of the different subprojects will be presented separately. Obviously, general conclusions regarding the settling processes cannot yet be presented, due to the early stage of research.

1. Cultural Landscape Study – Eva Kaptijn

Aims and Theoretical Framework

While several surface survey projects are being conducted in Jordan this part of the Jordan Valley has as yet never been studied in such a way. A range of tall based surveys conducted in this area, like Nelson Glueck's *Explorations in Eastern Palestine* (1951) and the *East Jordan Valley Survey* (Ibrahim *et al.* 1976, 1988), have provided us with a detailed picture of the number of tall sites and the periods in which they were inhabited. No attention has, however, been paid to the fields between the tall sites. Detailed surface surveys in other parts of Jordan and in the larger Eastern Mediterranean region have shown that an enormous amount of information can be gained from the systematic examination of the landscape (e.g. MacDonald 1992).

Furthermore, this information is of a different nature than the data discovered at tall sites. The inhabitants of these tall sites were not confined to their settlement. They must have interacted with the surrounding landscape in several ways, largely already indicated by certain remains of the settlement sites. Agricultural fields will have been present to sustain in their livelihood, flocks of probably sheep and goats, as well as cattle, will have been herded, roads will have connected the different areas and settlements, burials will have existed at certain locations, and (communal) memory will have provided certain localities with special significance. Most likely the environment was considered to be as much part of the living domain

as the settlement was. The village and its surrounding landscape are intrinsically linked and can therefore not be understood in complete isolation from each other. Some activities of people in the past left traces in the landscape that can be discovered by archaeologists. The problem the archaeologist is confronted with is how to discern meaningful patterns in the sometimes continuous scatter of artefacts that are affected by all sorts of post-depositional factors and how to link these patterns to human activities in the past.

The general aims of this subproject can therefore be described as the identification and interpretation of archaeologically significant patterning in the general surface scatter of artefacts. In the interpretation the nature and reasons for using this arid steppe region will be explored. It will be attempted to see changes in use during the Iron Age II and III period and explain these.

Methodology

The material remains left by the activities of people in the past have been affected by all kinds of processes acting upon the soil. These processes, e.g. erosion, deposition, digging, soil transport, ploughing, etc., have resulted in the horizontal and vertical displacement of artefacts from the place in which they were originally deposited.

Therefore any connection with their original pattern of distribution might be lost. As a result not all distributions of artefacts represent archaeological meaning. A distribution of artefacts on the surface must first be examined in terms of the geomorphologic and human processes that acted upon it before any archaeological significance can be inferred. Little effort has however been invested in the development of models to aid this examination (Bintliff 2005: 137).

Because the artefact distribution on the surface is regarded as being created by a combination of processes of which one is the activity of people in the past a methodology based on the terms on- and off-site can no longer be used. The terms site and off-site assume that a concentration of artefacts on the surface has an archaeological significance, although not necessarily always a settlement. The present interpretation sees artefacts on the surface as a continuous distribution with areas of higher and lower density that is caused by many different processes. A landscape-survey is therefore initially non-site based, a term which is unfortunately not widely used (Van de Velde 2001: 29). After analysis the finds that do represent archaeological patterning can be filtered out from this continuous 'carpet' of artefacts that covers the surface. Only at

that stage can archaeologists start using the term site.

Governed by these aims and considerations this survey had to develop a method that was able to document this continuous spread in a detailed way that allowed statistical calculations, but that also covered a sufficiently large area to be able to assess the entire research area of 72km². For logistical purposes the basic survey unit (termed the field) was taken to be a modern agricultural field. It was decided to subdivide each field into lines that were walked by one person. The lines were spaced 15m apart, thereby operating at a level of detail of maximum 15m. In order to detect changes in density of artefacts along one line these were broken up into plots of 50m (Fig. 3). As experiments have shown that it is very difficult to look for more than one material category at the same time each plot was walked twice; the first time collecting pottery, the second time searching for everything else. All detected artefacts were collected and brought to the station to be processed further. No distinction was made between feature and non-feature sherds or between flint tools and debitage flakes; all objects with indications of human background, processed and analysed. Although the interpretation focuses on the Iron Age II and III the survey will yield finds from other pe-

riods as well. These finds will of course not be ignored as the preliminary results presented here show, but within the scope of the *Settling the Steppe*-project their interpretation will not be at a level of detail similar to the Iron Age remains.

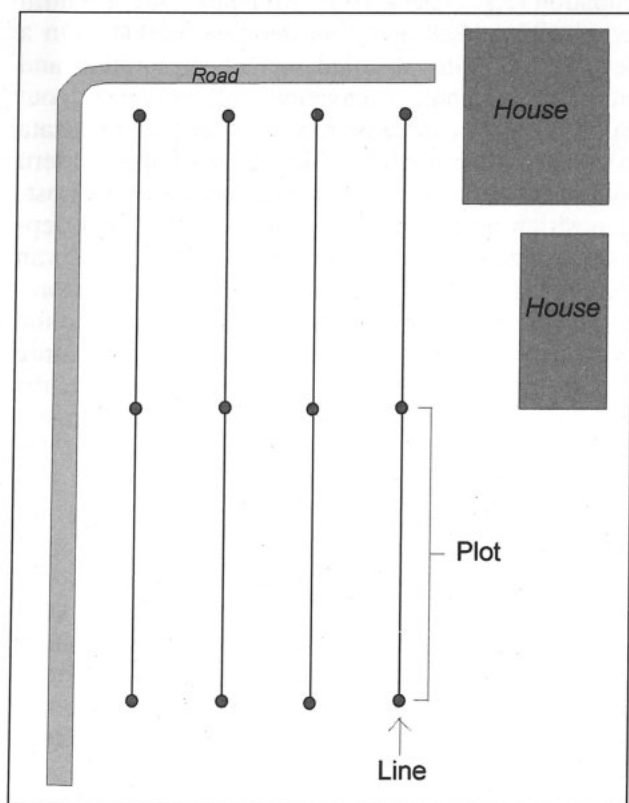
Preliminary results

During the 2004 field season the survey team consisted of an average of 6 people. In the 30 days of actual survey work the team covered an area of 1.6 km². This is only 2.2% of the entire research area. However, if the areas that cannot be surveyed due to the presence of villages, severe erosion, roads, etc. are not incorporated the percentage of area covered is significantly higher. As Tall Dayr 'Allā is the major site in the area and because the large amount of excavation data available make it the scientific focus of the project the area around Tall Dayr 'Allā, is going to be surveyed as thoroughly as possible. This is done to ensure that no valuable information in its occupational realm, or so-called *siedlungskammer*, is missed. Because of its size the rest of the research area can only be studied in a sampling fashion.

The region that was investigated this season can be divided into four areas. This year the areas to the southwest and northeast of Tall Dayr 'Allā were surveyed. To the southwest the land of the 'Dayr 'Allā Regional Centre for Agricultural Research and Technology Transfer', which includes Tall al-Fukhār, was surveyed. To the northwest part of the area east of the main road including land around Tall al-Qa'dān North and South was investigated. In this area, i.e. in field 27, a large amount of Chalcolithic sherds and flint tools was discovered in an area of ca. 300x180m. The field was until recently covered by a citrus plantation and had now been ploughed. Destruction by deep ploughing seems therefore to have been minimal and caused the good preservation of the finds. Analyses on the pottery, flint and stone tools are being undertaken at the moment. The results of this analysis will be published as a separate article in the near future.

The area to the east of Tall Dayr 'Allā was surveyed in a few large strips of fields to incorporate the area of Tall al-Ḥimma, located 3km to the east of Dayr 'Allā. In the first of these strips, at the southern side of the Wādī al-Ghawr circa 500m east of Tall Dayr 'Allā a very large amount of Islamic sugar pots and syrup jars was found. These are connected to the widespread sugar production from sugar cane grown in the Jordan Valley during the Islamic Period (LaGro 2002).

The fields surrounding Tall al-Ḥimma were sur-



3. Sketch of a fictional field showing lines and plots.

veyed as completely as possible. In the field it was already clear that this area is characterized by a relatively large component of flint tools dating to the Chalcolithic period. Further conclusions however have to await the analysis of the finds.

The second area to be surveyed was the Zur, the actual bed of the Jordan, surrounding Tall Dāmiya where the az-Zarqā' conflues with the Jordan River. It was aimed to establish the use of the landscape around Tall Dāmiya, which is one of the talls excavated by Lucas Petit in the *Iron Age Settlement Site Study* (see section below). Virtually no finds at all were discovered in this area. Fuad Hourani, the project's geomorphologist, concluded that this area has received so many alluvial deposits through the continuous overflowing of the Jordan and az-Zarqā' Rivers that all archaeological artefacts were most probably either buried or washed away.

The surroundings of the salt plain of Mallāḥa, located west-south-west of Tall Dayr 'Allā, were also investigated. Except for some exceptional geomorphologic results that still have to be analysed in detail, no major archaeological artefacts on the surface were detected.

The last area to be surveyed was the vicinity of Tall al-Bashir on the curve of the az-Zarqā' near the village of aṭ-Ṭiwāl. This area is characterized by the location of many talls close to each other, i.e. Rikābi, Bashir/Asiyah, Ramayla, Shahwān, Zakāri, Qaṭar Zakāri and Miḥith. Previous survey reports are not in agreement on the exact locations of these talls. One of the aims was therefore to determine their exact position. Remeileh on the southern side of the az-Zarqā' turned out to have been bulldozed away a few years ago. Tall Shahwān has been built over by the modern village of aṭ-Ṭiwāl and both Qaṭar Zakāri and Miḥith, reported by the East Jordan Valley Survey, could not be located (Ibrahim *et al.* 1988: 191). Just south-east of Tall al-Bashir, on the northern side of the az-Zarqā' a relatively high density of both Neolithic flint tools and pottery, and Islamic sugar pots was discovered.

Conclusions

Although conclusions regarding the research aims of the *Settling the Steppe*-project can only be drawn after full-scale analysis, some preliminary results were already clear in the field. The most important result of the first season must be that detailed surface survey is indeed useful. The restrictions posed by the active sedimentary nature of this alluvial area do not greatly inhibit the results of survey. Furthermore, several localities of special

interest that can already at this stage be identified as archaeological sites, like fields 27, 81 and the sugar pot sherds, have been discovered. The biggest contribution of this first season of landscape survey to the archaeology of the Jordan Valley is to be found in the large amount of artefacts found scattered over the area; a total of 45.846 sherds and 1458 pieces of flint were collected. This amount proves that a lot of information can be gained from the study of the countryside. The countryside provides us with a different type of data than excavations of tall sites; it gives us an insight into the activities in the landscape in the past. Both village and countryside have been part of the past society and the results of this first landscape survey activity show us that the archaeological remains in the countryside can no longer be neglected in this part of Jordan.

2. Iron Age Settlement Site Study – Lucas Petit

The purpose of this sub-project is to find regional parallels, or divergences, for the chronology and intensity of use of the core site Tall Dayr 'Allā during the Iron Age II and III periods – in itself and in connection with neighbouring, sometimes more favourable, regions. Judging from previous survey work, the research area, defined before, contains some 20 settlement sites with clear Iron Age occupation (e.g. Glueck 1951; Melleart 1962; Ibrahim *et al.* 1976, 1988 and Van der Steen 2004). On a few of these sites detailed surface exploration and micro-stratigraphic excavation will be carried out in order to get a detailed record of all cultural strata preserved. The analysis takes care of the modern assessment criteria, based upon knowledge of post-deposition processes that affected the original deposition-location of material culture (*cf.* Sullivan 1989). Data collection in the field, analysis of previous survey and excavation work, comparison with the stratigraphic picture and material culture of Tall Dayr 'Allā and close co-operation with the other disciplines of this project should finally result in a detailed picture of the habitation cycle of the drylands in the Jordan Valley.

The choice of the sites to be small-scale excavated was not only determined by their partial Iron Age occupation and a relevant location within the project's study focus, but also because of easy access to these levels by damage afflicted to them, generally by bulldozer's cuts. During the reported season two sites were trenched. The results should be read as preliminary, due to restricted analyses of the stratigraphy and material culture.

Tall al-'Adliyya, situated less than 1.5km south east of Tall al-Mazār and 2km north of Tall Dayr 'Allā,

was initially tested and systematically surveyed in October 2004. The site is approximately 41m in diameter, revealing Early Bronze Age, Iron Age I and II, Hellenistic, Roman, Byzantine and Ayyubid/Mamluk pottery (e.g. Glueck 1951: 307; Melleart 1962; Ibrahim *et al.* 1988: 190). Three soundings were conducted on the western half of the site along the edge of a major bulldozer cut that went down into virgin soil (Fig. 4).

A fragment of an east-west oriented mudbrick wall represents the earliest occupation remains excavated thus far, situated directly above sterile soil. The limited horizontal exposure prevents at the moment a precise dating of its construction and habitation. Nevertheless, other contemporaneous walls were seen in the bulldozer section, revealing with some extrapolation at least two multi-room houses. In the second phase, not long after the earlier units had collapsed, new features were built and some wall stumps were reused. Two excellently preserved houses with a large courtyard in between were encountered at Tall al-'Adliyya, constructed in a similar pattern as the buildings belonging to phase 1. The numerous courtyard layers and rebuilding activities in this phase represent a long time of continuous occupation during Iron Age II. Destruction ended this occupation suddenly, evidenced by a large number of storage jars left in one of the excavated rooms and a layer of burnt mudbricks in the most southern end of the bulldozer cut. After a period of abandonment, people re-established some living units, on top of and

in between the ruined houses of phase 2. This squatter activity showed a poor and meagre assemblage of material culture. The succeeding phases 4 and 5 contained excessive Roman occupation with *Terra Sigilata* and fragments of glass containers. A large east-west running wall on top of foundation stones was attributed to the earliest of both phases and acted probably as an outer extremity of a large building. The latest architectural remains found at Tall al-'Adliyya consist of large stone-walls and pavements. Unfortunately no floor surfaces nor material objects *in situ* were unearthed to date this construction. After the inhabitants left Tall al-'Adliyya, the site was used as a cemetery during the Islamic period, with pit graves and a row of stones on top of the east-west oriented skeletal remains.

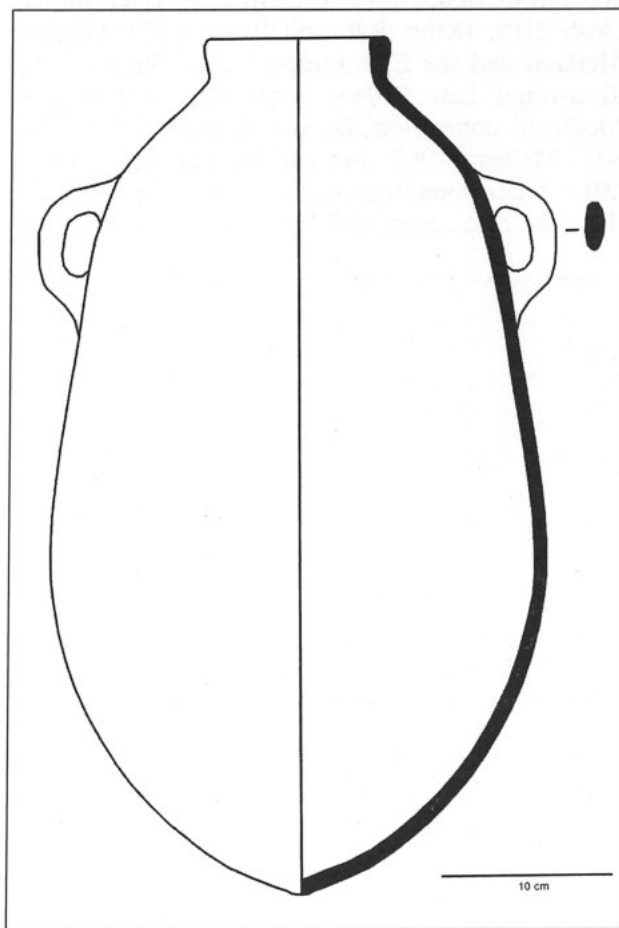
Tall Dāmiya, a medium sized settlement mound that rises abruptly out of the flat fertile lands of the Zur, is located directly south of the confluence of the az-Zarqā' and the Jordan River. The site has been cited frequently, due to its possible identification with the Biblical town of Adam, or Adamah and the existence of a ford over the river Jordan (Josh 3:16, IKing 4:46 and IIChr 4:27). Glueck, Mellaart and the East Jordan Valley Survey have discovered Late Bronze, Iron Age, Roman and Medieval pottery on the site (Glueck 1951: 330-331; Melleart 1962: 148 and Ibrahim *et al.* 1988: 191). Three soundings were conducted directly on the edge of a recent bulldozer cut on the southern



4. Section Tall al-'Adliyya showing soundings.

side of the mound's top. Eleven different phases were identified that, nonetheless, cover only the uppermost layers of this 15m high mound.

The earliest phase excavated thus far, was only reached in one square and consisted of several courtyard layers. Two succeeding phases were distinguished with only flimsy evidence of human occupation and meagre construction works. The character of the remains did change substantially in the fourth phase, including numerous mudbrick walls, installations and rich material culture, all buried under a thick layer of destruction debris. The remains of at least one two-roomed building were found that were constructed directly upon the uneven walking surface of the settlement mound. The ceramic evidence (**Fig. 5**) shows parallels with the Iron Age IIC assemblages found in phases VI and VII at Tall Dayr 'Allā and a bulla with cuneiform writing proves the connection with other regions. Shortly after the destruction, the inhabitants rebuilt the walls and used red-burnt mudbricks of the previous phase for building new installations and retaining walls. After a period of occupation the structures were abandoned and covered by a thin



5. Iron Age IIC jar from Tall Dāmiya.

layer of occupation deposits. No architectural features were distinguished and the material remains in the sediments are scarce. The stratigraphic relation of this phase with some mudbrick-lined pits that cut through many of the older layers cannot yet be made. The fills in all pits consist of white chalk remains of reed and straw, deposited in a continuous and long process of depositing. Beside organic contents that point to a function as storage, the fill also contained many clay loom weights. Two burial pits were discovered in the upper most layers of which one revealed the skeletal remains of a child. The chronological context of those is not yet clear.

3. Physical Landscape and Geoarchaeological Study – Fuad Hourani

The physical landscape study attempts to determine the palaeogeographical development of the Lower az-Zarqā' Basin during the Holocene (Hourani 2002). In order to achieve this aim focus will be placed on the Wādī az-Zarqā', the Wādī Rājib and the Wādī al-Ghawr. In valleys the different stages of erosion and sedimentation are the most distinct and their investigation will contribute significantly to the geological history of the Dayr 'Allā area. Additionally the geomorphologic processes in the areas to be surveyed will be studied. This will help to determine what post-depositional factors have acted on an artefact found on the surface. In the excavations some geomorphologic analyses will attempt to determine the nature of the deposition of certain stratigraphic layers. It can for example be ascertained whether a layer was deposited by man, animals or by natural agents (wind, rainfall, etc.) and whether it has been subsequently transformed by physical alteration, such as biological activities (earthworms, insects, roots), swallow/shrinking of sediments, dissolution/precipitation of soluble salts, and/ or by chemical and bio-chemical weathering, for instance redistribution of secondary carbonates, oxidation, etc.

During this season the investigations concentrated mainly along the course of the az-Zarqā' River. Especially in the areas east of Tall al-Ḥimma, in the bend near Tall al-Bashīr and in the Zur near Tall Dāmiya the deposits of the az-Zarqā' river were investigated. At least three terraces could be discerned. This points to the conclusion that this area has known at least three phases in which the az-Zarqā' had an erosive character alternated by periods of sedimentation. In the coming seasons attention will focus on establishing a date for the formation of these terraces.

At the foot of Tall Dāmiya a 3m deep sounding

was made to determine the original surface on which the tall's first settlement was built and to see in what type of environment it was located. The virgin soil was, however, not reached in this season. From this sounding and from investigations in the environment in combination with the archaeological surface survey it can be concluded that the amount of deposits that this riverbed environment received is very significant.

Additionally attention was given to a remarkable geomorphologic feature in this region, i.e. the Mallāḥa salt plain. Again soundings were carried out and several samples, for micromorphological and physicochemical analyses, were taken. As these samples still await analysis no definitive conclusions can be drawn, but it seems that human influence is greater than would be expected.

In the excavations at Tall al-'Adliyya and Tall Dāmiya suitable stratigraphic layers were sampled, but these too await analysis.

4. Botanical landscape study – Ellis Grootveld

The botanical study within this project concerns the analysis of archaeological botanical remains and — in order to interpret them — the study of the current flora in the region in relation to artificial watering and soil types.

The aims of this study are to develop a view about land use for agriculture and herding around the various Iron Age settlement sites during their distinguished phases, including the use of irrigation of agricultural fields. This would be an ecological and economic contribution to the project's aim to understand how and why people settled in this steppe region (cf. Neef 1989). In previous studies of carbonised plant samples from Dayr 'Allā it is clearly indicated (mainly by flax seeds, Van Zeist and Heeres 1973: 27) that during some periods irrigated agriculture was practised. Also other approaches to the identification of irrigated fields are promising (cf. Miller Rosen 1999; Charles *et al.* 2003).

Consequently, after identification of the seeds from collected samples, information about the ecology of each cultivated and non-cultivated species will be gathered, e.g. favoured precipitation, soil requirements, temperature regimes and flowering time. Thus indications of irrigation or possibly of varieties in mean annual precipitation may be given. The connection with different soils in the surrounding landscape may indicate where people in the Iron Age grew their different crops — or grazed their herds, because remains of their dung are often found in fireplaces.

Knowledge about present-day vegetation is tak-

en from relevant publications as well as from *herbaria* in Jordan, including Yarmouk University. Additional data and material will be collected during different seasons. This makes it possible to see a plant with leaves, flowers and seeds.

During this first excavation season samples from Tall al-'Adliyya and Tall Damiya were floated and sorted. Analysis of these samples and some of the samples that were taken during the more recent previous excavations at Tall Dayr 'Allā (in addition to the material studied by Van Zeist and Neef) is taking place at Leiden University and is still in an early stage. In the 'Adliyya and Damiya samples very few weeds were found so far, and agricultural crops present are mainly *Triticum spec.* and *Hordeum spec.*

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References

- Akkermans, P.M.M.G.
1984 Archäologische Geländebegehung im Balih-Tal. *Archiv für Orientforschung* 31: 188-190.
- Barker, G. and Gilbertson, D. (eds.)
2000 *The Archaeology of Drylands; Living at the margin*, One World Archaeology 39. London and New York: Routledge.
- Bintliff, J.
2005 Human impact, land-use history, and the surface archaeological record: a case study from Greece. *Geoarchaeology: an international journal* 20(2): 135-147.
- Charles, M., Hoppé, C., Jones, G., Bogaard, A., Hodgson, J.G.
2003 Using weed functional attributes for the identification of irrigation regimes in Jordan. *Journal of Archaeological Science* 30: 1429-1441.
- Finkelstein, I.
1995 *Living on the fringe; the archaeology and history of the Negev, Sinai and neighbouring regions in the Bronze and Iron Ages*, Monographs in Mediterranean Archaeology 6. Sheffield: Academic Press.
- Franken, H.J.
1969 *Excavations at Deir 'Alla. A stratigraphical and analytical study of the Early Iron Age pottery*. Leiden: Brill
1992 *Excavations at Tall Deir 'Alla: the Late Bronze Age Sanctuary*. Leuven: Peeters Press.
- Glueck, N.
1951 Explorations in Eastern Palestine IV. *AASOR* 25-28. New Haven: ASOR.
- Hourani, F.
2002 *Le cadre paléogéographique des premières sociétés agricoles dans la vallée du Jourdain*. Unpublished Doctoral Thesis, Paris.
- Ibrahim, M., Sauer, J. and Yassine, K.
1976 The East Jordan Valley Survey, 1975. *BASOR* 222: 41-66.
1988 East Jordan Valley Survey, 1976. Pp. 189-207 in K. Yassine (ed.), *Archaeology of Jordan: essays and reports*. Amman: Department of Antiquities and University of Jordan.
- Kooij, G. van der
2001 The vicissitudes of life at Dayr 'Alla during the first millennium BC, seen in a wider context. *SHAJ* 7: 295-304.
- Ibrahim, M.M. and Kooij, G. van der
1997 Excavations at Tall Dayr 'Alla; seasons 1987 and 1994. *ADAJ* 41: 95-114.
- Kooij, G. van der and Kafafi, Z.
In prep. Excavations at Tall Dayr 'Alla; seasons 1996, 1998 and 2000. *ADAJ*
- LaGro, H.E.
2002 *An insight into Ayyubid-Mamluk pottery: description and analysis of a corpus of mediaeval pottery from the cane sugar production and village occupation at Tall Abu Sarbut in Jordan*. unpublished diss. Leiden.
- Van der Leeuw, S. and Redman, C.L.
2002 Placing archaeology at the centre of socio-natural studies. *American Antiquity* 67/4: 597-605.
- Van Loon,
1988 *Hammam et-Turkman I. Report on the University of Amsterdam's 1981-84 excavations in Syria*. Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul, 63. Istanbul: Nederlands Historisch-Archaeologisch Instituut.
- MacDonald, B. (ed.)
1992 *The southern Ghors and northeastern 'Arabah archaeological survey*. Sheffield archaeological monographs 5. Sheffield: Sheffield academic press.

- Meijer, D.J.W.
- 1996 Tall Hammam al-Turkman: Preliminary report on the seventh campaign, May-July 1995. *Anatolica* 22: 181-194.
 - 2000a State and Trade. Toward a case study for Northern Syria. Pp. 219-240 in O. Rouault and M. Wäfler (eds.), *La Djéziré et l'Euphrate Syriens*. Subartu 7. Brussel: Brepols.
 - 2000b Ecology and archaeology: Perceptions and questions. Pp. 203-212 in L. Milano, S. de Martino, F.M. Fales, G.B. Lanfranchi (eds.), *Landscapes, Territories, Frontiers and Horizons in the Ancient Near East. Papers presented to the XLIV Rencontre Assyriologique Internationale, Venezia, 7-11 July 1997*. HANE Monographs 3: Padova: Sargon.
- Melleart, J.
- 1962 Preliminary Report of the Archaeological Survey in the Yarmuk and Jordan Valley for the Point four Irrigation Scheme. *ADAJ* 6-7: 126-157.
- Miller Rosen, A.
- 1995 The social response to environmental change in Early Bronze Age Canaan. *Journal of Anthropological Archaeology* 14: 26-44.
 - 1999 Phytolith analysis in Near Eastern archaeology. Pp. 9-15 in S. Pike and S. Gitin, (eds.), *The practical impact of science on Near Eastern and Aegean archaeology*. Wiener Laboratory Monograph 3. London: Archetype.
- Neef, R.
- 1989 Ch. III.a Plants. Pp. 30-37 in G. van der Kooij and M.M. Ibrahim (eds), *Picking up the threads...A continuing review of excavations at Deir Alla, Jordan*. Leiden: University of Leiden Archaeological Centre.
- Steen, E.J. van der
- 2001 Excavations at Tall al-Hammeh. *SHAJ* 7: 229-232.
 - 2004 Tribes and Territories in Transition. The central east Jordan Valley and surrounding regions in the late Bronze and Early Iron Ages: a study of the sources. *Orientalia Lovanensia analecta* 0777-978X; 130, Dudley (MA.): Uitgeverij Peeters and Departement Oosterse Studies.
- Sullivan, A.P.
- 1989 Technology of ceramic reuse: formation processes and archaeological evidence. *World Archaeology* 21: 101-113.
- Velde, P. van de
- 2001 An extensive alternative to intensive survey: point sampling in the Riu Mannu Survey Project, Sardinia. *Journal of Mediterranean Archaeology* 14(1): 24-52.
- Veldhuijzen, H.A. and Steen, E.J. van der
- 1999 Iron Production center found in the Jordan Valley. *Near Eastern Archaeology* 62/3: 195-199.
- Yassine, K.
- 1984a *Tall el Mazar I. Cemetery A*. Amman: University of Jordan.
 - 1988 *Archaeology of Jordan: essays and reports*. Amman: Department of Antiquities of Jordan, University of Jordan.
- Zeist, W. van, Heeres, J.A.H.
- 1973 Paleobotanical studies of Deir 'Alla, Jordan. *Paléorient* 1: 21-37.