CHAPTER THREE
SUMERIAN AGRICULTURE
AND LAND MANAGEMENT

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This chapter focuses on the agricultural landscape and the administration of fields, as well as agricultural procedures and production in the late third millennium, in particular in the period of the Third Dynasty of Ur. Other important forms of subsistence, such as pastoralism or horticulture, were organised and structured very differently in ancient Sumer, and will not be considered here. The Third Dynasty of Ur, or the Ur III state, refers to a ruling dynasty based in the city of Ur and their short-lived territorial state during the last century of the millennium. The Ur III period is often described as an extremely administrative and bureaucratic period of time with an unprecedented level of central authority. There is no denying that the administration and bureaucracy of this period was extensive and very well developed. However, it should be stated that this period was not all that different from both earlier and later periods, and it is clear that a large part of the organisation of the Ur III state rested on already established principles in ancient Mesopotamia, and this is especially true for agricultural procedures and production levels. Nevertheless, the roughly one hundred years of the Third Dynasty of Ur represent a period that is extremely well documented. In fact, with over 90,000 cuneiform tablets documenting the administrative affairs of the state published to date, and tens of thousands of additional tablets kept in museums and private collections around the world awaiting publication, the Ur III state is, at least from a purely quantitative point of view, the best documented era in the entire history of ancient Mesopotamia.

Chronologically, these administrative and economic tablets are unevenly distributed over the century or so that was the Ur III state. As Figure 3.1 shows, almost no texts have been recovered from the earlier part of the state’s domination. We only have a handful of tablets from the eighteen-year reign of Ur-Namma, the founder and unifier of the Ur III state, and only the last seventeen years of the forty-eight-year reign of Ur-Namma’s successor, Shulgi, produced tablets in any significant numbers (i.e. from Shulgi year 32). Also the decline and eventual collapse of the Ur III state remain relatively poorly documented in the textual record. With the notable exception of Ibbi-Suen year 15, the final two decades of the state’s last king (i.e. from Ibbi-Suen’s fourth year) have only produced very modest numbers of cuneiform tablets.

In other words, we are dealing with an exceptionally short period of time with an extreme concentration of information. Roughly 83 percent (49,009 tablets) of all the Ur III tablets with a known year date (59,015) come from a short period of twenty-five
years, from Shulgi’s forty-fourth year as king to the second year in Ibbi-Suen’s reign. It is this extreme level of administrative and economic documentation over only a few decades that make the Ur III state so suitable for a study attempting to recreate ancient Mesopotamian management of cultivated land, agricultural procedures and production levels. Like most ancient economies, the Mesopotamian economy was based on agriculture, and the textual evidence from the Ur III period provides very detailed information on practically every aspect of the agricultural production, and offers a wide range of very specific data that would be very difficult, or impossible, to obtain with an equivalent level of detail and/or reliability through studies of alternative material.

For the reconstruction of Sumerian agricultural procedures, we are almost exclusively dependent upon textual evidence, while data derived from the material culture remain of a relatively minor importance (Hruska 2007: 54 and 63, n. 1). It should be noted, however, that this is only partly a result of the agricultural focus and the relative abundance of cuneiform tablets in the third millennium, and perhaps reflects a general overestimation of the importance of written sources once they occur in the archaeological record. As noted by Hans Nissen (1988: 3–4), a prevailing, and entirely unrealistic, assumption that the numerous cuneiform tablets of the third millennium will answer all our questions regarding the period’s social and economic history has regrettably resulted in a situation where crucial archaeological data on flora and fauna from historical times have been neglected in archaeological excavations and subsequent studies.

\[\text{Figure 3.1 Chronological distribution of tablets during the five kings and 106 years of the Ur III state. Key: UN = Ur-Namma, } \hat{S} = \text{Shulgi, AS = Amar-Suen, } \hat{S} \hat{S} = \text{Shu-Suen, IS = Ibbi-Suen (data retrieved from BDTNS, 18 December 2010)}\]
Since the Ur III tablets, like most Sumerian cuneiform documents, almost exclusively stem from the archives of the major government households, they primarily emphasise the importance of the agricultural work within such public agencies, and any possible small-scale agricultural exploitation conducted by smaller households or individual families remain virtually unattested in the written documentation of the third millennium.

THE AGRICULTURAL LANDSCAPE

During the second half of the fourth millennium BC, a series of climatic changes and ensuing effects in the landscape profoundly changed the way of life in southern Mesopotamia. A relatively sudden increase in average temperatures coupled with decreasing levels of precipitations resulted in reduced flows in both the Euphrates and the Tigris, impacting the sedimentation of the Mesopotamian plain (Kay and Johnson 1981: 259 and fig. 4; see also Hole 1994: 127–131, and Potts 1997: 4–5). Within the space of a few hundred years, the annual floods that regularly covered large tracts of land in the south were largely stemmed, leading to the gradual silting up of much of the swamps and marches that made up the estuary of the two rivers. New and fertile land became available for cultivation, while the decrease of violent spring floods made long-term settlements along the rivers possible, especially along the Euphrates. However, the aridification following the climate change also meant that the rainfall in southern Mesopotamia in the third millennium would have been less than 250 millimetres per annum, and would not be able to sustain agriculture. The urbanisation of southern Mesopotamia and the organisation and concentration of labour facilitated the construction and maintenance of large-scale irrigation systems, and the resulting modes of suprafamily collaborations made it possible to administer and control the southern Mesopotamia essential biannual fallow regime (see Steinkeller 1999: 302f.). The collective and extensive irrigation works, on which all depended, would in turn no doubt have intensified the social cohesion within the urban centres. As Robert McC. Adams writes about the Mesopotamian city, and its inseparable connection to the agricultural landscape of ancient Sumer (1981: 2):

How firmly the occupants of the lower Mesopotamian plain ever recognized that alluvial terrain as a special object of attachment is uncertain, but their enduring loyalty to familiar associations and localities within it – to cities – is not a matter of doubt. Here we are concerned with the material conditions that must have played an important part in originating and sustaining these roots of attachment. And it is impossible to escape the conviction that irrigation agriculture – or the comparative security, population density and stability, and social differentiation and complexity that it induced – was at the very heart of these material conditions.

By paraphrasing Frank Hole, we may summarise the overall principles and features of the Sumerian agricultural landscape as follows (1994: 138): the climate shift of the fourth millennium made large-scale artificial irrigation a requirement for successful agriculture in ancient Sumer. Such irrigation systems were extremely vulnerable and had to be renewed annually. The necessary size of the systems, and the general labour intensity of the annual repair works, required a sizable organisation that went far
beyond the traditional family household. On the other hand, irrigation opened up new land to highly productive agricultural exploitation, which enabled the Mesopotamian floodplain to support a large population.

**Topography and agricultural fields**

While rural exploitation in the entire land of Sumer certainly always required artificial irrigation, topographical and environmental differences within southern Mesopotamia gave rise to significant regional variations in the nature of the necessary irrigation regimes. The area south-east of the major Sumerian cities, such as Eridu, Ur and Lagash, towards the coast of the Persian Gulf, was defined by lakes and permanent marshes. The ground water table was extremely high in the region, and agricultural work was largely impossible (Sanlaville 1989: 9).

Immediately upstream of the marshes and lagoons was a vast plain, characterised by extensive alluvial sedimentation and an exceptionally low gradient of the land, averaging for the entire plain to as little as 3–4 centimetres per kilometre along the Tigris and 5–6 centimetres per kilometre along the Euphrates. The deltaic plain (plaine deltaïque) extended from the large Sumerian city states in the far south to approximately the area of Babylon and Kish in the heart of southern Mesopotamia. Throughout the deltaic plain, the ground water table remained very high, and salinisation of the otherwise very fertile soil remained a very serious problem for the farming communities in this area (Sanlaville 1989: 8).

The northern alluvial plain included the Diyala basin and major Sumerian cities, such as Sippar and Eshnunna, and stretched from Babylon and Kish in the south to the Jazirah plain on the Euphrates and the city of Samarra on the Tigris in the north. The broader area was dominated by a desert plateau, and agricultural exploitation was only possible in the narrow river valleys. The natural gradient of the land was approximately twice as high as on the deltaic plain, averaging about 7 centimetres per kilometre along the Tigris and approximately 10 centimetres per kilometre along the Euphrates, and sedimentation was not as pronounced as further down the rivers. The ground water table was relatively low in the area, and intense cultivation with little regard for the gradual increase of salt in the soil was therefore possible (Sanlaville 1989: 8).

As already noted by Mario Liverani (1997: 221), agricultural procedures and irrigation systems reflect not only ecological and topographical conditions, but also a range of socio-political and administrative realities in a particular region. The third millennium rural landscape in the deltaic plain was characterised by almost exclusively regular and elongated fields lined with furrows. Several detailed studies of a group of approximately seventy cadastral texts from the province of Lagash, primarily dated to the seventh and eighth years of the Ur III king Amar-Suen’s reign, have presented a picture of rural landscape in the south being dominated by elongated and rectangular strips of land. The majority of these strips of land would have ranged in size between 90 and 135 Sumerian *iku* (GAN), which would equal approximately 32–49 hectares (see Liverani 1990, 1996; Maekawa 1992; Figure 3.2).

While it is easy to distinguish a certain uniformity in the sizes of the different fields, with the typical fields ranging from 90 to 135 *iku* (≈ 32–49 ha), and with more than half of the fields in the range 100–125 *iku* (≈ 36–45 ha), the exact shape (i.e. length–width ratio) of the different fields does not appear to have been standardised in the same way.
In his study of the agricultural fields of southern Mesopotamia, Liverani stated that the lengths of the field areas typically exceeded the widths by a factor of ten, and he emphasised the extreme length and narrowness of the fields (1990: 158; 1996: 21). However, a closer analysis of Liverani’s own data and his chart plotting the length–width ratio of the field areas reveals that although fields with a length–width ratio of 10 to 1, or even 20 or 30 to 1, certainly can be confirmed in the textual material, such extremely long and narrow fields did not dominate the rural landscape of southern Mesopotamia, and roughly 61 per cent of all the fields were less than eight times longer than they were wide (Figure 3.3, Table 3.1). The typical field (i.e. the median field) was roughly 6.5 times longer than it was wide.

**FIELD MANAGEMENT**

Liverani recognised the congruity in the sizes of the recorded fields, and he suggested that the standard field size in the Ur III administration was supposed to be 100 *iku* (i.e. 100 x 100 *ninda*, corresponding approximately to 36 hectares), although he also observed that the fields often exceeded this suggested standard, and that the average field size actually seemed to be around 115 *iku* (Liverani 1990: 157). This assumption

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**Figure 3.2.** Size measurements (in Sumerian *iku*) of the 452 fields (*a-sˇa*3) measured in the Lagash cadastral texts. Approximately 55 per cent of the fields ranged from 100 to 125 *iku* (≈ 36-45 ha; dark grey) while roughly 70 per cent were in the range 90–135 *iku* (≈ 32-49 ha; dark + light grey) (chart adapted from Liverani 1996: 156; see also Civil 1991: 42)
of a standardised (or ideal) Ur III field measuring 100 iku was corrected by Kazuya Maekawa (1992: 408), who pointed out that the standard size was not measured in iku but in the alternative surface measurement ninda (1 ninda = 6 metres) (chart adapted from Liverani 1990: 168).

The cadastral texts themselves tell us that each field area, or perhaps better domain parcel, was the ultimate responsibility of a state administrator referred to as engar, best translated as ‘cultivator’. Based on a land survey text from Umma, Maekawa (1987: 36–40) has demonstrated that the Ur III ‘cultivators’—usually in groups of five—were under the direction of an ‘inspector of plough oxen’ (nu-bandā, gu₄), who in turn...
answered to an ‘overseer’ (ugula4) in charge of two ‘inspectors of plough oxen’ (and therefore normally in charge of ten ‘cultivators’ and ten domain parcels) (Figure 3.4).

Each ‘cultivator’ in charge of one field, or domain parcel, employed three ‘ox drivers’ (ša3-gu4). Since the surface of 6 bur3 (as opposed to the surface of 100 iku) can easily be divided into three equal units, each measuring one square Uš (≈ 360 x 360 metres), it seems reasonable to assume that this represented the ideal size of cultivation under the responsibility of each ‘ox driver’. Each square Uš would be further subdivided into six family-sized plots measuring one eše3 (2.16 hectares) (Figure 3.5).

The eše3 measurement equals 6 iku, and each iku can be further divided into 100 šar, the traditional Sumerian garden plot, measuring approximately 6 x 6 metres.

The use of integral numbers of the bur3 for the measurements of field areas is not surprising given that the bur3 served as the basis for calculations of sowing rates in the Ur III period, with one bur3 of cultivated land typically receiving one gur of barley seed (≈ 300 litres) (Maekawa 1984: 87). Thus, the standard amount of seed for the 6 bur3 ‘field’ in these texts would be 6 gur (≈ 1,800 litres), the unit of the ša3-gu4 2 gur (≈ 600

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**Figure 3.4** Organisation of the supervision of fields and field workers in the Ur III period. See note 4 for alternative professional titles of the top official responsible for ten fields.

**Figure 3.5** Administrative division of a ‘field’ (a-sa3) in the Ur III period
litres), the eše, plot 1 barig and 4 ban, (≈ 100 litres), and the single garden plot measuring one šar (≈ 6 x 6 metres) should ideally receive 10 gin seed (≈ 16.67 ml).

Of course, these divisions of the domain parcel merely represent abstract measurements of administrative responsibilities and accountabilities, and would not necessarily be physically defined in the agricultural landscape. The three ‘ox drivers’ would together be responsible for the ploughing of the entire 6 bur, during the plough season (not just ‘their’ 2 bur units), and the various low-level agricultural workers assigned to the field as a whole would by no means be restricted to labour in individual eše plots.

**Sustenance land**

As mentioned above and in note 3, at least some of the agricultural workers on the provincial domain fields (GAN,gu,) had usufruct rights to plots of arable lands referred to as GAN,suku ‘sustenance field’. Depending on the status of the agricultural workers, these allotted fields varied in size, usually (or at least often) by a multiple of three (see Maekawa 1991: 213). The text BM 105334, recording a land survey in the province of Umma in Amar-Suen’s second year as a king, has shown that the sustenance land that was allotted to the ‘cultivators’ measured 1 eše, or 6 iku, while the subordinate ‘ox drivers’ received sustenance parcels measuring half this size. Above the ‘cultivators’, the ‘inspectors of plough oxen’ were each given sustenance parcels measuring 3 eše, or 1 bur, for their services, while the overseer in charge of ten domain parcels received 9 eše, or 3 bur (see most recently Koslova 2005 and Vanderroost 2008, with additional literature).

According to Remco de Maaier (1998: 55), the sustenance land was included in the larger domain land area. However, as Natalia Koslova has argued (2005: 704), the fact that these two categories of land were consistently kept apart in the administrative documentation, implies that they were also separate units within the agricultural landscape. In fact, land survey texts such as the Girsu text BM 23622+28004, in which the summary sections recording one estate’s total holdings of domain land, sustenance land and tenant land (GAN, nig–gal–la) can be compared to the sum of the individual entries of these types of land, seem to demonstrate that these three categories of land represented separate physical areas in the agricultural landscape (see Maekawa 1986). It is possible that de Maaier’s position was influenced by Piotr Steinkeller, who a few years earlier had suggested that sustenance plots were not cultivated by their holders at all, and that the sustenance plots, although physically tied to specific fields, simply served as abstract measurements of individual rations (Steinkeller 1999: 303 and notes 51 and 52). The ‘holder’ of a sustenance plot would receive a fixed annual grain ration based on the plot size according to a predetermined production rate irrespective of the inevitable regional and annual yield fluctuations. However, Steinkeller presented no concrete evidence for this claim, beyond the correct observations that large-scale agriculture is more productive than small-scale farming in ancient Mesopotamia, and that centralised control over a large area of cultivation would facilitate more rigorous adherence to crucial fallowing patterns. Moreover, Steinkeller did not attempt to explain why, in his opinion, the provincial administrative centres of the Ur III state in certain cases should deem it necessary to disguise perfectly normal worker rations of grain (še-ba) as fictive sustenance plots. What would the administration gain by
recording a fixed and annual grain ration as an abstract surface measurement of undefined land?

Steinkeller enumerated three factors that in his opinion made the existence of small farms in the third millennium impossible: 1) the necessity of strict adherence to fallow requirements, 2) the need for extensive irrigation systems, and 3) the volatile and shifting nature of the Mesopotamian rivers and canals, which eventually would obliterate any physical field boundaries. However, while there is no denying that these factors greatly influenced agricultural production and farming in southern Mesopotamia, they are by no means exclusive to the third millennium, or even antiquity. If these factors did not prevent the operation of small farms in, for example, the 1950s, when Augustus Poyck studied farming practices in southern Iraq (see Steinkeller 1999: 319 n. 51), we cannot presuppose that they prevented such operations in the third millennium BC.

As a matter of fact, the evidence supports the interpretation of the sustenance land as a physical feature of the agricultural landscape. In addition to the already mentioned land survey records, in which the sustenance plots are tallied up next to other types of physical fields, such as domain- and tenant plots, it should be noted that the different sustenance plots are not recorded as uniformly productive, and yields (projected or actual) varied from one plot to another (see e.g. BIN 5 277), something one would not expect if they merely represented abstract measurements of rations. Indeed, the considerable annual fluctuations in the harvest yields recorded for plots held by the same individuals over several years (see Waetzoldt 1987: 131) show that the sustenance plots and their yields were both real and relevant to the people to whom they had been allotted.

Considering that half the arable land in ancient Mesopotamia by necessity would have to remain fallow to prevent salinisation and soil degradation (see Gibson 1974: 10f.), individual household plots measuring an average of 2.16 hectares (1 ėē), and in some cases as little as 1.08 hectares (3 īku), may appear rather small to successfully sustain a family household.

However, as suggested by Jacob Dahl (2002: 334), it seems reasonable to assume that the holders of sustenance parcels would be able to rely on the agricultural facilities and infrastructure of the state, and thus be able to cultivate their plots without many additional expenses for items such as plough teams and oxen, external labour requirements and seed for planting (cf., however, Waetzoldt 1987: 130). Regarding the biannual fallow regime, it is not clear whether fallow land was included in the distributed sustenance parcels. In fact, considering the importance of strict adherence to the fallow requirements in Mesopotamia, and the disastrous results following violation of fallow (Gibson 1974), it seems reasonable that the state would retain control of the two-year fallow rotation, and simply distribute sustenance parcels from areas that were not left fallow. In other words, a 6 īku sustenance parcel in the Ur III period would, at least in terms of sheer productivity, equal a 12 īku field subjected to biannual fallow. An allocated sustenance plot measuring 6 īku would require 12 īku of institutional land, and the total area of arable sustenance land controlled by the state would have to be roughly twice as big as the area that was allocated and cultivated every year to the state’s workers; administrative texts would only consider the land cultivated in any given year, while all fallow land would remain unsurveyed (see Maekawa 1986: 99).

In addition to the institutional support that the sustenance plot holders in all likelihood could expect from the state, it is important to remember that the households
with sustenance fields would have had various other sources of income, including fishing and hunting in the marches, animal husbandry, date, vegetable and fruit cultivation, as well as monthly rations of agricultural products to individual household members provided by the state in return for various types of labour (see Waetzoldt 1987).

Finally, it should be pointed out that the deltaic plain of southern Mesopotamia was characterised by exceedingly high yields during the entire third millennium (cf., however, Potts 1997: 14f.), although it is possible that the productivity may have decreased somewhat during the later part of the millennium, perhaps as a result of a general increase in salt levels in the soil (see Maekawa 1974: 40–42 and Jacobsen and Adams 1958).

**PRODUCTION LEVELS**

The agricultural fields in the deltaic plain were, at least towards the end of the third millennium, almost exclusively cultivated with winter-grown barley, in all likelihood a reflection of this crop's very high tolerance of saline soils (Jacobsen and Adams 1958: 1252; Gibson 1974: 10; Maekawa 1974: 41). Barley yields in ancient Sumer, and especially in the Ur III period, have received a significant amount of attention by previous scholars, with Kazuya Maekawa's comprehensive study from 1974 remaining the standard reference. The standard yield in the Ur III period used in administrative calculations was 30 gur barley per bur land in Lagash, 34 gur/bur in Umma, and 20 gur/bur in Nippur (Maekawa 1984: 83). Assuming that one litre of barley weighs 0.62 kilogramme, this would represent yields of approximately 861 kilogramme per hectare in Lagash (and possibly Umma), 976 kg/ha in Umma (30 gur/bur), and 574 kg/ha in Nippur. These notional yields appear to be relatively realistic when compared to the yields recorded in the Ur III administrative texts. According to Maekawa (1974: 26), the average yield in the province of Lagash was 31 gur and 244 sila barley per bur land in Amar-Suen’s seventh year as king, and 25 gur and 11 sila in the following eighth year, which would represent average yields of approximately 913 kg/ha and 719 kg/ha respectively. Maekawa (1984: 84f.) has also demonstrated that the average yield in Lagash in the ten-year period from Shulgi 42 to Amar-Suen 3 was 23 gur and 220 sila barley per bur land (≈ 681 kg/ha). It is important to point out that these area yields are not particularly high. On the contrary, these yields can be compared with the significantly higher average barley yields of 1,396 kg ± 67.5 per hectare recorded on 77 randomly selected fields irrigated by gravity flow and cultivated with primarily primitive agricultural technologies in the Diyala region in the 1950s (Adams 1965: 17). However, given the extremely low standardised sowing-rate of 1 gur barley per bur land (≈ 29 kg/ha), the nominal and recorded yields of the Ur III period seem to imply a very high yield ratio of 1:20–30 (see Postgate 1984). Such impressive yield ratios can only be explained if we take into account that the farmers in southern Mesopotamia were drilling seeds into the furrows with a so-called seeder plough (apin) pulled by oxen, a technique that reduces the amount of seed grain by half, compared with broadcast sowing (Halstead 1995:14). This explanation for the high Ur III yield ratios seems to be confirmed by the fact that average sowing rates in the Diyala fields mentioned above were roughly twice that of the Ur III fields (60–80 kg/ha).
1 An earlier draft of this chapter benefited greatly from the comments and suggestions of Foy Scalf, for which I am most grateful. Needless to say, I alone am responsible for any remaining errors and shortcomings in the text.

2 Note, however, that the organisational coordination and social stratification necessary for the creation and maintenance of large-scale irrigation systems do not necessarily require an urban population, and it is important to recognise the potential within different patterns of social networks (see e.g. Wittfogel 1967 or Postgate 2003: 23f.). For a thorough discussion of non-agricultural urban systems in southern Mesopotamia in the fifth and fourth millennia BC, see Pournelle 2007; Pournelle and Algaze forthcoming. For a more complete account of Sumerian irrigation, see T. J. Wilkinson’s contribution in this volume.

3 These areas of cultivation belonged to the provincial domain land ($GAN_{gu}$), as opposed to the provincial sustenance land ($GAN_{\hat{s}uku}$), which was distributed among at least some of the agricultural workers of the domain land.

4 The $ugula$ of the $nu$-$banda$, $gu$, could in the Ur III texts also be referred to as $dub$-$sar$ $gu$, $\hat{s}abra$, $\hat{s}abra$-$gu$ or $\hat{s}abra$ $gu$-$\hat{u}$ ($\hat{u}$). (See Maekawa 1987).

5 The typical sustenance plot in the Ur III measured 1 $e\hat{e}$ ($6$ $iku$), although various other sizes are also attested (see Waetzoldt 1987: 128–132).

6 Note that it is possible that the sustenance land of the cultivators themselves ($GAN_{\hat{s}uku}$ $engar$), which is listed immediately after the domain land in the survey and not a summarised category of its own at the end of the text, may have been considered part of the domain land rather than the general sustenance land (see Maekawa 1986).

7 Note here, for example the Umma text $YOS$ 4 211, where it appears that some individuals received sustenance plots, while other workers in the same text simply received regular rations (see Waetzoldt 1987: 128f.).

8 According to Kilian Butz (1980–83: 484), the Ur III fields were probably fallow two years out of five, but he does not offer any concrete evidence supporting such an agricultural five-year cycle in the Ur III period. A system of alternate-year fallow was effective in Lagash in Pre-Sargonic times (LaPlaca and Powell 1990: 76, 82), and since the amount of cultivated (and fallow) land appears to have remained constant in this province from year to year in the Ur III period, it seems likely that a system of biannual fallow requirement was effective also in this period (see Maekawa 1984: 74f.).

9 Cf., however, Govert van Driel (1999/2000: 81 n. 4), who assumed that fallow requirements were included in (at least) the military sustenance plots of the Ur III state.

10 See also Jacobsen 1982, but cf. Butz 1979 and, in particular, Powell 1985. While the salt tolerant barley certainly remains more suitable than emmer wheat ($Triticum$ $dicoccum$) on the relatively saline soil of the deltaic plain, it should be noted that barley, due to its low irrigation requirements, actually has a tendency of increasing the soil’s salinity by the end of the growing season (el-Gabaly 1971: 65).

11 Note that it remains unclear if some of these recorded yields represent projections estimated before the harvests, rather than the actual yields calculated after the barley had been brought in from the fields (see Postgate 1984: 100).

REFERENCES

1974


