


1984

# The Local Environment and Human Food-Procuring Strategies in Jordan: The Case of Tell Hesban and Its Surrounding Region

Lawrence T. Geraty  
*Andrews University*

Oystein LaBianca  
*Andrews University*, [labianca@andrews.edu](mailto:labianca@andrews.edu)

Follow this and additional works at: <https://digitalcommons.andrews.edu/pubs>

 Part of the [Agricultural and Resource Economics Commons](#), [Archaeological Anthropology Commons](#), [Food Studies Commons](#), and the [Near Eastern Languages and Societies Commons](#)

---

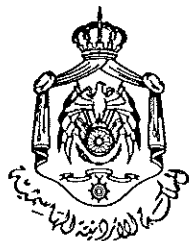
## Recommended Citation

Geraty, Lawrence T. and LaBianca, Oystein, "The Local Environment and Human Food-Procuring Strategies in Jordan: The Case of Tell Hesban and Its Surrounding Region" (1984). *Faculty Publications*. 847.  
<https://digitalcommons.andrews.edu/pubs/847>

This Contribution to Book is brought to you for free and open access by Digital Commons @ Andrews University. It has been accepted for inclusion in Faculty Publications by an authorized administrator of Digital Commons @ Andrews University. For more information, please contact [repository@andrews.edu](mailto:repository@andrews.edu).

STUDIES IN THE HISTORY  
AND ARCHAEOLOGY OF  
JORDAN  
II

Edited by Dr Adnan Hadidi



Department of Antiquities, Amman

Hashemite Kingdom of Jordan

and

Routledge & Kegan Paul

London, Boston, Melbourne and Henley

1985

## The Local Environment and Human Food-Procuring Strategies in Jordan: The Case of Tell Hesban and its Surrounding Region

### I

To all those who have over the years been involved in some way with the recent excavations at Tell Hesban the transience of human occupation of the site over its 3,200 year history is a well known fact. The site was first settled in the 12th century BC, experienced growth and increasing prosperity over the next 500 years, followed by a gradual decline and eventual abandonment by the 5th century BC. Over the subsequent three centuries, during Persian and Early Hellenistic times, no sedentary occupation is attested. Then, in the Late Hellenistic period, about 200 BC, the site was resettled. Throughout the Roman and Byzantine periods, human ingenuity at the site and exploitation of its environs followed a cumulative course resulting in the achievement of significant feats of engineering and architecture and in the accumulation of considerable wealth. This continues into the Umayyad period when suddenly, about AD 750, a decline sets in which culminates in total abandonment. For the next 450 years no signs of sedentary occupation are evidenced until about AD 1200 when a small village was rebuilt on the site. During Early Mamluk times settled life reached another momentary peak, only to be followed by gradual decline and collapse. From the middle of the 15th until towards the end of the 19th centuries a 400 year hiatus in sedentary occupation is encountered. Then during the early part of the present century, members of the Ajarma and other tribes of the Balqa joined hands in rebuilding the present-day village of Hesban.

This pattern of on-again off-again occupation is by no means unique to Tell Hesban. Indeed, judging from the results of the site-survey carried out in connection with the excavations at Tell Hesban (Ibach 1978), and from reports of other excavations and surveys carried out in Jordan (Department of Antiquities 1973; Sauer 1980), it is clear that the pattern uncovered at Tell Hesban is merely an instance reflecting the history of settled life east of the Jordan as a whole.

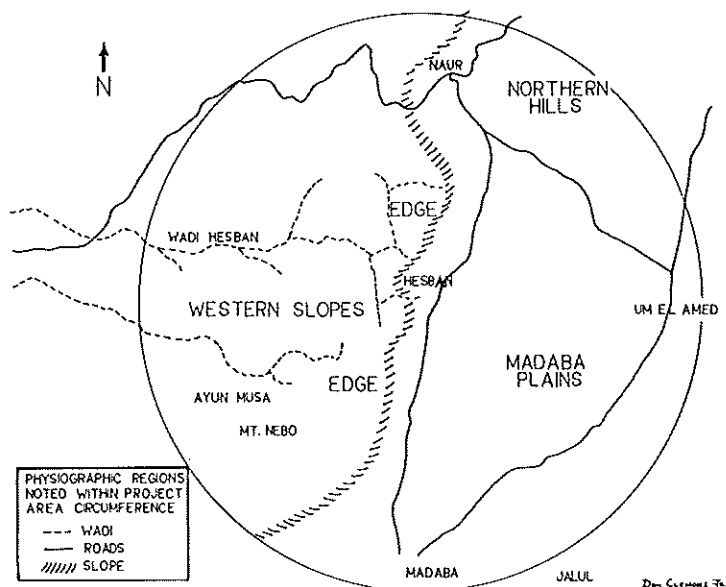
In this paper our aim is to direct attention to the processes which account for this transience in sedentary occupation east of the Jordan. Our approach will be to focus first upon the recent history of resettlement at Hesban and its vicinity as a means to generate insights and hypotheses which, in turn, will

be employed in elucidating the archaeological evidence as it pertains to the question of change over time in the occupational history of Tell Hesban.

As a framework for integrating the diverse lines of evidence with which we will be dealing, our analysis will involve viewing the site and region in question as, among other things, a food system. In other words, we propose to examine empirically-attested changes in settlement, landuse, operational facilities (such as water management facilities, food processing and storage facilities, transportation facilities, etc.) and diet as parameters of changes in the food system—the set of institutionalized and interconnected activities which people carry out in their quest for food. We believe that such a perspective gives prominence to the fact that the lives of most people in Jordan have been rural lives concerned with the necessities of daily life. Furthermore, this perspective focuses attention on the crucial role which the local environment plays in shaping human food procuring strategies. And finally, by adopting a food system perspective we have sought to give due recognition to the way of life of the pastoral nomad as one among several strategies for exploiting the natural resource represented by the land east of the Jordan.

Our foundation for this Transjordan food system analysis rests on a variety of data: technical reports concerning Jordan's economy and agricultural sector (prepared by the Jordanian government and various international agencies: see LaBianca, forthcoming); the results of a food production survey conducted by LaBianca in the 10 km radius (FIG. 1) comprising the Hesban project area during 1980–81 (LaBianca, forthcoming), the results of an environmental survey carried out by Larry Lacelle and Patricia Crawford in the same project area during 1979 (Lacelle, unpublished), the Hesban Project area archaeological site survey reports previously produced by Robert Ibach and his team members (Ibach 1976, 1978), the findings of five excavation seasons at Tell Hesban itself, from 1968 to 1976 (Boraas and Horn 1969, 1973, 1975; Boraas and Geraty 1976, 1978), and lastly the data provided by Joachim Boessneck and Angela von den Driesch from their quantitative analysis of animal bones excavated at Tell Hesban (Boessneck and von den Driesch

## 1. Map of project area showing four physiographic regions.



1978). These investigations have all been carried out in cooperation with the Jordanian Department of Antiquities and the American Schools of Oriental Research under the auspices of the Andrews University Hesban Expedition directed first by Siegfried Horn (1968–73) and then by Lawrence Geraty (since 1973).

## II

One has a 2,000 square kilometer panoramic view when standing on the summit of Tell Hesban which lies 880 meters above sea level (FIG. 1). To the north are the 'northern uplands,' some which appear as gently rolling hills, others as steep escarpments. To the west lie eroded slopes leading first gently, then gradually more steeply, into the Jordan Valley. South and east are the Madaba Plains which vanish in the southern horizon and the eastern desert. The village of Hesban rests right on the edge of this Transjordan highland on the eastern margin of the eroded area. The hill on which the settlement is located owes its existence to the processes of weathering and erosion. Where down-slope erosion has not removed the soil which has formed on bedrock, primarily to the east and south of the tell, the farmers of Hesban still plant grain, and more recently, vegetables and fruit trees. The villagers' dependence on their local environment is evident also in their economic exploitation of the tell's rocks and sediments as well as the surrounding soils and clays (Bullard 1972).

In January the mean daily temperature ranges between 10–14°C on the western slopes, but remains at 8°C in the northern hills and on the plains. In June the mean daily temperature ranges between 26–30°C on the western slopes, while ranging between 24–26°C in the northern hills and on the plain. Rainfall is most abundant in the northern hills where the amount ranges between 400–500 millimeters

annually. The southern plains consistently receive down to 300 millimeters of rainfall. Most rainfall occurs between November and March.

The principal wadis in the region are Wadi Hesban, Wadi el Humeidi, Wadi Ayun Musa, Wadi el Marbat, Wadi Masuh, Wadi el Habis and their tributaries, all controlled in their erosional activity by the Jordan River–Dead Sea depression. These wadis flow primarily during the rainy season. About 13 springs, particularly in the western and northern regions, flow for longer periods (though not every year in all instances). The most active springs are Ain Hesban and Ayun Musa. Groundwater lies several hundred meters below the surface and even today has not been tapped by the use of tube wells.

In the previous century, two great tribal confederations vied for control over this landscape's pastures (cf. Tristram 1873, Conder n.d., 1892; LaBianca, forthcoming). One group was the Adwan Confederacy, semi-nomadic sheep and goat breeders. This tribe would graze their sheep and goats on the landscape's hills and plains during the summer, then descend to the Jordan Valley's lower slopes, valleys, and plains to spend the cold months. There they generally had permanent homes with agricultural lands.

The Beni Sakhr Confederacy, nomadic camel and horse breeders, constituted the second party involved in the land dispute. During the previous century this tribe had begun protecting a small number of Palestinian 'fellaheen.' In return, these farmers would, using dry farming methods, produce grains on the plains. This arrangement was conducted on a share-cropping basis with the Beni Sakhr. Therefore, the sedentary population lived primarily on the plains during this early period.

By 1955 the sedentary population had increased from an estimated population equaling less than 3,000 in 1880 to about 13,000. This increase is due in part to the settlement of Palestinian refugees in this area.

The population within this study area had grown to 40,000 persons by 1975. Such growth is directly related to the changes in food production occurring within the 20 years since 1955. The major change was a transition from the cereals, sheep–goat mixed farming by tribal and peasant farmers to a rapidly advancing, market-oriented farming system based on vegetables and tree crops—especially olives and grapes.

The Palestinians shared their knowledge of vegetable farming and orchard management with their Jordanian hosts, and this allowed them both to settle on the slopes as well as in the plains. Utilizing terraces, they were able to plant their gardens and orchards on this fertile but otherwise untenable terrain. Consequently, there was a large increase in village settlements in the wadi system by 1975.

There are a number of other noteworthy changes. Most important, perhaps, is the pacification of the countryside. This action allowed the sedentary farmers to pursue their agricultural livelihood without the threat of raids and plunderings by tribesmen. Unsecured landholdings provided

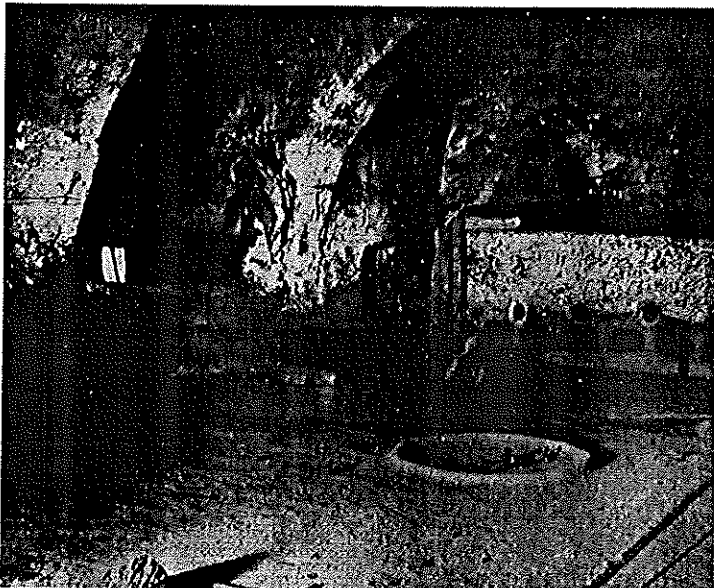
no incentive for making the long-term investments in time, labor and finances which terrace construction and tree crop production call for.

Changes in dwelling types reflect both food production intensification and the gradual pacification of the countryside. Tents and caves are characteristic of the nomadic life. Early semi-sedentary life, with its mixed farming of cereals—sheep/goats, found housing in what may be labeled 'fortified farm houses' (FIG. 2). Typically, these dwellings were built from stones quarried by the ancient Romans. The usual 'fortified farm house' had two vaulted arches upon which would be placed logs and earth to form a roof. Typically, windows consisted of small holes from which to observe the enemy and fire upon him, or else they consisted of slightly larger openings sealed off with metal bars. Both livestock and humans occupied these dwellings, albeit the livestock usually only at night. Granaries were typically built between the vaulted arches so grain could be safely stored. The oldest buildings in many Tranjordanian turn-of-the century villages are of this type.

As the countryside became pacified these 'fortified farm houses' were turned into animal shelters, and modern buildings with larger windows were preferred. Furthermore, the village dwellings became more spread out as the fear of raids diminished. This ended the pattern of clustering dwellings for protective purposes which existed in less secure times.

Important changes in other areas related to food production include modifications in water management, road networks and other public works, food storage, processing, marketing, and distribution. What is especially worth noting here is the manner in which food production intensification has affected the exploitation of animals. For example, a comparison between the way of life of pastoralists and

2. Interior of a 'fortified farm house' in Madaba (in Archibald Forder, 1909, *Ventures Among the Arabs*. New York: Gospel Publishing House).



semi-sedentary mixed farmers would reveal the pastoralists exploiting sheep, goats and camels while the semi-sedentary farmers would be relying more heavily on draft animals, especially oxen, for tilling purposes. The more intensive vegetable and fruit tree agriculture developing on the steep slopes necessitated the use of the horse and mule. These last two animals were a much more surefooted source of draft power on the steep terraces. It is interesting to note that the horse and mule are today still preferred over machinery in the terraced region of the study area, even though tractors and combines have replaced the oxen teams on the plains.

Dietary changes are equally revealing. As landuse shifts from pasture grazing animals to field and tree crop production, there is a gradual diminishing of sheep and goat meat in the diet. This is offset by an increasing reliance on poultry and, among Christians, pork. These animals can be raised without interfering with crop production.

### III

The account of recent changes in settlement, landuse, operational facilities and diet that we have offered above clearly suggests a process of intensification of human exploitation of the region in question: the actual number of people living off the land has increased from a few thousand to over 40,000; dozens of year-around village settlements have been established where a little over a hundred years ago there were none; landuse has changed from an emphasis on pasture animals to intensive and wide-spread production of cereals, vegetables, fruits, and poultry; roads have been built where formerly only footpaths and donkey trails existed; food storage and marketing facilities have been established where before there were none, and so on.

Closer analysis of the processes underlying many of these changes indicates that while the pace at which change occurs may vary between, say changes in landuse and changes in diet, analytically distinguishable phases may be recognized which correspond to particular points along the continuum from low to high intensity exploitation of the natural resources for the purposes of obtaining food. Such points may be suggested for each of the parameters of the food system with which we have been concerned here.

For example, in the case of the settlement pattern, the low intensity phase involved relatively few people per unit of land; the presence throughout the region of numerous camping sites, especially in the vicinity of sources of water, but an absence or near absence of permanently settled villages; and dwellings consisting primarily of tents or caves. Next followed a medium intensity phase characterized by a relatively greater number of people per unit of land; the presence of villages on the hills, edge and plains, but not so much on the slopes; and a prominent concern with protection evidenced in the location of houses in close proximity to one another and the presence of dwellings built with special concern for the protection of settlers, as exemplified by the 'fortified farm houses' already described. The high intensity phase involves

relatively large numbers of people per unit of land; a relatively larger number of villages and towns all over, and especially in the steeper valleys and slopes where before there were only a few settlements; and the presence of large and impressive structures along with dwellings of considerable variation in architecture and size without the earlier primary concern with protection.

Changes in landuse are closely tied to those in settlement. Thus in the case of the low intensity phase, landuse involves an emphasis on ruminant grazing of camels, sheep and goats—herd composition depending among other factors on the length of annual migrations of the herdsman. Dry-farming of cereals may be practised either by the herdsman themselves or by a subordinated group of producers. The medium intensity phase involves greater emphasis being placed on dry-farming of cereals combined with ruminant grazing of cattle, sheep and goats. During the high intensity phase, ruminant grazing diminishes in importance as most available lands are planted with cereals, gardens and large orchards. Typically, this shift along the landuse intensity axis is correlated with a gradual shift away from subsistence-oriented toward market-oriented production, particularly in the case of fruits and vegetables.

Along with these changes in settlement and landuse come related changes in operational facilities. Whereas in the low intensity phase, little emphasis is placed on the construction of permanent facilities other than the occasional repair of a cistern and the arrangement of stones into fences for enclosing animals as in the case of herding sites; the medium intensity phase is manifest by the erection of numerous stone walls around settlements to protect crops from grazing ruminants, the construction of various food processing and storage facilities such as winnowing grounds, mills, tabuns, storage barns and pits, etc. Particularly important is the raising of cattle for use in plowing and donkeys for hauling water and produce from field to village. These investments in facilities and equipment become even more prominent during the high intensity phase, except now truly impressive public works are found throughout the region. Such works may include paved roads and associated reservoirs for watering draft animals, large dams and aqueducts for transporting water to villages, towns and surrounding fields; large-scale terracing works along wadi-bottoms and hillsides; public buildings such as places of worship and public meeting halls, granaries, market-places, etc. In our particular area, this is the phase when the donkey, mule and horse gain prominence as well, for these animals are better suited to plowing on the steep hillside terraces and on the slopes which by now are settled by orchardists, viticulturists and other farmers.

Changes in dietary habits can also be distinguished by phases. Thus during the low intensity phase, when subsistence production prevails, diet is closely tied to landuse. Among pastoralists the staple items consist primarily of animal products such as milk and cheese preserved and prepared in various ways; though figs, grains, and various herbs, plants

and roots are also used as these become available or are gathered along the migration routes. Meat is eaten only on rare occasions during feasts or ceremonies or when important visitors arrive. The medium intensity phase involves distinctively greater reliance on cereals combined with a slight increase in the consumption of meat, including poultry. Fruits and vegetables play a relatively larger role in the diet as well. Diets during the high intensity phase are distinctive first of all because of their variety, consisting of a wide diversity of locally and distantly produced items depending on the wealth of the household in question. Noticeable also is the prominence of meats from barnyard animals such as pigs and poultry. Such meats can be produced without requiring cultivated lands to be returned for use as pastures.

We have already mentioned that the rate of change may vary with respect to each of these parameters so that, for example, landuse may be further along on the intensity continuum than diet. Thus, what we have proposed is not a typology consisting of mutually exclusive categories of food procuring intensity levels, but rather, we have offered a set of distinctive features whereby patterns of dominance may be ascertained, given the pertinent archaeological data. What must be established in the case of every historical time segment of interest is the extent to which a particular combination of features reflects a particular point along the food procuring intensity continuum. For example, where the weight of evidence suggests medium level features we can expect a mixed farming dominance involving village-based dry-farming of cereals and ruminant grazing. This does not mean certain low or high intensity features may not be present as well. In many cases they are. The present pattern of dominance in the study area, for instance, is approaching the high intensity food procuring level, yet there are still low and medium level features in the region.

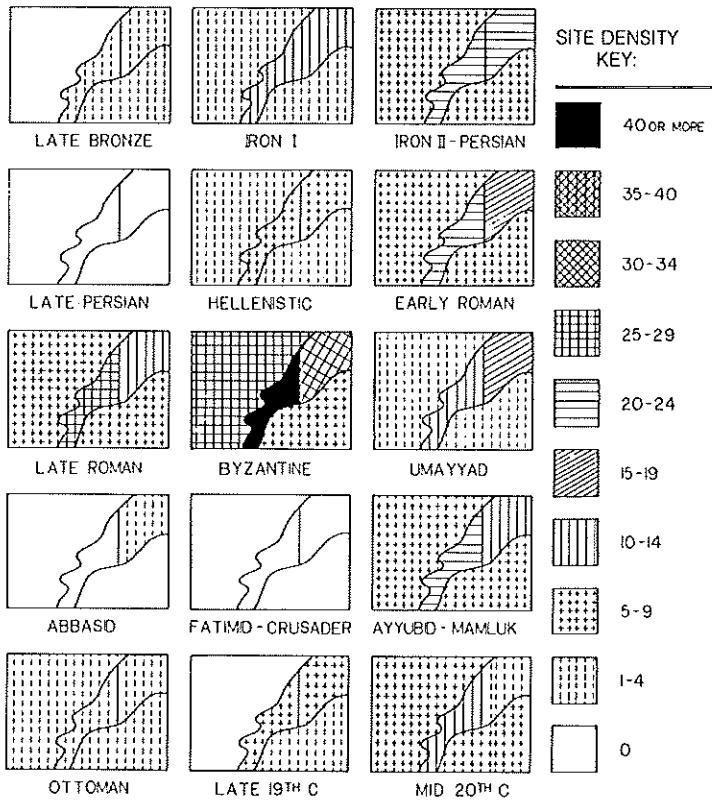
#### IV

What follows is a brief historical application of this model of the food system change process to the three data sets discussed earlier. The description for each period can be compared to the visual representation in FIG. 3.

##### *Late Bronze Age*

The small number of sites within the study area during the Late Bronze Age, and the absence of sedentary occupation at Tell Hesban indicate a dominant pattern reflecting nomadic pastoralism during this period. That the few settled sites are all on the plain and that even where other sites in Jordan from this period have been excavated they are mostly, though certainly not exclusively, cave, tomb, or temple sites, adds further weight to this impression. Notice, however, that this does not mean absence of population altogether, but merely points to a pattern of nomadic pastoralism involving a migrating population for large sectors of the country (cf. Department of Antiquities 1973, 19–21; Sauer 1980, 15–17).

3. Changes over time in the density of archaeological sites in each physiographic region.



*Iron I*

Three features indicate a mixed farming dominance pattern during this period: the presence of a small, possibly fortified, village at Tell Hesban; the presence of 28 sites on the plains, the edge, and in the hills; and the large quantity of cattle. There is evidence that the dwellings themselves included both caves (Herr, unpublished) and 'fortified farm houses'. These finds fit well with what has been discovered elsewhere in the country where Iron I tends to begin with scanty settlement evidence but gradually develops into a period with numerous town sites (cf. Sauer 1980, 17-19).

*Iron II-Persian*

A well-established mixed farming dominance pattern with a small tree and vine crop production sector (as seen by the presence of several such sites on the western slopes) explains this period. Specific features of Iron II include 59 sites, especially on the edge and in the hills; the continued importance of cattle; and larger settlement size, including an impressive water reservoir. The latter implies more than the interests of a single town, probably the planning of a central government. Possibly Hesban was one of the unnamed sites at which Mesha, the Moabite king, claims to have constructed water conservation projects (Pritchard 1969, 320, 321). No architecture from the Persian period was found and sedentary occupation of the region appears light. Again all of this evidence from Hesban appears to support what is already

known about Transjordan from other sites in this period (cf. Department of Antiquities 1973, 21-29; Sauer 1980, 20-24).

*Hellenistic*

The marked decline in sites, as well as the absence at first of sedentary occupation at Tell Hesban, suggests a nomadic dominance pattern at Tell Hesban during the Persian and Early Hellenistic periods. A marked transition from a nomadic to a semi-sedentary mixed farming dominance pattern occurred later in the Hellenistic period. This is witnessed by the presence of a small fortified settlement and caves in which safety could be sought in the event of danger as well as by the large number of slingstones present in comparison to other periods. Mullers give evidence for the grinding of cereals and for the first time at the site there is the appearance of luxury items (Kotter, unpublished, 27). This situation is comparable to that found at Araq el-Emir and Tell edh-Dhahab West, both just to the north in the hills (cf. Department of Antiquities 1973, 30-33; Sauer 1980, 24-26).

*Early Roman*

The mixed dominance pattern was strengthened during this period. This is indicated by the 54 sites surrounding the region, a small village with numerous caves and subterranean installations at Hesban, and an increasing quantity of cattle for use as draft animals. There is also evidenced a rudimentary tree and vine crop emphasis in the wadis. In the second half of the period an inn built around an enclosed courtyard suggests the rising importance of travel (Mitchel 1980), perhaps related to the newly-constructed Via Nova whose Trans-Jordanian route went through the Hesban region. Family tombs and their contents in surrounding cemeteries indicate moderate wealth.

*Late Roman*

The trends initiated during the Early Roman period appear to continue during the latter half of the period. Hesban itself is becoming a temple town with elaborate architectural styles including plaster decoration (Kotter, unpublished, 28, 29). This is evidenced in the tombs as well. Judging from the increase in horse and donkey, and the decline in cattle remains, Late Roman period farmers concentrated more and more on tree and vine crops. This situation coincides well with what we know about the peaceful Late Roman elsewhere in Jordan (cf. Department of Antiquities 1973, 34-38; Sauer 1980, 26-31).

*Byzantine*

An intensive food production dominance pattern emerges during the populous and prosperous Byzantine period. This is clearly attested to by the available data: there are more than a dozen sites located on the western slopes; Tell Hesban is itself a major town with several churches and an active market place; there are elaborate new water management works in the region; and the horse and donkey have their greatest

importance during this period. Sheep and goat meat scarcity result from turning most available pasture into cropland. This is compensated for by the consumption of large quantities of poultry, pig, and fish. The construction of a reservoir in the Late Byzantine period may indicate the beginning of a shift towards stock production, especially since this coincides with a period of rampant inflation and population loss in the country at large (cf. Storffell 1983; Department of Antiquities 1973, 41–42; Sauer 1980, 31–33).

#### *Umayyad*

The sudden absence of settled sites on the western slopes during this period suggests a reversal of the processes which peaked during the Byzantine period. Hesban itself experienced a sudden decline. The mixed farming dominance pattern reasserts itself on the edge, in the hills, and on the plain. The country itself looked eastward toward the desert and southward toward Arabia (cf. Sauer 1980, 34–36).

#### *Abbasid-Crusader*

The complete absence of sedentary occupation during this 450 year period both in the Hesban region and in the country generally supports a pastoral nomadic dominance pattern (cf. Department of Antiquities 1973, 45–50; Sauer 1980, 36–37).

#### *Ayyubid-Mamluk*

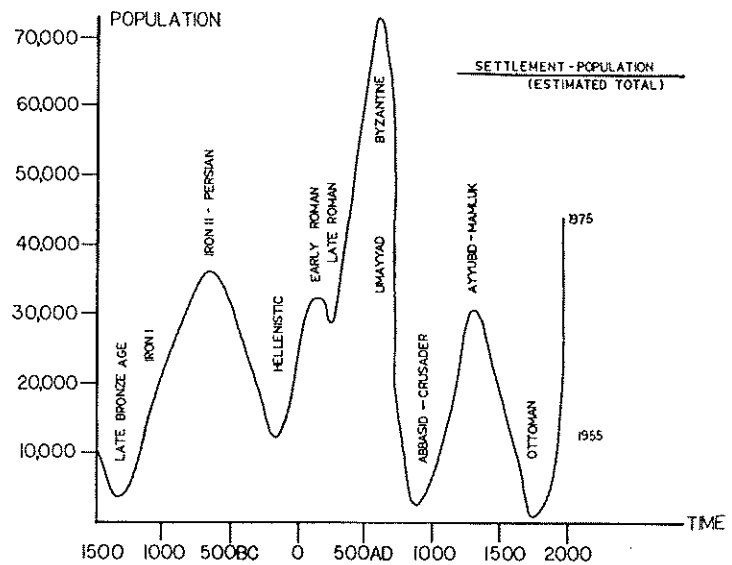
As would be expected, the re-establishment of sedentary occupation throughout the Hesban region during the Ayyubid and Early Mamluk period is accompanied by evidence of cave dwellings and protective fortifications. Between AD 1260–1400 Hesban became a major town with extensive buildings including a caravanserai accompanied by elaborate water collection systems that reused old cisterns and a reservoir (DeVries, unpublished).

In less than 250 years the region again underwent a food production intensification primarily involving mixed farming on the edge, plains and hills. There are definite signs of tree and vine crop enterprises in the wadi region. Again, the horse and donkey are the predominant livestock. Poultry, fish, and wild pig figure prominently in the diet. This resurgence of population in the Early Mamluk period coincides with Transjordan's new importance as a bridge between Egypt and Syria after the defeat of the Crusaders. Prosperity lasted till the Mongol invasion about AD 1400, after which a weak central government and plagues contributed to a return to nomadic patterns (cf. Sauer 1980, 38–40).

#### *Ottoman*

Thanks to Hutteroth's research (1975) on Ottoman tax records from 16th century Palestine, we can confirm the prevalence of nomadic pastoralism during most of this period. This pattern has also been suggested by the archaeological data from Hesban and elsewhere in Transjordan. Hutteroth's demographic data indicates an occupation within the project area of approximately 2,500 persons for this period. Trans-

4. Estimated changes over time in the population of the project area.



Jordan was primarily of interest to the Turks because it was the pilgrimage route to Mecca; hence forts and religious monuments were erected rather than channels or dams (cf. Department of Antiquities 1973, 50–53; Sauer 1980, 40–42).

As has already been suggested, changes in population size through time can be related to changes in the intensity of food production strategies. Thus, as food production intensified throughout the past century, the population increased commensurately. Given that the average village within the project area in the past century had a population of approximately 600 persons, it has been possible to estimate the population sizes of previous periods by multiplying this figure by the number of village sites identified by the archaeological survey. This bench-mark figure is probably a bit high for the high intensity food production periods, due to the greater diffusion of population in peaceful times, and a bit low for the medium intensity periods, due to the greater coalescence of the population during more turbulent times. Nevertheless, it offers a rough basis for graphically depicting the parallel changes which have occurred in population size and food production through time (FIG. 4).

## V

Closer analysis of the data at hand leads to several propositions regarding the temporal properties of the Transjordanian food system:

First, it is apparent that since the Late Bronze Age there have been at least four 'agricultural intensification' epochs in Transjordan. The first one culminated in the Iron II period, the second in the Byzantine period, the third in the Mamluk period, and the fourth in the Modern period.

Second, in the case of all four intensification epochs, the data points to a 'step-wise process' of food production intensification. Transhumant pastoralism is followed by



mixed agri-pastoral farming, and finally by intensive, high-moisture-demanding tree and vegetable production.

Third, whereas the 'evolution' to higher food production intensities seems to take several generations and even centuries, the collapse of an intensive system may be relatively sudden. This appears to have been the case at least at the end of the Roman-Byzantine and the Late Mamluk epochs.

Fourth, a 'system's stability' in this particular region seems to be directly related to its level of intensity. The least stable systems are the high-moisture demanding ones, while the most stable systems appear to be the pastoral nomadic ones. Thus, between 1500 BC and the present, the Hesban Project area was dominated for almost 1,600 years by low intensity systems, almost 1,300 years by medium intensity systems, and only about 700 years by high intensity systems—primarily during the Roman-Byzantine epoch.

## VI

These temporal properties invite further exploration of the processes which are responsible for these patterns. Why the oscillation back and forth between high and low intensity systems? Why the step-wise process of agricultural intensification? Why the sudden collapse of higher level systems? Why the transience of high intensity systems and the stability of low intensity ones?

While the answers to questions such as these must ultimately be anchored in historical and archaeological data about the respective cultural periods involved, certain general assumptions and propositions will now be offered in an effort to aid the search for historical causes. We may begin by focusing on the role of the environment.

Agricultural production on Hesban's hinterland is limited by the dry climate, the high altitude, and the resulting shortage of ground and surface water. This situation has restricted traditional agriculture in this region to the production of livestock such as camels, sheep and goats. These animals can survive the dry, hot climate. Additional agricultural endeavors involved dry farming techniques in the plains, where wheat and barley predominated, and terracing methods on the slopes, where tree and vegetable crops predominate.

Because no legume, which if inserted into the rotation might have provided fodder for livestock in addition to restoring soil (as does clover in temperate areas), was known to traditional agriculturalists in the region, a chronic lack of integration of crop and stock production has persisted through time. Thus, most crops grown have been for direct human consumption, leaving sheep and goats to forage on seasonally scarce natural pastures, as well as on the stubble remaining following the grain harvest (cf. Grigg 1974, 125).

The competition for land resources which has resulted from this lack of integration of crop and stock production has tended to favor the stock-producing herdsman because of the greater resiliency of his economic foundation. As Barth (1971) has noted, enterprise in the pastoral sector is always

faced with the possibility of rapid growth regardless of whatever public economic institutions and facilities might exist. This is true because part of its product comes automatically in the form of capital gains, which only an active management decision to slaughter can remove from reinvestment.

However, the food requirements of expanding urban economies provide incentives for enterprising agriculturists to grow grains for export on arable fields formerly held by nomads as pastures. As increasing protection is provided to the frontier grain farmers by the armies controlled by urban elites, their productivity is increased. Gradually, the social and economic infrastructure of the urban-based, market-oriented economy is extended into the frontier region. When the necessary marketing apparatus is properly in place, sedentary agriculture expands onto the slopes where terrace farming of vegetables and tree fruits is begun. The evolution from stock production to grain production to horticultural production has then been completed.

The relentless exploitation of these marginal land resources under high intensity food systems leads ultimately, albeit gradually, toward their exhaustion. As productivity declines, the treatment of the cultivators by urban elites becomes more severe. One example of this is the demand by the elites for a greater share of the produce. Such demands by the urban elite lead to food shortages and imbalances in the peasants' diets which weaken their immunities and heighten their susceptibility to disease and death—the most devastating of which in the past would be caused by the plague. As Dols has noted, (1977), the black death in the Middle East repeatedly depopulated both urban and rural areas within the span of a few years.

The foregoing model is offered as an example of the sort of explanation which is likely to emerge when a food system perspective is adopted. This perspective not only focuses attention on the role of the local environment in the human quest for food, it also supplies a discovery procedure for ascertaining the dynamic interactions which lie behind changes in food procuring practices through time.

Thus, the resiliency of the pastoral way of life, and the difficulties which urban elites have in controlling and dominating nomadic pastoralists in frontier regions, might account for the relative stability of low intensity food systems and the contrapositional transience of high intensity systems in this region.

Furthermore, the step-wise process of agricultural intensification, and the sudden collapse of higher level food systems, may be attributed to the slow process by which the supporting infrastructure for sedentary agriculture is established—in the case of the former, and in the case of the latter—to the synergistic processes which culminate in a depopulation caused by disease and death.

Finally, the oscillation between high and low intensive Transjordanian food production systems may, in the end, be attributable to the systematic and forced over-exploitation of

this fragile ecosystem and its historical role as a frontier. While these proposals are by no means novel, they deserve, in our opinion, renewed evaluation by those of us who are trying to understand the cultural history of Transjordan.

### Bibliography

- Barth, Fredrik, 1971. 'A General Perspective on Nomad-Sedentary Relations in the Middle East' in Cynthia Nelson, ed., *The Desert and the Sown*. Berkeley: University of California Institute of International Studies, 11-21.
- Boessneck, Joachim, and von den Driesch, Angela, 1978. 'Preliminary Analysis of the Animal Bones from Tell Hesban,' *AUSS* 16: 1, pp. 259-287.
- Boraas, R. S., and Geraty, L. T. 1976. 'The Fourth Campaign at Tell Hesban: 1974,' *AUSS* 14: 1, pp. 1-216; 1978, 'The Fifth Campaign at Tell Hesban: 1976,' *AUSS* 16: 1, pp. 1-303.
- Boraas, R. S., and Horn, S. H. 1969. 'The First Campaign at Tell Hesban: 1968,' *AUSS* 7: 2, pp. 97-239; 1973, 'The Second Campaign at Tell Hesban: 1971,' *AUSS* 11: 1, pp. 1-144; 1975, 'The Third Campaign at Tell Hesban: 1973,' *AUSS* 13: 2, pp. 101-247.
- Bullard, Reuben G., 1972. 'Geographical Study of the Heshbon Area,' *AUSS* 10: 2, pp. 129-141.
- Conder, C. R., [n.d.] 1892. *Palestine*. New York: Dodd, Mead and Co.; *Heth and Moab*. London: Palestine Exploration Fund.
- Department of Antiquities, 1973. *The Archaeological Heritage of Jordan, Part I: The Archaeological Periods and Sites (East Bank)*. Amman, Jordan: Department of Antiquities.
- DeVries, Bert (Unpublished). 'Hesban in the Ayyubid/Mamluk Periods,' Unpublished manuscript.
- Dols, M. W., 1977. *The Black Death in the Middle East*. Princeton: Princeton University Press.
- Grigg, D. B., 1974. *The Agricultural Systems of the World*. Cambridge: Cambridge University Press.
- Herr, Larry G., (Unpublished). 'The Iron Age at Tell Hesban,' Unpublished manuscript.
- Hutteroth, Wolf, 1975. 'The Pattern of Settlement in Palestine in the Sixteenth Century' in M. Maoz, ed. *Studies on Palestine During the Ottoman Period*. Jerusalem: Magnes Press.
- Ibach, Robert, Jr., 1976. 'Archaeological Survey of the Hesban Region,' *AUSS* 14: 1, pp. 119-126; 1978, 'Expanded Archaeological Survey of the Hesban Region,' *AUSS* 16: 1, pp. 201-213.
- Kotter, Wade R. (Unpublished). 'Objects of Stone, Clay, Bone and Ivory from the Heshbon Excavation,' Unpublished manuscript.
- LaBianca, Øystein S. (Forthcoming). 'Objectives, Procedures, and Findings of Ethnoarchaeological Research in the Vicinity of Hesban in Jordan,' *ADAJ*.
- Lacelle, L. E. H. (Unpublished). 'Environmental Resources and Limitations of the Tell Hesban Area, an Assessment of Man-Environment Interrelationships, Present and Past,' Unpublished manuscript.
- Mitchel, Larry A., 1980. *The Hellenistic and Roman Periods at Tell Hesban, Jordan*. Unpublished Andrews University doctoral dissertation.
- Pritchard, James B. (ed.), 1969. *Ancient Near Eastern Texts Relating to the Old Testament*, 3rd ed. Princeton: Princeton University Press.
- Sauer, James A., 1980. *The First International Conference on the History and Archaeology of Jordan*. Amman, Jordan: [Department of Antiquities].
- Storfjell, J. Bjørnar, 1983. *The Stratigraphy of Tell Hesban, Jordan, in the Byzantine Period*. Unpublished Andrews University doctoral dissertation.
- Tristram, H. B., 1873. *The Land of Moab*. New York: Harper Bros.