A STUDY OF DIET IN MESOPOTAMIA
(c.3000 - 600 BC) AND ASSOCIATED
AGRICULTURAL TECHNIQUES AND METHODS
OF FOOD PREPARATION

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ABSTRACT

This study has been undertaken in order to find out what were the main foodstuffs consumed by the people of Mesopotamia, whether they would have provided an adequate diet containing all the essential nutrients, and whether the foodstuffs could have been supplied locally. Agricultural techniques have been looked at to see how efficiently and in what quantities food crops were produced and the methods of food preparation have been examined in order to see in what form the foodstuffs were consumed. The modern climate and countryside are outlined and the evidence for the ancient climate and changes in the courses of the rivers are set against them.

The sources of evidence used can be divided into three main categories. These are: direct evidence of food sources from excavations - that is, botanical and zoological remains indicating the existence of specific cereals, vegetables, meat-animals etc, at a given place and at a given point of time; indirect evidence from excavations such as tools and artefacts which could have been used in the production and preparation of food, representations of plants, animals, food-preparation and consumption on cylinder seals, stone reliefs, pottery, inlay work, jewellery etc; and evidence from cuneiform tablets of the variety of foodstuffs known, and in many cases, of the amounts of foodstuffs eaten. In the main, the cuneiform texts which have been consulted are those which are published with transliterations and the vast body of texts which are either unpublished or published only in copy have not been examined. It was considered that the enormous number of texts already published could be expected to give a representative picture of the main features of food preparation and foodstuffs.

The main cereal crop cultivated was barley and this was the main crop used for rations and for fodder. Emmer-wheat and bread-wheat were also grown, as were a wide variety of vegetables and fruits, including onions, chickpeas, lentils, dates, figs and pomegranates. The main meat-animals were sheep, goats and cattle whose dairy products were also used. Hunting and fishing were practised to provide food and these activities were probably more important in the third millennium.
The main types of food were those based on cereals, such as breads, beer, roasted grains, 'semolina' and malt. The wide variety of breads made included sweetened preparations to which dates and ghee had been added. Animal fats and vegetable oils were used and the main vegetable oil was probably linseed.

The qualitative nutritional value of the diet was assessed, and it was found that most of the essential nutrients existed in the food stuffs available in Mesopotamia. However, if the rations issued by employers are taken to represent the probable diet of the ordinary people, it is seen that there is a marked deficiency of Vitamin A and Vitamin C. Other possible sources for these vitamins were examined. An assessment was made of the energy intakes of the ordinary people, from the ration lists, and it was found that the average intake for the whole of Mesopotamia was higher than that recommended for an adult male by the Food and Agricultural Organisation of the United Nations, although the local average varied from place to place and time to time. No such quantitative nutritional assessment could be made for the diet of other classes.
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BIBLIOGRAPHICAL ABBREVIATIONS

The abbreviations listed in the Chicago Assyrian Dictionary have been followed in the notes and references used in this thesis. Other abbreviations include:

Adams Diyala

Amiet Susa

ANE P

A.O.A.T. I

Bauer

Boehmer

Buringh Soils
Cylinder Seals

Dalley et al

Davidson, Passmore & Brock

Diyala Report

Ellis Agriculture

Flora

Figullia Iraq
Gadd Stones

Iraq XIV

Iraq Handbook
Iraq and the Persian Gulf Geographical Handbook Series, Naval Intelligence Division, 1944.

J. Fac. Med.
Journal of the Faculty of Medicine, Baghdad.

Layard I

Layard II

Labat Manual

Lambert RA 59

Landsberger Jahrezeiten

Mallowan Nimrud

Moortgat Art
OSP I

Parrot Sumer

Porada I

Postgate Archives

Postgate Taxation

SET

Uruk Countryside

Van Driel

VR

Westenholz Jena
CHAPTER 1

THE ENVIRONMENTAL SETTING

Some knowledge of the type of climate and countryside in existence in Mesopotamia between c.3000 and 600 BC is necessary as a background against which to study methods of food production and preparation. Unfortunately at the present time there is not sufficient information about the ancient climate and environment to draw a complete picture. But if the modern situation is outlined and the evidence from c.3000 to 600 BC set against this, it is possible to get some idea of the ancient conditions. This chapter deals with the climate and rainfall, the geomorphological background, soils and modern land use, and whenever possible the evidence for different earlier conditions is given.

1.1 Climate and Rainfall

1.1.1 Modern climate

The climate of the Mesopotamian plain is one of strong contrasts. The summers are very hot and dry while the winters are cool, sometimes even freezing, with strong winds and rains. To illustrate these contrasts, in summer the monthly mean temperature at Baghdad is around 30°C (95°F), and in July the temperature may rise to 50°C (120°F). In December and January, the temperature can drop as low as -5°C with a monthly mean of around 10°C (50°F). In Mosul the monthly mean temperature in the summer is not quite so high as Baghdad, but the winters tend to be colder.1 Frosts are common from November and small falls of snow occur quite often in the northern plains. The Kurdish and Zagros mountains are covered in snow every winter.2

1.1.2 Modern rainfall

The rainfall mainly occurs in the winter and spring. Its chief source is depressions from the Mediterranean which are able to move east across the Palestine/Syria mountains only through the 'Syrian Saddle' - a gap in the mountain range west of Aleppo. These depressions
are sometimes reinforced by moisture from the Gulf and from the lakes and marshes of the south. The rainfall from the Mediterranean falls in the northern part of the country so that most of the area lies outside the 300mm per annum isohyet which marks the practical minimum rainfall necessary for dry-farming.\(^3\) The Assyrian plains around Mosul lie within this isohyet which curves across the north of the Syrian desert and describes an arc around the northern Habur valley, the Jebel Sinjar and southeast through the northern parts of the Adhaim and Diyala plains, skirting the Zagros foothills to the Gulf.\(^4\)

**TABLE 1: ANNUAL RAINFALL IN MESOPOTAMIA**\(^5\)

<table>
<thead>
<tr>
<th>Modern site</th>
<th>Rainfall (mm)</th>
<th>Nearest important excavated archaeological site</th>
</tr>
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<tbody>
<tr>
<td>Tell Afar</td>
<td>337</td>
<td>Tell Rimah</td>
</tr>
<tr>
<td>Mosul</td>
<td>385</td>
<td>Nimrud</td>
</tr>
<tr>
<td>Kirkuk</td>
<td>385</td>
<td>Nuzi</td>
</tr>
<tr>
<td>Tuz Khurmatli</td>
<td>280</td>
<td>Nuzi</td>
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<tr>
<td>Qaiyara</td>
<td>292</td>
<td>Assur</td>
</tr>
<tr>
<td>Baghdad</td>
<td>149</td>
<td>Diyala sites</td>
</tr>
<tr>
<td>Hilla</td>
<td>110</td>
<td>Babylon and Kish</td>
</tr>
<tr>
<td>Diwaniya</td>
<td>116</td>
<td>Nippur</td>
</tr>
<tr>
<td>Samawa</td>
<td>134</td>
<td>Warka</td>
</tr>
<tr>
<td>Ba'da</td>
<td>116</td>
<td>Tello</td>
</tr>
<tr>
<td>Ur</td>
<td>82</td>
<td>Ur</td>
</tr>
<tr>
<td>Deir ez Zor</td>
<td>150(^6)</td>
<td>Mari</td>
</tr>
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</table>

The above annual rainfall figures give a rough indication of the variation which can be expected between localities. The readings are based on the seasonal rainfall - July to June - over a number of seasons. The names of important excavated archaeological sites nearest to these rainfall stations have been included to give a picture of the rainfall conditions in their area at the present time.

Although the amount of rainfall per year is important, the reliability of the rain and the time of year in which it falls is even more vital. In Mesopotamia a locality may have heavy rain one year but very little the next. The following figures show some of the variations found in rainfall at the end of the last century and the beginning of this.
A more recent example of unreliable rainfall is the torrential rains experienced in the Jezira in 1971 after a drought of twelve months. People living near the site of Umm Dabaghiyah considered that this type of torrential rain came every 20 to 30 years. This rain came too late to prevent the crops from being a failure or to provide summer pasture for the flocks which had already been moved to the north-east of Mosul. It has been suggested that two such years in succession could destroy an agricultural community unless it was given government assistance.

### 1.1.3 Evidence for the ancient climate and rainfall

It is not yet possible to prove whether there were climatic changes in Mesopotamia during the period from the third to the first millennium. There is no direct evidence, such as pollen cores which would at least show local changes in the dominant plant cover, available for the area.

The nearest areas from which pollen-cores have been taken are Lake Zeribar and Lake Mirabad in the Zagros mountains in west Iran. Zeribar is about 160 km north west of Kermanshah at a valley elevation of 1,300 m, and Mirabad is at an elevation of some 800 m, in the Saimarreh valley, south west of Khorramabad. They are thus about 300 km apart, but both in mountain areas. The cores suggest that there was an increase in humidity, possibly because of a rise in precipitation.

<table>
<thead>
<tr>
<th>Year</th>
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<th>Basra</th>
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<tr>
<td>1889</td>
<td>77 mm</td>
<td></td>
</tr>
<tr>
<td>1890</td>
<td>501</td>
<td></td>
</tr>
<tr>
<td>1891</td>
<td>275</td>
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<td>1892</td>
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<td>1907</td>
<td>260</td>
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<td>1908</td>
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<td>1926</td>
<td>334</td>
<td>308</td>
</tr>
<tr>
<td>1927</td>
<td>55</td>
<td>95</td>
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or because of a fall in temperature, or a combination of both, around 4000 BC (6000 BP). The Zeribar diagram provides no indications of fluctuations in climate after 3000 BC but the Mirabad diagram points to two short oscillations suggesting slightly drier conditions. These oscillations may have been due to local conditions such as dry summers. But it is difficult to use the evidence from these two cores to reconstruct the climate for areas in the Mesopotamian plains which have a different elevation and environment.

A number of attempts have been made to draw up a climate pattern for the Near East. Butzer made one such attempt based on archaeological and literary evidence because of the lack of geomorphological evidence. He considered that the fifth, fourth and early third millennia were periods of greater humidity and rainfall than today but that during the third millennium there was severe dessication leaving the area more arid than the present time. Most of his evidence comes from Egypt: texts refer to droughts due to low Nile floods (between 2100 and 1950 BC) and a steadily decreasing flood level during the Egyptian Old Kingdom, and studies of faunal changes from Predynastic times indicate the local extinction of savanna fauna in the Sahara also pointing to increasing desiccation.

In Mesopotamia, Butzer suggests that the movement into Mesopotamia during the third millennium was associated with this dessication, which continued through the second millennium and may have encouraged the Aramean migrations between 1200 and 1000 BC. This arid climate, he believes, began to improve during the course of the first millennium, when the temperature and precipitation became similar to those of today with only 'short-term variations, never exceeding the order of a few hundred years'. Unfortunately such approximation, although valuable for a climatologist, is of little use to a historian.

Agrawal has attempted to reconstruct the past climate of the Indus Valley. He has used evidence from pollen cores and from excavations. Excavations in the Indus Valley have revealed the pre-Harappan and Harappa cultures which thrived from 2800 to 1700 BC.
After 1700 BC these cultures gradually disappeared. There was a resurgence around 800 BC in this area but the mounds were sited in the old river beds, indicating a lessening in the water supply. Pollen analyses from the area indicated six phases: I pre-8000 BC - arid; II 8000-7500 BC - more humid than today; III 7500-3000 BC - a little more humid than today; IV 3000-1000 BC - much more humid than today; V 1000 BC - 200 AD - intensely arid; VI early centuries AD to the present - present conditions. Agrawal sees the end of the Harappan culture coinciding with the gradual onset of the arid conditions, c.1700 BC.

In an assessment of the climate of Palestine (8000 BC onwards) Crown has pointed out that excavations at Ur, Kish, Fara and Nineveh have revealed flood strata dating between 3500 and 2500/2400 BC. These strata do not represent the same flood but rather series of floods similar to those which take place in Iraq today. However, at the sites there are no such traces of flooding from before or after 3500-2500/2400 BC, and Crown infers from this that this period may have been wetter than the preceding or succeeding ones. In his tentative conclusions for Palestine, he suggests that 4500-3500 BC saw hot dry conditions. After 3500 BC the temperature fell and rainfall increased, but by 2300 BC there was a rise in temperature resulting in droughts - he cites both the crop failures in Intermediate period Egypt and the drying out of lakes in the Zagros as evidence for this. He considers that these drought conditions improved around 2000 BC.

From Mesopotamia itself there is some evidence from which it may be possible to infer climate changes. First, the settlement patterns in the late third and second millennia suggest alterations in climate and rainfall. Surveys conducted in the Diyala region in Central Mesopotamia, and around Warka show fluctuations in the number of settlements, though it must be remembered that the pottery, by which the settlements are identified on a surface survey, is not yet all precisely dated. Broadly speaking, in the Diyala region there was an increase in settlement during the third millennium and early second reaching its height in the Old Babylonian period; during the second millennium there was a gradual drop and by the end of the millennium
and in the beginning of the first the number of settlements was very low. In Central Mesopotamia the situation is slightly different. The area appears well-settled during the first half of the second millennium, but there is a great drop in settlements at the end of that millennium and the position does not improve until almost the middle of the first. In the Warka region there is a fall-off in settlement from the middle of the second millennium which continued until the early part of the first. And in the north of Mesopotamia, a survey in the plain south of Jebel Sinjar showed a sharp decline in the number of towns during the second millennium.¹⁸

These patterns of settlement could be used to suggest that there was a gradual drop in rainfall and/or rise in temperature during the second millennium which made the maintenance of settlement and agriculture increasingly difficult. But the danger in associating changes in settlement with climatic changes is that it is over-simple and ignores the political situation. The second half of the second millennium saw first the rise of the Old Babylonian dynasty and then the Kassite dynasty, both of which had their capitals in the central Mesopotamia area. It has been seen that the central Mesopotamia area was well-populated at this time while the other regions showed the number of settlements beginning to fall from the Kassite period. The twelfth century was a period of political weakness throughout Mesopotamia, and indeed most of the Near East, and it is not surprising that the number of sites should fall. However, it can also be argued that difficult agricultural conditions leading to bad harvests would lead to political unrest and that governments would concentrate on maintaining the economy of their central areas before assisting peripheral areas. If the difficult conditions continued, the central government's ability to cope with these and the political disruption would lessen. In the ninth century, on a stele, Assurnasirpal refers to resettling tells which were deserted in the reigns of his predecessors, and at the end of the seventh century, a stele at Tell Rimah records that Ashur-nirari III ordered the governor, Nergal-ereš, to build some 331 towns. It is possible that these towns may have been for the subject people transported from the Damascus and Nairi lands after a successful Assyrian campaign. Two of the towns were to
be named after Adad-nirari and none of them was named after earlier kings, so that it is probable that they were either completely new settlements or ones which had been deserted. This suggests that the political situation in Assyria in the first half of the first millennium had become sufficiently stable to allow areas and towns once deserted to be repopulated.

Desiccation may have been a contributory factor in the fall in cereal yields and the change from wheat to barley (see 2.1.6) apparent towards the end of the third millennium. Barley is not only more resistant to soil salinity than wheat but requires less water for growth and has a shorter growing season. It is better suited therefore to harsher conditions than wheat.

Dated texts from the Old Babylonian period suggest that the barley harvest then took place a few weeks earlier than in the Persian and present times. In addition contracts giving delivery dates indicate that September was the time of the date harvest - again a little earlier than Persian times. Although harvest times can vary from year to year and area to area, it would seem that the barley and dates ripened earlier in the Old Babylonian period than nowadays, suggesting that the climate was warmer.

Green dates (ubinnu) are mentioned in a text at Nuzi for different households. As these are unripe dates this suggests that they were locally grown rather than imported. If this is so it means that the temperature at Nuzi must have been higher in the mid-second millennium than it is today. Dates cannot now grow in this region, although date palms are reported by Mukkaddasi in the Sinjar and at Tell Afar in the tenth century AD. The other fruits listed include some called baluli, a local Hurrian word, which again indicates a local origin for the fruit in the text.

It has been suggested that there were more forests in the Near East in ancient times than there are today. The use of treetoponyms - for example Mt. Nāšur - to cover the whole of the eastern Taurus and part of the Northern Zagros, has been cited as evidence for
The toponym Mt. Hašur goes back to early Sumerian times or before, and comes from the hašurru GIS.ḪA.ŠUR cypress (Cupressus sempiravens horizontalis). This tree does not grow in the eastern Taurus today, but the use of its name to cover this mountain range suggests that it once did so - possibly in sheltered areas and at low altitudes. Its disappearance may have been due to the demand for timber for palaces etc and to the accessibility of its growing areas. The forests may have been gradually thinning out from the third millennium onwards.

Wood used in building was found at the Palace at Tell Brak, a site on the Jagh Jagh some 30 kms south of Nisibin. This wood, dated to the Agade period, was identified as elm, ash, oak, plane and poplar. Pine was identified in houses dating from c.1500 BC. The different types of wood found in the earlier period suggest a greater density of woodland and variety of species than is found today. The fact that only pine was identified from the houses of the mid-second millennium may indicate some deforestation before that period, but it may also reflect merely the difference in building materials used in a palace and a private house.

The Neo-Assyrian reliefs of the first millennium depict a landscape with a plentiful tree cover and date-palms growing in Aššurbanipal's garden are shown with bunches of dates, suggesting a warmer climate than there is today, as dates cannot now ripen in the Mosul area. In Byzantine times the woodland existing on the Jebel Abd el Aziz (the westward continuation of the Jebel Sinjar) was dense enough to provide cover for raiding Arabs, and it is quite probable that the deforestation of the hilly areas within Mesopotamia was not completed until quite recently.

There are many reasons for deforestation. The over-grazing of goats causes great damage and is the traditional reason given for loss of tree cover. But vast quantities of wood were required for building, furniture etc and, more importantly, for charcoal required for the making of metals. A drop in precipitation would make the natural re-growth of young trees more difficult while the continued loss of
tree-cover would increase run-off, a major source of loss of rainfall.

To sum up, the evidence for the climate in the third to first millennia is scanty and difficult to interpret but certain patterns can be suggested.

First, taking the areas surrounding Mesopotamia, the evidence from Egypt cited by Butzer suggests that the beginning of the third millennium was wetter than today but that the second half of the third and the second millennium was a much drier period. In the Indus Valley, cited by Agrawal, conditions wetter than today lasted into the second millennium but the onset of intensely arid conditions was beginning to be felt by about the middle of that millennium. In Palestine Crown sees increased rainfall in the early half of the third millennium but arid conditions in the second half, while the climate improved in the second millennium.

In Mesopotamia itself, the floods found at Ur, Kish, Fara and Nineveh between 3500 and 2400 BC may mean that there was a higher rainfall at that time. The drop in cereal yields and increasing preference for barley rather than wheat towards the end of the third millennium and in the second suggest worsening agricultural conditions, possibly due to a combination of increased soil salinity, higher temperatures and lower rainfall. If the evidence for earlier barley and date harvests in the Old Babylonian period and the slight evidence for dates growing at Nuzi in the mid-second millennium, are added to this, then the possibility of increased aridity in the second millennium is strengthened. The drop in numbers of settlements which took place during the second millennium may be partially due to the increasing dry conditions, but it must be emphasised again that political instability can also cause depopulation and the last two centuries of the second millennium was a period of great political upheaval. Settlement patterns improved during the first millennium but the appearance of dates on a relief portraying a garden in Nineveh suggests that the temperature was still higher than today by the mid-first millennium.
Although the suggested climatic patterns for Egypt, the Indus Valley, Palestine and Mesopotamia do not correspond exactly, they all indicate arid conditions during part of the second millennium. However, these conclusions are only tentative for all the areas, particularly Mesopotamia, and must remain so until more direct evidence, such as pollen cores for Mesopotamia, is available.

1.2 Geomorphological Background

Mesopotamia can be called the joint basin of the rivers Euphrates and Tigris. It is surrounded on the west, north and east by an arc of mountains consisting of the Palestine/Lebanon coastal range, the Taurus and Eastern Taurus and the Zagros mountains. To the south-east is the Gulf and to the south and south-west is the Arabian Massif. The Palestine/Lebanon mountains and the Arabian Massif proper are separated from the river valley by the Southern and Syrian deserts.

1.2.1 The Northern Euphrates and the Northern Tigris

The Euphrates rises in the Taurus mountains and enters the Mesopotamian plain at Jerablus on the Syrian/Turkish border. Its most important tributaries within the basin are the Balikh and the Habur, both of which join it on the left bank. The Tigris rises in the Eastern Taurus entering the basin at Pesh Habur. Its tributaries also join on the left bank after rising in the Eastern Taurus and the Zagros ranges.

The land to the south and west of the Euphrates is mainly desert, while the area to the north, called the Jezira, is flat plain with low stony hills, the most prominent of which is the Jebel Sinjar, which reaches a height of 1460m and 1356m in places. The plain continues east across the Tigris and south-east to the Erbil area. It is interrupted by a number of hill ranges, including the Jebel Maqlub and the Jebel Bashiqa. Further south, another range of hills, the Jebel Makhul and the Jebel Hamrin, is cut by the Tigris and the Adhaim rivers. This range is long and narrow and its highest point is about
450m above sea-level. It gradually drops in height towards the Diyala River to about 200m. The plain to the south is lower than that to the north so that the Jebel Hamrin is like the riser and tread of a staircase leading to the Assyrian plains.

The main tributaries of the northern Tigris within Iraq are the Greater Zab, the Little Zab and the Adhaim. The Greater Zab rises in the Eastern Taurus. It is a torrential river given to sudden and severe rises in level. It is normally at its highest at the end of April and during May. Its main flood-waters reach the Tigris a little later than those of the Tigris itself, but the two floods may overlap, which can cause the Tigris below the rivers' confluence to increase by about two-thirds. The catchment area of the Little Zab, in the Kurdish mountains, is on a lower level than those of the Tigris and Greater Zab so that the body of flood water arrives rather earlier. This river reaches its maximum volume at the beginning of April. The catchment area of the Adhaim has little snow and rain, and the flow sometimes dries up. It contributes very little water to the Tigris.

1.2.2 Southern Mesopotamian flood plain

The Euphrates/Tigris basin is divided into two main parts, by a low cliff line stretching from Hit on the Euphrates to Samarra on the Tigris. This line marks the division between the northern plains and the alluvial plains in the south.

There are two main theories about the formation of the southern Mesopotamian flood plain. The older one maintains that the plain was formed by alluvial deposits brought down by the Euphrates and the Tigris (and the Karun river in Iran) which gradually filled in a trough between the Zagros/Taurus mountain range in the north-east and the stable Arabian Massif in the south-west. According to this theory the coastline of Mesopotamia gradually crept south-east from the Hit-Samarra line, possibly only reaching its modern limit in the Islamic period. During the third millennium the coastline may have reached Ur, Larsa and Lagaš.
In 1952 Lees and Falcon proposed a new theory in which they maintained that the Mesopotamian plain is kept in its present position by the episodic subsidence of the bottom of the trough and the deposition of the river sediments. A possible modification of this theory is that alluvium is highly compactible so that part of the subsidence of the Mesopotamian plain may be due to the 'compaction of the sediment rather than the subsidence of the bed-rock below'. Studies of changing sea levels in the warm periods after the Ice Ages suggest fluctuations in the extent of the Gulf, which may have reached its present size in the fifth millennium. However, raised beaches have been found on the Caucasian and Pontic Coasts, and on the coast of Mauretania, dated to around c.3500 BC, suggesting a world-wide rise in sea-levels. If these were extended to Mesopotamia it is possible that the Gulf advanced north-east of Ur at that time.

There is little variation in the relief of the Southern Mesopotamian flood plain which is dominated by the Euphrates and the Tigris rivers which run north-west/south-east through the plain. The courses were not static but have changed several times throughout history.

The Euphrates flows at a higher level than the Tigris, and the main drainage pattern in the northern part of the plain is towards the south-east, i.e. with the flow from the Euphrates. A main drainage line (called the Aqar Quf Main Drain or the Tigris–Euphrates Outfall) marks the boundary of the drainage and deposition between the two rivers: this runs south from the Aqar Quf depression close to the Tigris but curves to the south-west near Kut al Imara. From this point the drainage pattern of the plain turns to the south-west and the flow is from the Tigris.

The plain between the two rivers is dominated by marshes and desert areas. The Hor al-Hammar, the lake bordering on the Euphrates as it turns east to join the Tigris at Qurna, is an expanse of shallow water about 115 km long and 12-17 km wide in low water. The southern edge of the lake slopes gradually to the Southern Desert (Ash Shamiya) but the northern edge is bordered by extensive reed marshes. But during the periods of flood the area between Nasiriya and Amara and
Qarmat Ali may be entirely covered by water. The area of permanent marsh spreads from the Hor al-Hammar north-east almost as far as Qala Salih on the Tigris and continues to the east of the Tigris in the Hor al Hawizer. Another belt of permanent water runs along the right bank of the Tigris north to al-Gharbi. The extent of this belt varies with the seasons. Although it has not been surveyed in detail, maps show that the Hor Sanniya, the northern part of this belt, was open water about 0.5 to 1.5 m deep in July 1915 and in April 1919 'but it is believed to be less extensive now than then' (1944). The Shatt al-Gharraf leaves the right bank of the Tigris at Kut al-Imara and eventually tails out into marshes near Nasiriya. The water course is important in irrigation; the distributaries taking water from the stream disperse into marshes about 8 km to 24 km from the Shatt. Many of these marshes, particularly those on the east of the Shatt al-Gharraf are perennial, but others dry out in summer and become baked hard and cracked in the hot sun. Interspersed among all these marshes are areas of slightly higher ground where more or less permanent settlements are established and to the west of the permanent belt of water along the Tigris much of the land also dries up in summer.

A vast expanse of marsh known as the Great Swamp was formed in the 6th and 7th centuries AD and extended from Kufa on the Euphrates across to the Tigris and down to Basra. At the end of the 5th century during the Sassanian period, the dykes on the Tigris broke because of neglect when the water rose suddenly and flooded all low lying lands to the south and south-west. Some repair and reclamation was possible but in the 7th century a very high flood caused both the Euphrates and the Tigris to break their banks. This coincided with the end of the Sassanian dynasty and the coming of the Moslems, and the area again suffered from neglect so that the Great Swamp became permanent. During the Abbasiid period, the Tigris flowed along the Shatt al-Gharraf into the Great Swamp through which there was a navigable channel through a succession of lagoons, into the Shatt al-Arab. The Mongol invasions in the 13th century added to the difficulties of control in the marsh areas but the area covered by permanent swamp has decreased since that time.
The area between the Shatt al-Gharraf and the Euphrates can be more or less divided into three: there is a cultivated region along the Euphrates, with a marsh area around Hilla and Shamiya, another cultivated region along the Tigris and the Shatt al-Gharraf, and a wasteland in the middle marked by tells and abandoned canals.\

The plain undulates gently to the south, mostly without vegetation, with areas of dunes. These, which appear to be made of silt particles identical to those forming the plain, vary from stable low swellings to loose steep mounds of 6 - 8 m high. The dunes can be moved by strong winds, especially the prevailing wind from the northwest, though the atmospheric depressions drawing winds and storms from the south-east can also cause them to move or change shape.

The movement and speed of the dunes does not seem to have been measured, but the large formation of dunes now found around the ruins of Jokha (Umma) first appeared late in the 19th century AD and the German excavators of Warka noticed a definite encroachment of the frontier dunes upon Warka during the 40 years since they started excavating. The plain continues south towards the present channel of the Euphrates. It is divided from the narrow band of cultivation along the left bank of the river by back-slope depressions, which are subject to seasonal flooding and under flood conditions can form more or less interconnected lagoons draining parallel to the main river bed. The water from these depressions either sinks down to the water-table or evaporates.

There is also a narrow cultivated strip along the right bank of the present Euphrates, which widens at Nasiriya. From this point irrigation canals leave both banks of the river and drain into the Eaur. al-Hammar. The area around Ur is featureless except for the occasional tell. South of Ur, and some 25 km south of the present Euphrates course, possible earlier courses for the Euphrates have been traced. These disappear into the Hammar Lake in the region of al Khamisiya. The chain of marsh islands in the How. al Hammar are mostly parts of river levees of an ancient course of the Euphrates but the course of the river in this region is constantly changing.
because the river drops its silt load in the marshes and the Haur and so silts up its bed.

1.2.3 The present course of the Southern Euphrates

At present the Euphrates enters its delta below Hit, and curves gradually eastwards as if to join the Tigris at Baghdad. It takes a more southerly course at Fellujah until Shinafiyah when it again turns south-east to flow into the ḤeḤʿ al-Hammār. The right bank of the river runs close to the Western Desert which is cut by many wadis and depressions, some of which, for example the Abu Dibbis, can be cultivated in some years. South of the Wadi Abu Dibbis, a belt of sand dunes runs parallel with the Euphrates until the Wadi Batin. The lake Habbaniya, on the right bank of the Euphrates, is used as an escape for flood waters.

Along the left bank of the Euphrates between Ramadi and Mussaiyab many canals flow eastward—these include the Saqlawiya, the Abu Gharib, Yusufiya, Latifiya and Iskanderia etc. At Hindiya the Euphrates divides into the Hilla and Hindiya branches. The importance of these two branches has seesawed continuously since Abbasid times. Then the western Hindiya branch carried the greater volume of water but by the twelfth century AD the Hilla branch had become broader and more important, 'pouring its surplus water by many distributaries into the Great Swamp'.

The western branch gradually silted up until a new canal had to be excavated to bring water to the holy city of Najaf. During the same period the canals from the Euphrates to the Tigris were silting up as was the bed of the Great Swamp and more water was passing down the Euphrates. When Midhat Pasha in 1870 closed the Isa (Saqlawiya) canal the effect was to pass more and more flood waters into the Najaf canal which gradually widened and in ten years had again become the main channel. Land along the Hilla branch went out of cultivation and great distress was felt. Just before the First World War the Hindiya barrage was constructed to restore water to the Hilla branch. The Hindiya branch divides into two channels at Kifli and then into
several more at Shamiya and Abu Sukhair emptying into the Shamiya marshes. It finally reunites as one channel at Samawa.

The Hilla branch divides into a fan of canals between Hilla and Diwaniya below which point there is no main channel. The major part of the irrigation is from the left bank of the Hilla branch, although some small canals draw water from the right bank. The Diwaniya canal continues south, in more or less the same channel as the former main bed of the Euphrates, and joins the Hindiya branch at Samawa. From there the Euphrates flows into and through the ḫawd al-Hammar to Qurna, where it joins the Tigris to form the Shatt al-Arab.

1.2.4 The old course of the Euphrates (Fig. 5)

During the third millennium to the first millennium the main stream of the Euphrates ran east of its present course, passing the city of Sippar where it divided into a number of branches. One flowed past Kish, where it probably divided to pass Marad on the west and Nippur on the east. The western branch joined the Nippur branch, the Purattu, again at Shuruppak. Another more easterly branch, the Irninna, may have flowed from Sippar, past Kutha and thence to or past Nippur. The situation is very complicated and most authorities have slightly different versions; undoubtedly the river itself changed its course many times during the period.

In the Warka area, it seems that two branches of the Euphrates served the region, the Purattu which flowed from Nippur to Warka and then on to Ur, and the Iturungal which flowed from Adab (Bismaya) to Umma, Bad Tabira and Larsa, joining the Purattu at about Larsa. The joint river then flowed on into the Ur area.

There may have been a swamp or lake to the south-east of Warka, along the river. This is based on a gap in tells between Warka and Ishan Khaibar, a site lying about 20 km north-east of Ur. The area of possible marsh in the Warka vicinity coincides more or less with the backslope depressions of the present Euphrates which was an area found to be very difficult to survey so that the lack of sites may be
more apparent than real. Some sites dating between the Akkadian and Old Babylonian period were found but this may only indicate that the areas and margins of marshes fluctuated over the period.

A branch of the Iturungal left its left bank north of Umma and flowed to Girsu (Tello) and on to Lagas (al Hibba) and Nina (Surghal). Another watercourse, traced from air photos by Adams, takes off from the Iturungal south of Umma. This watercourse unfortunately cannot be dated. It has been suggested that though it may have existed in Early Dynastic times it could also represent a new course of the Iturungal in about the Old Babylonian period. No settlements were found along its bank and it continued through an area apparently devoid of settlement towards Nina. It seems likely that both these watercourses disappear into marshes after Nina.

Returning to the main course of the Euphrates, Jacobsen, using the findings of the survey of Central Sumer (carried out in 1953/54) and textual evidence, suggests that a line of tells found on the map (but not investigated in the Survey) from Larsa south to Ishan Khaibar may follow the course of the joint Iturungal and Purattu after their confluence at Larsa. The line is to the east of the possible marshy area mentioned above. Another line of tells following a south-east course leads from Ishan Khaibar through Sukhair West and Sukhair East to Diqdiqah, which is situated 2.5 km north-east of the ziggurat at Ur. Most of these tells had surface pottery of Kassite - Middle Babylonian period. But Early Dynastic strata were found at Sukhair East by the Department of Antiquities of Iraq and inscriptions of Ur III and Isin/Larsa date were found at Diqdiqah and brought to Ur when it was being excavated. A channel, visible from air photographs and dating to the Early Dynastic period, flows from the north-east, dividing at the town of Sakheri. Both channels disappear on the photos under silt left by later cultivation, but the main channel has been reconstructed as curving round the south-west of Ur and then flowing south-east.

No more mounds were traced on the map after Diqdiqah so that it is suggested that this branch of the Euphrates may have entered a marshy area. It is known that a canal or branch of the main stream flowed past
Ur itself and this probably turned south-east down to Tell Lahm (identified as Kisiga/Kissak by a Nabonidus cylinder found there by Fuad Safar⁴⁸), which is about 38 km south-east of Ur. Safar's investigations showed an Early Dynastic settlement which was occupied in Akkadian, Isin-Larsa, Old Babylonian to Kassite times. After this it was probably a cemetery and may have been reoccupied in the Assyrian and Neo-Babylonian periods, although at this time the main settlements were on the plain outside the walls of the main mound.

It is not known when the Euphrates abandoned its ancient course. By the first century AD the Euphrates and Tigris were said by Pliny to have long had a common mouth.⁴⁹

1.2.5 The present course of the Southern Tigris

The Tigris enters the flood plain at Samarra and pursues a meandering course south-east until Kut al-Imara. The width of the Tigris varies between 225 and 320 m. The area on the left bank is barren plain and the country on the right is intersected by channels and irrigation canals. The Aqar-Quf depression, which is used as an escape when floods threaten Baghdad, lies to the west of the Tigris.

The Tigris is fed by the Diyala on its left bank. Adams⁵₀ describes the lower Diyala plain as 'an irregular, fan-shaped alluvium that falls very gently towards the south and was laid down for the most part by the waters of the Diyala on their way to join the Tigris river'. This alluvial fan extends from the point where the Diyala breaks through the Jebel Hamrin about '50 kms to the west-south-west and upward of 130 kms to the south and south-east. On its southern and western extremities its deposits blend imperceptibly with those of the far larger and more destructive Tigris. On the east it disappears in a band of salt marsh and seasonal swamp that is annually replenished by the Diyala winter flood as well as by a score of ephemeral mountain torrents from the east'. The boundaries set by the Diyala and the Tigris have changed from time to time causing local conditions to alter.
Below Kut al-Inara there are three main courses for the Tigris, with low marshy ground between them — the present channel, the Shatt al-Gharraf (Shatt al-Hai) and the Shatt Dujaila. The present course of the river down the Shatt al-'Amara probably took place gradually, perhaps because of the silting up of the Shatt al-Gharraf. No sites have been found as yet on the Shatt al-Amara, either because it was more open to attack from the east or because the regime was less suitable for early irrigation. The river may not have flowed so far east until Sassanian times. The main stream of the river was the Shatt al-Gharraf during the Abbasid period, but during the preceding Ommayyid period, the course is thought to have been the Shatt al-Dujaila on which the city of Wasit was built. Now the Shatt al-Gharraf enters the Hor al-Hammar through numerous little streams and there it joins the Euphrates. The Euphrates joins the Amara branch at Qurna and together they form the Shatt al-Arab.

### 1.2.6 The old course of the Tigris (Fig.5)

The old course of the Tigris is not as well known as that of the Euphrates. Some survey work has been carried out in the Tello area and in the Diyala region, but little is known about the area in between.

The Diyala is the main tributary of the Tigris after it has entered the alluvial plain. From about 30 kms after leaving the Jebel Hamrin, until a few kms from the Tigris, it runs in a deep narrow bed, cut through the alluvium. The entrenchment is so deep that the Diyala cannot overflow its banks — even at the time of the highest floods. Ionides feels that there is no conceivable circumstance which could have caused the Diyala on its present alignment to build up the existing plain and then cut a deeper bed unless the tail waters had begun to retrogress. As these are controlled by the Tigris, he suggests that the Diyala occupied a much longer course between its outlet from the Jebel Hamrin and its junction with the Tigris. He suggests the possibility of the Diyala once occupying the bed of what was later the Nahrawan canal and joining the Tigris at a lower point — the slope of the river would be less and it could...
have built up a raised levee and raised the plain level through flooding. This process would have been aggravated by the construction of the Upper Nahrwan to bring Tigris water into the area because of the expansion of irrigation. This latter development did not take place until the Sassanian period, so that during the third to the first millennium the Diyala would have occupied the lower Nahrwan course.

Adams\textsuperscript{56} feels that the situation is more complicated than this. He suggests that the longer course of the Diyala would have produced a dendritic network of channels - rather than a single course - with several contemporary mouths of the river from near its present junction downstream to the old junction of the Tigris and the Nahrwan. To this suggestion he adds the changes which would occur in the river's discharge if there was a climatic or erosional shift in the watershed (such as deforestation which would increase the rapidity of runoff and the stream's ability to scour its bed) and the possibility of the entrenchment of the Diyala as a consequence of the slow upthrust of the Jebel Hamrin. His survey findings support the suggestion of a network of channels and the lack of a fully developed meander belt and the irregular nature of the upper valley suggest that the incision of the Diyala's bed may be relatively recent. A tentative reconstruction of the course of the Tigris through the Diyala plain suggests that it flowed further to the east than at present, at least until the Achemenian period.\textsuperscript{57}

The survey in the Tello area indicates that this region was served by a branch of the Euphrates (see above p.22), and little information could be gained about the southern course of the Tigris.

Of the three main branches the Shatt al-Charraf seems the most likely candidate for the third to first millennia course. This is based on its westerly position near sites dating to that period. But, as it does not appear to have served the Girsu-Lagaš area, it may have followed a more easterly course than at present - its lower reaches may have followed the course of the Shatt al-Khadr. This latter watercourse was in use in Islamic times and is still traceable on the ground.\textsuperscript{58} That the third millennium Tigris flowed to the north and north-east of
Girsu is shown by Entemena's recorded building of a canal \textsuperscript{59} to connect Girsu with the river, probably in order that the city's supply of water was not entirely dependent on the Girsu branch of the Iturungal. This canal of Entemena's was extended to serve Larsa by Sin-idinnam \textsuperscript{60} in c.1850 BC.

In view of the changes in the course \textsuperscript{61} of the Tigris in the last two thousand years it seems reasonable to assume that its course varied during the third to first millennia, but these alterations cannot yet be traced.

1.2.7 The marshes

Both the ancient rivers appear to have flowed through marshy areas; the easterly branches of the Euphrates probably ended in marsh after Nina, and the Tigris too may have disappeared in the same marshy area.

The regime of the rivers and the low flat relief of the land suggest that flooding was always a dominant factor. Early traces of settlement at Ur, Warka and Tell Uqair suggest that there may have been marshes nearby — evidence for reed huts was found at Ur and Warka, and a thick layer of reed matting was the earliest sign of occupation at Tell Uqair in the fourth millennium. \textsuperscript{62} None of these sites is in an area of permanent or seasonal marsh today.

Literary references to floods are common. Perhaps the most famous of all Akkadian epics is the Eleventh tablet of Gilgamesh which tells of the Flood and how Uš-Napishtim and his wife were saved from its destroying power. Another version of the Flood story is that found in Enûma ilu aššurum where the hero is Atraḫasis. This epic was copied in Akkadian in the reign of Ammišaduqa, later Old Babylonian period, and copies also exist from the later Assyrian period. It is possible that this Akkadian story is related to a Sumerian story which also tells of the creation of man, a flood and the hero's escape from it, but it is not certain whether this Sumerian epic survives the end of the First Dynasty of Babylon. \textsuperscript{63}
This repetition of the story of a devastating flood which lasted for some time suggests (a) that floods were frequent in the alluvial plain and (b) that some were devastating enough for their destruction to be remembered and recorded over a period lasting nearly three thousand years. The Flood (or floods) may have been of a similar type to the events and floods which brought the Great Swamp into existence.

References to Ur and Eridu in a Sumerian composition about the Heron and the Turtle help to confirm the existence of marshes in these areas in the third millennium. This text also refers to Tutub (Khafajeh) and Kirītab and Akshak. Akshak is situated in the Diyala region and Kirītab, from references in other texts, would seem to be west of Kish and north-west of Marad.64

References to these sites in a text dealing with events in marshes suggest that they too were in marshy areas and indeed Adams feels that there may have been marshes in the south-east of the Diyala plain during the third millennium, but that these disappear (or were drained) in the Isin-Larsa period.

There were certainly areas of permanent marsh in the southern half of the alluvial plain in the second and first millennia. The area of land south of Larsa was called the Sealands and produced an independent dynasty ruling Southern Babylonia at the end of the Old Babylonian period and possibly throughout the Kassite period. Their independence from Babylonia proper may even have extended (though not under the same dynasty) into the first millennium. The 'Sealands' was the title of an administrative province around the head of the Gulf which owed some allegiance to Babylon at the end of the second millennium. Its name may refer to the proximity of the sea, but it also may reflect the extent of marsh. Marshes are depicted on many Assyrian reliefs, such as those illustrating Sennecherib's campaigns. Mention of swamp and Szubu, the Chaldaean (Muzēzib-Marduk, King of Babylon), who lived in the middle of the swamps, appear in Sennacherib's fourth campaign. The accounts of this campaign describe how Semacherib carried off the people of Bit-Iakin 'from the midst of the swamp and reeds'.69 It would seem therefore that a
large area of southern Babylonia was marsh during the Neo-Assyrian times and could be used as refuge for defeated or rebelling subjects and kings.

1.3 Soil Conditions

1.3.1 Modern soil conditions (Fig.6)

1 Brown soils

The area to the east of Mosul, the Kirkuk-Erbil-Mosul plain, is the most important dry-farming area in Iraq, giving reasonably good crop yields. The soils are deep Brown soils underlain by Bakhtiar gravel and limestone. The soil is 2-4m thick. Limestone hills and ridges have shallow Brown soils of Lithosols, and are often surrounded by gravel fans. Brown soils are well-developed over the whole plain and some even grade into Chestnut soils (i.e. north-west of Dohuk). Small strips of alluvial soils lie along the rivers. The depth of soil varies with relief, but is shallowest on the upper slopes and rounded summits of hills. The soils are non-saline except in some depressions and in areas where there is local irrigation, for instance at Nineveh. Soil is not a serious problem in this plain, except north of Mosul, where the deeply eroded area extends into the northern part of the Upper Jezirah.

2 Mountain soils

The mountains in north-east Iraq are mainly limestone, although some of the highest peaks on the Iranian border consist of metamorphic rocks. The area is made up of very steep, broken and rough land, with many drainage channels and some valleys. The hilly land is very stony. Most of the soils are gravelly and shallow Lithosols, but there are also Chestnut soils, Brown soils, Rendzina and Chernozem soils etc. In some of the valleys there are alluvial soils which are flooded by the rivers in winter.
3 Reddish-brown soils

Between the Euphrates and the Tigris lies the Jezira - an area that was once an old inland sea, in Permian times, in which mainly gypsum was deposited. It is divided between desert on the Euphrates side and steppe land north towards the Tigris. Limestone and sandstone occur to the north and east of the area. South of the Jebel Sinjar the soils belong to the Reddish Brown group which are quite deep to the south of Sinjar and Tell Afar. A report of borings in this area show that 20% of the borings had soils more than 200 cm deep, with only 4% showing soils less than 60 cm, which is considered to be a minimum depth for cultivation. This percentage of deep soils increases to the north of the Jebel Sinjar and the soils gradually grade into Brown soils, with a flat area of deep Brown soils east of Tell Kotchek.

4 Sierozem soils (grey desert soils)

The desert areas, north-east and south-west of the Euphrates, are mainly made up of different kinds of limestone. Areas of Gypsumiferous alluvium spread west from the plain south of the Jebel Sinjar. The shallow deposits of weathered gypsum soils are subject to wind erosion and, especially in the Northern Desert, to the erosion caused by flash floods in the winter. Although there is some development of soil profiles away from the frequent deeply-cut wadis, the lack of permanent vegetation suggests little humus content.

5 Lithosols

The tops of hill-ranges in the Jebel Sinjar and in the Kirkuk-Erbil-Mosul plain tend to have very shallow soils and to be rather barren. Crust soils (of limestone and gypsum) occur in this area. They are of secondary formation, mostly occurring several decimetres below the surface but often the thin upper soil has been eroded away exposing the crust. The hill slopes have stony shallow to medium deep soils.
6 Saline alluvial soils of the flood plain

The parent soil material of the southern Mesopotamian flood plain is mainly river sediments but some wind-borne material has been blown from the deserts and mixed with the fluviatile deposits. The top few metres of a very large area of the flood plain are formed by sediments deposited as a result of irrigation. In Figure 6 the saline alluvial soils have been subdivided according to the main source of their salinity:

7 The saline alluvial soils of the Marshes—here the soils are waterlogged and much of the area is under permanent marsh and water;

8 Saline alluvial soils of the Eastern plain—these soils are formed from the sediments of the Tigris and from mountain streams from the Zagros mountains;

9 Saline alluvial soils of the Estuary—this area is influenced by the tides of the Gulf and there are areas of tidal flats;

10 Saline alluvial soils of the Terraces—these soils are not flooded but some areas have become saline through irrigation.

The soils of the flood plain are built up during flood periods when the discharge of water and amount of sediment is high. The soil particles in suspension vary from fine sand to clay in size. When the water flows from the river banks, the velocity of the water, which previously had kept the particles in suspension, decreases and the largest, sand, particles are deposited first. As the speed of the flood decreases so the other particles are deposited according to size. Thus the accumulation of sediment is greater near the river and low banks are gradually formed which are higher than the land farther away. These levees form strips along both sides of the river, and they contain silt and clay as well as sand. In the basins behind the levees there is little sand. Drainage from the basins is slower and they can be waterlogged for at least part of the year. The groundwater table is high in the basins.

The rivers tend to meander, eroding their banks, particularly at the bends, and silting up other places. Thus silted-up beds of streams
occur along the present course of the rivers. An example of these 'meander-belts' can be seen south of the Hindiya Barrage of the Euphrates. A dominating feature of the flood plain is the shifting of the river beds. Levees become higher in the course of time and the river gradually rises above the level of the surrounding plain. During a flood, water may break through the levees and enter a basin area, forming a new stream bed. Over a long period of time, a former levee may even be covered up by clay during floods as the continuous sedimentation gradually raises the level of the plain. Sedimentation is not a continuous process for the whole plain, however, and only parts of the plain may be affected by any one flood.

The soils of the levees tend to be coarse; the groundwater table is low, fluctuating with the level of the river, and is almost non-saline and the soils are well-drained. These characteristics mean that the levee soils are suitable for many crops, but they can only be properly irrigated by using water-lifting devices such as pumps. For this reason their cultivation is probably of relatively recent origin. The soils of the river basins are more finely textured; the groundwater table is high, especially in the southern sections of the basins; the soils are poorly drained and often waterlogged. Nearly all the soils are saline. Gravity flow is the main form of irrigation.

There are slight differences between the various parts of the basins; the basin soils near the levees, especially in the northern part of each basin, are waterlogged during the floods, but there is always some drainage to the lower areas. Basin depressions soils which occur in the deepest parts of the basins are mostly in the southern parts of the basins, often waterlogged and badly drained. The deepest parts of the depressions can be covered by water for most of the year — they are called haur soils. These divisions gradually grade into one another. The basin soils are silty clay loam, silty clay and clay soils and the groundwater level is about 1.5 m to 2.5 m below the surface. If the soils are not cultivated or irrigated the groundwater level may drop.
Irrigation has probably been employed in parts of the alluvial plain of Mesopotamia since about 5000 BC. The pattern of settlements found in the Kish area\textsuperscript{81} and the Warka area\textsuperscript{82} suggest communities settled along watercourses and probably using their water for irrigation. Canals were probably built to carry water to parts of the basins not reached by natural streams. These canals developed in much the same way as natural streams: levees were formed, beds became silted and fresh canals had to be constructed, often parallel to the old one. This increasing use of irrigation caused the deposit of young silty sediments on top of the older soil and the formation of irrigation levees and irrigation depressions within the original basins. This 'secondary meso-relief'\textsuperscript{83} adds to the difficulties of natural drainage, the groundwater level rises and soil salinity becomes a problem.

Buringh states that almost the whole of the area of the Euphrates, Tigris and Diyala flood plains are covered with irrigation sediment to a depth of between 0.5 m to 5 m or even more.\textsuperscript{84} The ancient sites are not of course at a uniform depth below the modern plain surface. The earliest settlement at Kish dating to the Jemdet Nasr period, was found 9.0 m below the modern plain level; also at Kish, but a kilometre to the north, Early Dynastic palaces were found above plain level; at Ras al-'Amiya, a few kilometres to the north-east, an Ubaid tell was found only 1.20 m below the surface.\textsuperscript{85}

The reasons for the different levels of the ancient sites include the discontinuous process of flooding and sedimentation over the whole of the flood plain, the fact that levees and probably tells (especially those with heavy over-burdens of Parthian or other constructions) sink in alluvium because of the weight;\textsuperscript{86} and the effects of wind erosion. The appearance of large formations of dunes around the site of Umma (Jokha), at the end of the last century and the encroachment of dunes in the Warka area during this century (see above p.19) illustrate changes caused by wind, and active dune land has also been recorded south of Kutha (Tell Imam Ibrahim).\textsuperscript{87} The material forming these dunes may be from the alluvial surface of the plains but it may also come in part from tells.\textsuperscript{88} Many sites may have been entirely denuded by wind erosion and others covered up (especially single period sites with little grandiose building).
The other soil divisions shown on Figure 6 are:

11 Regosols - these are mainly sand-dunes;
12 Desert soils - these are calcareous, shallow, and have a very low organic content;
13 Chestnut soils - these soils are found in the mountain valleys in the north-east of Iraq. They have a moderate humus content, and the soil fauna (earthworm) and biological activity are well developed.

1.3.2 Soil salinity

Salinization is the accumulation of salts in the soil and it is a serious problem in the alluvial plain. The definition of a saline soil is: 'A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants'.

The most common salt in saline soils is sodium chloride (NaCl) but calcium chloride (CaCl₂), magnesium chloride (MgCl₂), potassium chloride (KCl), gypsum (CaSO₄·2H₂O), sodium sulphate (Na₂SO₄·10H₂O) and magnesium sulphate (MgSO₄) also occur. Gypsum is present in most Mesopotamian soils but its solubility is low and it does not have an important influence on plants. The other salts have a higher solubility and therefore the groundwater may have a high concentration of salts. Thus it becomes difficult for the plants to take water through their roots and vegetation and cultivation suffer. Many of the saline soils form a white salt crust which is often puffed up and bubbled.

The salts in Iraqi soils have different origins:
(a) The ground water contains highly concentrated salts. A percentage of the salt is retained in the soil when the water evaporates and this amount is increased by transpiration and more evaporation. Buringh considers that the groundwater passes through older layers of the plain which had in their turn become saline, and that some groundwater flows underground from the desert areas bringing salts 'from deeper, salt-containing layers'.
(b) Some influence from the sea can be detected in the south part of
the plain. Occasionally layers of fresh water have been found on top of saline waters and wells dug in the fresh water tend to go brackish when the fresh water is used and the brackish water level rises. Also, in the south, some areas are flooded with sea-water.

(c) Irrigation water contributes to the salinization: the water used for irrigation is taken from the rivers which flow in their upper regions through rocks many of which contain salts.

The cause of salinity in the flood plain soils has been attributed to the long duration of irrigation. And it is also thought that as natural drainage was virtually impossible, because of the very slight drop in land level between Baghdad and the Gulf, in central and southern Iraq, the salt content in the Tigris and the Euphrates waters (200-500 ppm) would be enough to produce about 0.4 tons of salts during winter cropping and one ton during summer cropping. However, chemical analyses of mudbricks and mud-plaster from archaeological sites along the Euphrates and Tigris rivers were made which indicated that salinity and alkalinity were present in the alluvial soils of the Mesopotamian plains at the beginning of irrigation agriculture. The sites chosen were Tell es-Sawwan, Tell Harmal, Aqarquf and Tello on the Tigris, and Kish, Nippur, Warka and Ur on the Euphrates. It was assumed that the mud-bricks and plaster were made from earth near the building sites, taken from cultivated lands, or lands that had never previously been cultivated. Care was taken to select bricks which had not been influenced by floods, rain, wind, dust or weathering, or capillary action. As well as the analyses results suggesting that salinity and alkalinity were present in the soil which made the bricks, it was considered that the salinity appeared higher along the Euphrates than along the Tigris at any corresponding time. Harden concludes that the 'potential soil salinity, and alkalinity were present before intensive irrigation was developed. Irrigation development cannot be considered as a direct cause of salinization of the Mesopotamian plain but rather as being responsible for its localization and distribution, and for secondary salinization.'

A study of soils was made by Yahia in the Ramadi area. Here the soils were irrigated from water from the Euphrates, which is
classified as having only medium salinity according to the classification system of the US Salinity Laboratory. Evaporation and transpiration concentrates the originally low salt content. The conclusion was that the salinity of the groundwater is the main original source of soil salinity, aggravated by irrigation over a long period.

A study of soil conditions was also done in the Diyala plain east of the Tigris covering the region from Deltawa to Kut once irrigated by the Nahrwan canal. The soils are alluvial. The overall characteristics included an abundance of lime with the pH of between 7.6 and 8.0. The soils were mostly silty with fine sand at less than 20%. They are saline, mainly sodium chloride with occasionally Sabakh soils. The groundwater in the southern Nahrwan area has a salt concentration twice the salt concentration of seawater. The high salinity of this area may have been caused by the excessive use of irrigation water after the construction of the Nahrwan canal. Before the Nahrwan Canal and when the Diyala was flowing in its supposed dendritic network of channels, salinity may have been less a problem.

Good drainage can control salinity and leaching out the salt by washing through the soil with enormous quantities of water can cure it, but these two techniques are usually held to be only practical since modern times. Local 'flushing' of areas is possible, with the excess water running away into depressions. Deep drainage must be deeper than the layer of soil which is to be leached and requires deep ditches and tiled drains. Local farmers and tribesmen in the Daghara area (north of Diwaniya) reported accumulation of salt and waterlogging since the later 1930s and early 1940s. It seems as if the increased availability of water to irrigate this area in the summer and winter has increased the rate of salinization. It is possible that the small irrigation canals which were at the same level as the fields could act the dual role of canals and drains - bringing the water as necessary during the cultivation cycle and acting as drains at other times.
1.4 Modern Land Use (19th/20th Centuries AD)

Most of the Mosul-Erbil-Kirkuk plain is under cultivation. Wheat is the main crop and the average yield per hectare in 1957/58 was 353.9 kilos. Barley is also grown (an average yield is 411 kilos a hectare). Much smaller areas of rice, cotton, sesame, lentils and other vegetables are also cultivated. The most important fruit tree is the vine (5,736,287 in 1957/58) followed by the pomegranate (245,342), fig (223,764) and peach (117,857). The vines are particularly important in the Kurdistan mountains where they are grown on terraces, especially in the Shaqlawa area, but they are also grown in the Assyrian plains by irrigation in a few vineyards. The most important livestock is sheep - over 1,000,000 were included in the 1957/58 agricultural and livestock census, with just over 477,000 goats and 56,000 cattle.

The foothills behind Kirkuk are mainly grazing lands. There is always some grass there and in dry years herds are brought in from the desert and steppe, causing overgrazing. Kirkuk itself is described as situated on a wide fertile basin, standing among gardens, orchards of limes, olives, figs and apricots, and vineyards. Wheat and barley are grown locally and further south in the Qaradagh region. D. Hywel Davies includes this area in his rotation cropland but the rest of the plain, south to the Jebel Hamrin and beyond, he calls unimproved seasonal grazing land, only available in spring and early summer.

The 300mm isohyet, the minimum amount of rainfall necessary for dry-agriculture, encloses the Mosul-Erbil-Kirkuk plain and runs through the Adhaim plain north of the Jebel Hamrin. It also runs, west of the Tigris, across the northern Jezira at the Jebel Sinjar.

But land use is dictated by the type of soil as well as by rainfall. Most of the Northern Jezira is grazing land except in places where the Reddish-brown soils are deep and where the soil is of the Brown soil type. The deep Reddish-brown soils can produce reasonable crops when there has been plenty of rain during the winter. Wheat and
barley are the main crops in a dry-farming – fallow rotation. To the north, east and south of the Jebel Sinjar, the yield is 1400 kg/ha wheat on the best land. Further to the south the yields decrease to 900 kg/ha.\textsuperscript{108} Wheat yield in the Jezira (Syria) in 1948 was said to be 4–6 times the seeding-rate, and according to local farmers could be 10–15 times the seeding rate with better irrigation.\textsuperscript{109}

The southern Jezira is not an important agricultural area. On the Syrian littoral and in the Syrian Jezira, some cereals, sesame and cotton are planted, but cultivation is confined to the valleys where it depends on irrigation.\textsuperscript{110} The area has been described as unimproved seasonal grazing land only available for grazing in spring and early summer except in a very few areas.\textsuperscript{111} The main herd animals are sheep, goats and camels.

A. Musil in 1912 and 1915 travelled during April and May along the Euphrates to Baghdad: at Deir ez-Zor he gives a picture of cultivated tracts along the river with the south-west plain bare. At Ana, there were palm groves and gardens growing onions and garlic, pomegranate trees, fig-trees, mulberries and occasional olives. The Hit area was dominated by the salt and naptha springs. North of the Euphrates, Musil remarked on the various quality of the salt to be found in the salt pans, that of Umm Rahal (north-east of Hit) being considered better tasting than that found from the pan north of Ana.\textsuperscript{112} The area from Rawa to the Habur had several salt pans, and in summer the salt crusted up to 50 cms thick. This, he said, was in an area of poor pasture which had had no good rain for four years.

The southern Diyala plain is classifiable as semi-arid steppe and the vegetation is sparse. Areas used as runoffs for excess irrigation water, which cannot be cultivated, are used as summer pasture and even in the very barren lands of the south Nahrwan district spring grazing takes place. The levees provide the most varied natural vegetation as they are the least saline soils in the region. The main cultivated plant is winter grown barley or wheat grown in alternate years with a weed fallow in the intervening winter. About 44% of the irrigated area is under winter grain crops and vegetables and legumes
such as broad beans, lettuce etc, with about 3% under spring and summer sown crops such as cotton, watermelon, rice and sesame. About 4% of the irrigated land is under date groves and orchards. Sheep are the main herd animal, followed by goats and cattle. Sheep are mainly kept for wool, but also for milk, meat and hides, whereas cattle are used mainly for milk products, especially butter-milk and ghee.

The southern Mesopotamian flood plain can be roughly divided into four main types of land use:

(1) irrigated cropland, irrigated by both lift irrigation, mainly along the Tigris from Baghdad down to Amara, with smaller areas along the Euphrates from Ramadi to Hilla and in the Divaniya region, and by flow irrigation, which dominates the Shatt al-Charrar region and the land irrigated from the Hindiya and Hilla branches of the Euphrates;

(2) grazing land;

(3) unproductive land; and

(4) marshes and lakes.

The main crops are barley and wheat cultivated on the fallow system—half the land being left fallow in a given season. A small amount of the winter sown land is used for summer crops, but this is restricted because of lack of water in the summer. In the Hilla-Divaniya area the main winter crops are barley, wheat with a little cotton, alfalfa and millet and some vegetables including broad beans which are interplanted with the barley or wheat. In the summer rice is one of the main crops, with sesame and vegetables and a little cotton, millet, green gram, sorghum, alfalfa etc. Winter vegetables include tomatoes, cucumbers, onions, radishes, and beet, while the summer vegetables include water melons and long cucumbers. Similar crops and vegetables are grown in the Ramadi area, although rice is not so important. However, rice is an important crop in the Shamiya area, on the Charrar and around Amara, although Davies considers it to be wasteful of water in this latter area.

Salinity is a great problem in the irrigated areas. Increasing salinization has compelled the farmers in the Daghara area to abandon first rice cultivation, then wheat, and to rely more and more on barley—although even here the yields have been falling.
Some land is irrigated specially for pasture but the bulk of the grazing land is unsuitable (or difficult) for irrigation farming. Most farmers carry on a mixed farming regime, keeping goats and sheep and cows as well as cultivating crops. The animals graze on the stubble from harvested fields and on parts of the fallow land, but they are also kept in the Jezira, that area between the main branches of the Euphrates and the Tigris which is not cultivated. Much of this uncultivated land makes very poor grazing, consisting of sandy or stony desert and even abandoned salt-flats. Other animals kept include water-buffaloes. A few of these are found in the Daghara-Diwaniya area, but they are most important in the marsh areas of the south where they are kept by the Marshdwellers. Often water-buffaloes are owned by the villagers (such as those living at ech-Chaibayish situated in the marshes north of the Hammar lake) but are cared for by the Ma'dan who live deeper within the marshes, in return for dairy produce and half the offspring.

Rice and millet are grown along the edges of the marsh areas but reeds are also a very important crop. They are used for fodder, made into mats, used in housebuilding, boat-building and for fuel. High floods can be a problem. At ech-Chaibayish they can cover the cultivated lands from March to August (although they occasionally recede in July) and it is only possible to cultivate late summer crops. Rice and Great Millet are raised from young seedlings of 30 to 45 days old and are transplanted to other areas less susceptible to flooding; in years of prolonged flooding no cultivation is possible. In the period from 1934 to 1953 cultivation was only possible in ten years. Fishing and fowling are also important in the marsh areas and along the rivers.

One of the most important crops in all Iraq is dates; these are grown in patches along the Euphrates almost as far as the Syrian border and along the Tigris to about Samarra. There are also date-orchards in the Mandali and Badra areas, but the most important area for dates is along the Shatt al-Arab from Fao to Qurna. Other crops are often sown between the rows of palms; these include fruit trees such as figs, apricots and pomegranates, vegetables such as onions and beetroot, melons and beans, and wheat and barley.
CHAPTER 2

AGRICULTURAL TECHNIQUES

By the third millennium the main method of food production was agriculture. Cultivated cereal crops had become the staple foodstuff, without which the people of Mesopotamia could not survive. Fruit and vegetables were also grown and herds of sheep, goats and cattle were kept for their dairy products, meat, wool, hair, hides and dung. Although other methods of food production, such as fishing, hunting game and birds, and gathering wild fruits and herbs, continued to be used, they were not sufficient by themselves to feed the population nor to support the economies of the towns and states which had grown up. Life was dominated by agriculture and the efficiency of the techniques used and how well they were adapted to the environment are of paramount importance when considering diet and the supply of food available for consumption.

In this chapter, the main techniques used in cultivating the cereal crops, e.g. irrigation, field preparation, sowing, harvesting, and their efficiency, especially in relation to yields, will be considered. Pastoral farming will also be discussed. The cultivation of fruit and vegetables will only be touched on briefly and fuller details of these, together with the provision of dairy products and meat from domestic animals, fishing and hunting will be given in Chapter 3.

The main sources of evidence for the use of irrigation, the type of crops and the techniques used in cultivation are palaeo-ethno-botanical remains, settlement surveys from which probable irrigation patterns can be deduced, cylinder seals, plaques and reliefs showing agricultural tools and methods, and the remains of actual tools found during excavations. The cuneiform texts also provide an invaluable source for details of the methods used, the types of crops grown and the yields achieved.
2.1 Types of crops cultivated

Before discussing the techniques involved in cultivation it is advisable to consider what crops were grown. The most important group of crops grown in Mesopotamia is the cereals. These include barley, different types of wheat, millet and rice. The evidence for the two last is scarce and dates mainly from the first millennium (see below 2.1.4 and 2.1.5).

2.1.1 Barley

There are many different species of barley (Latin name Hordeum) - about 20 in the temperate zones and eight in present-day Iraq. Of these, two cultivated species (H. vulgare and H. distichon) are important economically as the cereal which provides animal fodder, and is used as a food and to make beer. H. vulgare is a six-row barley with a touch rachis. Its main sub-divisions are: H. vulgare var. nudum (= H. vulgare var. coeleste L) which has naked grains, and H. vulgare var. hexastichim (= H. Hexastichum L) which is dense-eared. H. distichon is a two-row tough-rachis hulled barley: one of its variations, H. distichon var. nudum, has naked grains.

Both the six-row and the two-row types of barley were cultivated in the area of the Near East from the seventh millennium and the palaeoethnobotanical material shows that both continued to be cultivated into the first millennium. In general, the two-row barley was grown in the mountainous areas and the six-row in areas where there was irrigation.

2.1.2 Wheat

There are twelve cultivated species of wheat (Latin name Triticum) in present-day Iraq. The species found in the archaeological record in Mesopotamia are T. dicoccum (emmer) T. aestivum (T. vulgare Vill) (bread wheat, common wheat) and T. compactum (Host) (Club wheat) and possibly T. turgidum L (rivet or cone wheat).
Emmer wheat has been cultivated in the Near East since the seventh millennium BC and is present in early levels at sites in Iraq, Palestine, Syria and Asia Minor as well as in Europe.\(^5\) *T. aestivum* and *T. compactum* have been found in sites dating from 6000 BC, and palaeoethnobotanical remains on sites show that they and emmer wheat continued into the first millennium.\(^6\)

### 2.1.3 Textual evidence for barley and wheat

The cereals most frequently referred to in the texts are ŠE/Še'\(\text{u}\), ZÍZ (ZÍZ.AN, ZÍZ.A.AN, ZÍZ.AN.NA)/kun\(\text{n}\)\(\text{tu}\) and GIG (ŠE)GIG. BA, (GIG.BI))/kibtu. The accepted translation for ŠE/Še'\(\text{u}\) is barley, although this word can also mean a grain used as a measure or as a determinative for corn (cereals) of all kinds.\(^7\) ZÍZ/kun\(\text{n}\)\(\text{tu}\) is translated as emmer-(wheat)\(^8\) and GIG/kibtu as wheat.\(^9\) Unfortunately Hrozny's promised discussion on barley appears never to have been published, but he stressed throughout his book on emmer-wheat\(^10\) that the grain type ŠE is the most important in Mesopotamia with ZÍZ (ZÍZ.AN, ZÍZ.A.AN, ZÍZ.AN.NA etc) in second place, and GIG third. His identification of ZÍZ as emmer-wheat partly on philological grounds and partly on the botanical evidence of emmer-wheat found in Egypt\(^11\) is strengthened by the more recent finds of emmer in Mesopotamian sites. The translation of ŠE as barley is also strengthened by the palaeoethnobotanical evidence. In view of this it may be reasonable to suppose that GIG/kibtu represents bread or club wheat.

This identification of words with types of cereals is not as straightforward as suggested by the above paragraph. Terms for more than one type of barley and of emmer-wheat are found in the texts. For instance, in Lagāš in the Early Dynastic a field\(^12\) was planted with ZÍZ.BABBAR (white emmer-wheat) and ZÍZ.CÚ.NUNUZ (multi-coloured reddish emmer-wheat?\(^13\) ) in quantities of 6 GUR.SAG.GÁL and 1 GUR.SAG.GÁL respectively. Another type of emmer-wheat from this period is ZÍZ.SÍ (red emmer-wheat).\(^14\) Hrozny points out that these distinctions of colour do not continue into later periods, so that it is possible that experiments were still being carried out with different species of emmer-wheat in the third millennium, with one particular type predominating.
later. Alternatively, it may not have been considered necessary to differentiate between what was essentially the same type of cereal.

2.1.4 Millet

The Latin name for millet is *Panicum*. Archaeological evidence for this cereal is rare in Mesopotamia. Helbaek found an imprint of a grain on a pottery lid at Jemdet Naar, dating to c.3000 BC. And he also found about 800 cc of millet in Room 19, TW3, Nimrud, dating to the 7th century BC. Some grains were naked, but others still had glossy husks. Only a few barley grains and some willow weed was found in the same sample (No.VIII). Millet was also found at Aššur among vegetable remains in a bowl set in a grave. The Akkadian for millet is *dubnu* (*tuḫnu* in Assyrian). It is included among foodstuffs at Nippur, and was grown with 'linseed' at Nuzi.

2.1.5 Rice

The evidence for rice (Latin name *Oryza*) is slight between c.3000 and 600 BC in Mesopotamia, and it is generally held that it did not arrive as a crop until the Persian period or later. However, Campbell Thompson has suggested that \( \text{šE.LI.A/šU.kurangu} \) is rice. \( \text{šE} = \) grain in general and \( \text{LI.A = dTšu} = \) grass. Campbell Thompson considers that the modern Arabic word *pirinj* which is used in Mesopotamia for rice, stems from the Old Persian word *gurinj* and that *kurangu* is a loan-word from *gurinj*. The equivalent \( \text{šE.LI.A = šU.kur} \) (var. ku-ra)-an-gu appears among the cereals in Uruanna II, 485. And \( \text{šE.LIIL} \) and \( \text{šE.BA.KI.CA} = ku-ra-gi \) are listed among the cereals in a vocabulary list from Aššur. \( \text{šE kur-an-gu} \) appears in a Neo-Assyrian letter form in the Governor’s Palace at Nimrud; in this it would appear that certain villagers have run away - leaving their seed-corn and abandoning the rice (šE kur-an-gu) they were sowing.

Rice requires heat and much water, and is therefore a suitable plant to grow in the marshes in southern Iraq and in areas where there is a good supply of irrigation water. In the present day in the Diyala region it is sown in May, June and July and harvested in October and November.
2.1.6 Crop preferences

The palaeoethnobotanical remains combined with the texts indicate that more barley was cultivated than emmer-wheat or 'bread-wheat', and it was the main crop used for rations and for fodder.

Some comparison of the amounts of barley and emmer-wheat and 'bread-wheat' grown can be found by examining texts which give details of the amounts of these cereals grown on different fields or seed issued for their cultivation. A few examples may be useful. It must be stressed that only a limited number of texts have been examined, and that the picture drawn from them strictly speaking only applies to the actual fields referred to in these texts and may only reflect individual farmers' preferences. However, the actions of one farmer are likely to be similar to those of his neighbours because the same agricultural conditions will prevail. It seems probable therefore that these examples are representative of the local situation at least, and they have been accepted as such in the following discussion.

If Table 3 (p.45) is examined, it can be seen that at Lagas in the Early Dynastic III example, over twice as much barley was grown as emmer-wheat and more than 4.5 times as much land was planted with barley as with 'bread-wheat'. In the late Agade period at Lagas 35 times more barley was grown than emmer-wheat and 69 times more barley than 'bread-wheat'. The emmer-wheat was nearly twice as much as the 'bread-wheat'.

In the Umma area, if an average is taken from the example texts, more than 22 times as much barley as emmer-wheat was grown and 227 times as much barley as 'bread-wheat'. Nearly 11 times as much emmer-wheat is grown as 'bread-wheat'. (The comparisons with bread-wheat include only texts Nos. 48, 97 and 136.)

Although not shown in Table 3, at Gasur in the Agade period, texts 25 give details of the areas shown in barley, emmer-wheat and 'bread-wheat'. Barley is sown in 69% of the total area, 'bread-wheat' in 16% and emmer-wheat in 15%, so that more than twice as much barley was grown as the combined wheats.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Town</th>
<th>Period</th>
<th>Barley</th>
<th>Emmer-wheat</th>
<th>Bread-wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauer 39</td>
<td>Lagaš</td>
<td>ED III</td>
<td>429 21/24 gag*</td>
<td>196 gag*</td>
<td>-</td>
</tr>
<tr>
<td>Bauer 16</td>
<td>Lagaš</td>
<td>ED III</td>
<td>3 gag*</td>
<td>-</td>
<td>96 SILA (seed)</td>
</tr>
<tr>
<td>Pinches Amherst 13</td>
<td>Lagaš</td>
<td>late Agade</td>
<td>2 guru</td>
<td>198 GUR</td>
<td>129 GUR</td>
</tr>
<tr>
<td>RTC 195</td>
<td>Lagaš</td>
<td>late Agade</td>
<td>1 guru</td>
<td>230 GUR</td>
<td>88 GUR</td>
</tr>
<tr>
<td>MAD 4,39</td>
<td>Umma area</td>
<td>Agade</td>
<td>578 GUR</td>
<td>11 GUR</td>
<td>-</td>
</tr>
<tr>
<td>MAD 4,48</td>
<td>Umma area</td>
<td>Agade</td>
<td>4087 GUR</td>
<td>185 GUR</td>
<td>9 GUR</td>
</tr>
<tr>
<td>MAD 4,97</td>
<td>Umma area</td>
<td>Agade</td>
<td>32 GUR</td>
<td>12 GUR</td>
<td>6 GUR</td>
</tr>
<tr>
<td>MAD 4,136</td>
<td>Umma area</td>
<td>Agade</td>
<td>149 GUR</td>
<td>7 GUR</td>
<td>3 GUR</td>
</tr>
<tr>
<td>Pinches Amherst 49</td>
<td>Lagaš</td>
<td>Ur III</td>
<td>1475 GUR</td>
<td>187 GUR</td>
<td>-</td>
</tr>
<tr>
<td>Pinches Amherst 58</td>
<td>Lagaš</td>
<td>Ur III</td>
<td>743 GUR</td>
<td>124 GUR</td>
<td>-</td>
</tr>
<tr>
<td>Pinches Amherst 31</td>
<td>Lagaš</td>
<td>Ur III</td>
<td>144 GUR</td>
<td>-</td>
<td>120 SILA</td>
</tr>
<tr>
<td>UET V</td>
<td>Ur Old Babylonian</td>
<td>2324 GUR</td>
<td>260 GUR</td>
<td>50 SILA</td>
<td></td>
</tr>
<tr>
<td>BE XIV 18</td>
<td>Nippur Kassite</td>
<td>65 GUR</td>
<td>102 GUR</td>
<td>60 SILA</td>
<td></td>
</tr>
<tr>
<td>BE XIV 24</td>
<td>Nippur Kassite</td>
<td>286 GUR</td>
<td>3 GUR</td>
<td>80 SILA</td>
<td></td>
</tr>
<tr>
<td>HSS XV</td>
<td>Nuzi mid-second millennium</td>
<td>6 imer 70 qa</td>
<td>65 imer 10 qa</td>
<td>40 imer 65 qa</td>
<td></td>
</tr>
</tbody>
</table>

* gag = GUR.SAC.GAL
In the Ur III period at Lagaš about 7 times as much barley was grown as emmer-wheat (see Table 3 again), and the amount of 'bread-wheat' is extremely small. In the Old Babylonian period at Ur nearly 9 times as much barley as emmer-wheat is recorded. At Nippur, in the Kassite period, if the two texts are treated together it can be seen that about 3.5 times as much barley was recorded as emmer-wheat with very small quantities of 'bread-wheat'.

The position is slightly different at Nuzi in the mid-second millennium. Here the text suggests that 9.7 times as much emmer-wheat was grown as barley and six times as much 'bread-wheat' as barley. Emmer-wheat is about 1.6 times as common as 'bread-wheat'.

These proportions suggest that there was an increase in the amount of barley grown compared with the wheats in the late Agade period, especially in the Umma area, which continued in the Ur III and Old Babylonian periods, although it is perhaps not quite so marked then. The comparison between barley and emmer-wheat improves at Nippur in the second millennium, and at Nuzi, about the same time, the wheats are grown much more extensively than barley.

Jacobsen and his associates, in their study of textual and palaeo-ethnobotanical sources attached to their Diyala project, also found a fall in the cultivation of the wheats, especially in the southern alluvial plain. They attribute this to increasing salinity of the soil, barley being more resistant to levels of soil salinity than wheat. The greater proportions of wheat grown at Nippur in the second millennium they felt was due to the fact that Nippur is in the north of the alluvial plain and suffered less from salinization. Nuzi is in the northern plains and salinity may be held to be relatively unimportant there.

However, salinity may be too simple an explanation for this heavy reliance on barley as the main food crop. After all, bread made from wheat is more palatable, tastes better and is easier to leaven than that made from barley. Wheat at the present time is the main cereal from which bread is made and more of it is produced than any other grain.
Barley has a shorter growing season than wheat, and it requires less moisture and is more tolerant, not only of soil salinity, but of high temperatures. It is therefore well adapted to the semi-arid environment of the Near East. In addition it also has a greater calorific content than wheat, although the difference is only slight. The shorter growing season would mean that the barley would be ready for harvesting before the real heat of the summer started. In 1970 in harvests carried out in selected fields all over Iraq 599 barley fields were harvested in April compared with 290 wheat fields. In June only 242 barley fields were harvested compared with 1088 wheat fields.

But what may have been a more important factor is that barley can out-yield wheat, especially in the semi-arid areas of the Near East. In 1957/58 the following yields were found in Iraq:

<table>
<thead>
<tr>
<th>Liwa</th>
<th>Wheat</th>
<th>Barley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosul</td>
<td>353</td>
<td>407</td>
</tr>
<tr>
<td>Erbil</td>
<td>303</td>
<td>351</td>
</tr>
<tr>
<td>Sulimaniya</td>
<td>374</td>
<td>398</td>
</tr>
<tr>
<td>Kirkuk</td>
<td>296</td>
<td>327</td>
</tr>
<tr>
<td>Diyala</td>
<td>309</td>
<td>358</td>
</tr>
<tr>
<td>Baghdad</td>
<td>537</td>
<td>617</td>
</tr>
<tr>
<td>Ramadi</td>
<td>489</td>
<td>552</td>
</tr>
<tr>
<td>Kerbela</td>
<td>337</td>
<td>458</td>
</tr>
<tr>
<td>Hilla</td>
<td>689</td>
<td>669</td>
</tr>
<tr>
<td>Kut</td>
<td>507</td>
<td>577</td>
</tr>
<tr>
<td>Amara</td>
<td>392</td>
<td>573</td>
</tr>
<tr>
<td>Nasiriya</td>
<td>550</td>
<td>528</td>
</tr>
<tr>
<td>Diwaniya</td>
<td>1067</td>
<td>1284</td>
</tr>
<tr>
<td>Basra</td>
<td>422</td>
<td>411</td>
</tr>
</tbody>
</table>

It can be seen that, with the exception of Hilla, Nasiriya and Basra, barley outyields wheat throughout Iraq. The differences in yields in these three liwas is the smallest. In the other southern liwas the barley yield exceeds from at least 50 kilos per hectare, rising to 121 k/ha in Kerbela, 181 k/ha in Liwa and 217 k/ha in Diwaniya.

Thus the benefits of barley over wheat could have been a greater yield, a shorter growing season, more tolerance of a semi-arid environ-
ment and greater resistance to soil salinity, four powerful reasons for preferring to cultivate barley.

2.2 Agriculture in the alluvial plain

The rainfall in the alluvial plain is too low to sustain cereal agriculture. It is considered that if agriculture is to rely on rainfall there must be a minimum of 200mm of reliable rain per year. In effect this means for safety that rain-fed agriculture must be inside the 300mm isohyet while areas outside this line require at least some irrigation. The alluvial plain lies outside the 200mm isohyet. The rain comes in the winter (November to March) with March being the month of higher rains. As discussed in Chapter 1 (pp.6-8), the rain is not reliable and may not fall for several years at a time. It may also not be on time, coming too late to be of use for the crops. Thus the rain is of minor use in cultivation and the main water supply must come from the rivers and be distributed by irrigation.

2.2.1 Methods of irrigation

The main reason for irrigation is to supply moisture to crops when they are first sown or planted and then at appropriate times during their growth to ensure their proper development. Unfortunately the regime of the Euphrates and Tigris is such that their flood-times do not coincide with the seasons for sowing and watering. The Euphrates reaches its maximum in April or May and the Tigris in March or April; after this both rivers subside and reach their lowest levels in September or October. There is a gradual rise in level from November and December due to winter rainfall in the mountains. A study of agricultural techniques in the Diyala region showed that October was the period for preparing the land and for starting the sowing. Harvesting of the cereal crops takes place in the alluvial plain mainly at the end of April and the beginning of May. In the Baghdad and Diyala areas it may extend into June. The rivers are at their lowest when water is required for the preparation of the ground and for sowing, and are only gradually increasing during the period when the crops require
watering. The period of high floods coincides with the time when the crops are ripening and becoming ready for harvest. Uncontrolled flooding over large areas would destroy the new crop, and the high rate of evaporation which occurs during the summer months would then ensure that insufficient water was available for the following sowing season. Thus some sort of controlled irrigation is essential.

The simplest method of irrigation which could be used is the 'free-flow' or gravity method. Rivers in alluvial plains tend to be above the level of the surrounding countryside, with high banks or levees. These natural levees are built by the sediment deposited by the river. The river deposits the coarsest and heaviest silt particles in the bed itself, causing it to rise. In flood conditions the rest of the sediment is deposited on the banks of the river, building them up gradually. The levees receive material such as sandy loam and silty clay and the finest material, clay and clay loam, is deposited on the backslopes of the levees and in the basins beyond. In this way fans are formed sloping down from the river levees into the basins.

When water is required for irrigation purposes, the farmers can breach the natural levees so that the water runs down the backslopes into the basins. In order to pass the water from field to field without ditches, the fields are surrounded by low mud walls which can be temporarily breached to allow the water to flow into the next field. The final field in this system is often left fallow for the year so that it can be used to allow excess water to drain away after irrigation. If fields further away from the river require water, small canals can be constructed to carry the water from the breach in the levee. This can lead to quite complex systems of canals, reservoirs and dams etc.

The 'free-flow' method of irrigation is really only practicable when the river is higher than the plain, and the levees themselves cannot be watered in this way. For them, and for areas in which the river is below the surrounding countryside, some way of lifting the water from the river is required. Nowadays this is done with mechanical water-pumps, as well as with waterwheels and shadufs. The evidence is scanty for the use of waterwheels and shadufs in Mesopotamia c.3000-
600 BC, but there is sufficient to show that some sort of lifting mechanism was employed.

The shaduf consists of two uprights supporting a horizontal pole. Across this bar is another pole which is weighted at one end and has a bucket suspended by a rope or pole from the other. The rope is pulled down by a man to the water until the bucket is filled up. It is then lifted up and the weight at the other end of the cross-pole causes the bucket to rise to the required level. The waterwheel is basically a system of buckets suspended independently from a wheel. The wheel is rotated so that the buckets are dipped one at a time into the water. Because of their independent suspension the buckets swing so that they retain the water, even when the wheel continues rotating. The wheel may be moved by hand, by animal power or by the current of the river.

The evidence for the shaduf comes from a cylinder seal, a relief, and from texts, while evidence for waterwheels comes only from texts. A cylinder seal which has been dated to the Akkadian period (Fig. 8) shows a shaduf with what appears to be a single vertical support for the counter-weighted bar. The upright rises slightly above the bar so that in fact it may represent two uprights only one of which can be shown by the artist. The bucket seems to be suspended by a rope and the whole structure is operated by one man. The cutting of the seal is rather schematic with much use made of the drill. The only other recognisable illustration of a shaduf comes from the Neo-Assyrian period on a relief dated to Sennecherib's reign. In this, two shadufs are placed by a river bank and men are shown in the act of drawing water. The main theme of the relief is the transport of bull-colossi.

The word for shaduf in Akkadian appears to be makutu. This term appears in lexical lists. References in economic texts are rare, but in the Old Babylonian period 'men of the shaduf' are involved in a dispute in the Kish area and 3 ikû of fields at Dilbat are referred to as being irrigated by shaduf.
Laessoe has discussed the possible textual evidence for the waterwheel in detail. He considered that wheels rotated by animal power were unlikely to have been used in Mesopotamia because of the complexity of their design, and that the evidence for the use of the waterwheel driven by the current (undershot wheel) was not strong. There are some lexical references which may refer to irrigation mechanisms, but they cannot necessarily be interpreted as waterwheels or hoists. Two Old Babylonian letters refer to the erection of some 'machine' for raising the water level if the amount of water is too low, but it is not clear what type of 'machine' is involved. Laessoe's conclusion was that only slight indications of the use of waterwheels can be traced.

It would seem, therefore, that some methods of raising water for irrigation from the rivers were used and that the main one was the shaduf. The illustration on the cylinder seal dated to the Akkadian period and the references to its use at Kish and Dilbat suggest that it may mainly have been used in the northern part of the alluvial plain. It can never have been as important as gravity-flow irrigation and may possibly have been used only when the river-level was too low to allow free-flow irrigation, or for such specialised cultivation as orchards or gardens.

2.2.2 The extent of irrigation

The importance of irrigation and the construction and repair of canals can be seen from the frequent references in the cuneiform texts. The references appear in letters, year-names, historical inscriptions etc, and emphasise the important place held by irrigation in the Mesopotamian society. But it is difficult to judge the actual extent of the irrigation system from the texts alone. It was politically useful for the king or local ruler to stress the way in which he cared for the irrigation system and so the economic well-being of his subjects. It is also difficult to distinguish whether new canals are being built, or whether repairs are being referred to.

Several surface surveys have been carried out in Iraq with a view to establishing settlement patterns in different periods and to study
the probable irrigation systems. These surveys include those done by R.M. Adams in the Diyala area, in the Nippur area, and together with H. Nissen in the Uruk area. M. Gibson made a study of the Kish region and T. Jacobsen and his wife visited the Tello area.

These surveys consist of the surface examination of sites and the collection of pottery. Where possible air-photographs were studied. The pottery was used to date the sites. 'Index-fossils' with easily distinguished diagnostic features and with a well-documented and short-lived span were selected and made into a framework so that sites on which these 'index fossils' occurred could be assigned to a chronological period. A number of problems exist. Probably the most important one is that the pottery from all periods is not equally well-known. For instance, one of the main 'index fossils' for the Kassite period in the Diyala region is a large solid footed chalice which is apparently absent in the Old Babylonian levels. But other Old Babylonian pottery features continue through Kassite times without change, so that while a site can be dated to the Kassite period, it cannot necessarily be established whether it was occupied in the Old Babylonian period as well. In addition, lack of the solid-footed chalice may have led the number and size of Old Babylonian sites to be exaggerated. Another problem is that modern cultivation etc prevent some areas from being as fully surveyed as others.

Once the sites have been dated, they are plotted according to date, and it is then assumed that they lie along the major water-courses of that period. The impression given by the surveys is that the settlements followed a dendritic drainage pattern which was probably the one followed by the rivers, and that there was little evidence for large-scale constructions of canals going against this natural pattern.

Third millennium

The Diyala region in the third millennium shows a gradual increase in the number of settlement sites with the time of greatest settlement being the Ur III/Isin-Larsa period towards the end of the millennium. Not all the sites were occupied throughout the entire
period. An example of abandonment and later re-occupation can be found at Tell Agrab. This site, and some others apparently on the same water-course, were completely abandoned at the end of the Early Dynastic period, but were re-occupied for the Ur III/Isin Larsa period. There were several other sites on the same line which were either re-occupied or founded during the Ur III/Isin Larsa period.

In Central Mesopotamia, around Kish and Nippur, the period of greatest settlement appears to be the fourth/early third millennium, in the Ubaid/Uruk/Jemdet Nasr period. The area of settlement drops during the Early Dynastic period, but rises again in the Akkadian to Isin-Larsa periods. In the Warka region the largest settlement area dates to the Early Dynastic III period when settlement appears to be concentrated in a few good sized settlements lying along two main water-courses. Numerically there is a fall in settlements from the Early Dynastic I period. The number of settlements is roughly the same in the Akkadian period but the area settled falls. There is an even greater fall in the Ur III period, although the actual number of settlements increases. Both the number and the area of settlement increases in the Isin-Larsa period.

In the Tello region there may be evidence for artificially constructed canals. In his survey of the area Jacobsen found a line of tells running south from Imrebia to Tell Mehsin when it appears to divide in two, southwest to Alwah ash Sharqiyyah and southeast to Abu Melekh. These mounds are dated as early as Early Dynastic with some continuing into the Old Babylonian period. They may mark a take-off canal from a branch of the Euphrates. This take-off canal would have been some 45 kms long and it may have been the boundary canal between Umma and Girsu. However, as this line runs for the main part parallel with a branch of the Euphrates, it may only represent changes of course of this river. Jacobsen found a further line of canals north of Tello, running from Muhallakiyyah to Krainisiyat, and he tentatively reconstructed this as part of Entemena's feeder from the Tigris, later extended in the Old Babylonian period to serve Larsa.
Among the different possibilities which arise from the changes in settlement pattern is the abandonment of farmland and the bringing under cultivation of new areas. This particularly applies to the Warka area. The pattern of sites for the Akkadian period more or less follows that of the Early Dynastic III. But in the Ur III/Isin-Larsa periods a new widespread pattern has emerged, particularly in the vicinity of Warka, Larsa and Suheri. One reason for this could be the need to bring new land under cultivation, either because the land previously cultivated had become less fertile because of salinity, or because it was increasingly difficult for the water to reach the fields because of the build-up of sediment at the head of the canals caused by years of irrigation. If farmland had had to be taken out of use, this may have been one reason, apart from any political disturbances caused by the Gutians, for the drop in size of individual settlements in the Ur III period. People may have left their old villages and started up new settlements in fresh areas.

The problem of soil salinity (see 1.3.2, pp.33-35) can arise because of over-irrigation of the land. This may be one of the negative aspects of a secure government which allows the construction and care of canals to continue without fear of disruption because of political upheavals. There is a temptation to over-irrigate in order to increase yields, and if the water supply is increased the temptation becomes even greater. In addition, the smaller canals at field level, which could double as drainage ditches when not in use, can no longer be used in this way because of the increased water. This extra supply of water, and the lack of drainage, will mean that the water-table will rise bringing the salts to the surface. This will cause a gradual drop in the fertility of the land and may not necessarily take a long time.

The sediments dropped by the rivers during floods are also dropped during irrigation leading to the filling up of the canal at its head. If the head of the canal is not kept clear the tail of the canal will cease to receive any irrigation water. This may cause security problems between settlements at the tail of the canal and those at the head who can get their water without keeping the canals
clear. Those villagers living downstream on the canal may have to abandon their fields and go elsewhere, opening up new canals and new land. Eventually, particularly when there is no authority powerful enough to force the head-of-canal villagers to clean their stretch, the canal will go out of action.56

One way of combating this is to re-route the canal so that the head is further upstream. And this may have been one reason behind Entemena's canal to the Tigris. He was unable to use the Euphrates any further upstream because of Umma, so that he had to tap some new source of water. He did this by setting up a feeder north-east to the Tigris.

Names for canals or stretches of canals found in inscriptions indicate the importance attached to canal building and repair by the governments of the day. One problem in knowing the extent of the canal system is that the logogram ID means both 'river' and 'canal' and may also have been applied to stretches of canals and rivers to which specific names were given. Some canals (and rivers?) seem to be named after the fields through which they flow.57 The surveys suggest that the settlements run along the natural water-courses forming a dendritic pattern. Studies of texts58 give details of a complex system of irrigation canals which run along fields and which join and rejoin other canals. These smaller canals cannot be distinguished in surface surveys and it seems likely that most of the canal construction dealt with the local canal systems. There is little evidence from the settlement surveys of any major large canal building. Work done on the main watercourses probably was restricted to cleaning out the beds, strengthening the banks and perhaps straightening the line of sections.

The constant amount of work required to keep canals and reservoirs in working order is reflected in the administrative texts. One text gives details of the amount of work to be done by each man when it was necessary to strengthen the dyke of the field GANA₄:ǔ.GIG in Urukagina year 1.59 Five groups of men worked together under a foreman and each man was responsible for 1 kₜₙₕ.60 The number of men in each group differed. Ten men worked as individuals — their professions include a carpenter, fuller, leatherworker, potter, basket-maker (?), and a
shepherd. These men were also responsible for 1 Kūš. A gardener was responsible for 5 Kūš, another shepherd was responsible for 2 Kūš and a porter (?) for 5 Kūš. It is probable that the groups of men were regular employees, while the individuals whose professions are given and who seem to work under their own responsibility may either rent or own plots of land in the field served by the canal, or may perform this work as part of a service-obligation.

Another text gives details of which part of the canals require attention and where reservoirs lie alongside. Lengths of canal to be newly constructed or planned were also recorded.

In his topographic study of the region of Umma, Sauren has listed some of the words referring to types of canals. These include Ǝ/iku-(canal)-ditch or small canal; PA₄.A.DA.GA/palgu and atappu: small canals slightly larger than the iku-ditch. PA₄.A.DA.GA canals were deepened and cleared by GURUS-workmen, paid by the day. They seem to have been small enough for smallish (45 and 41 for example) groups of workmen to manage in only one day. They are the smallest of the canals in the irrigation system and are apparently found all over the province of Umma, as were the 'winding water-canals' (I.D.AMUŠA₄). These latter canals often had branches and reservoirs. Provision also seems to have been made for the excess water by the use of swamp-areas into which it could drain. They appear to have been placed near the mouth of the canal. Water-reservoirs (NAG.KU₃) were sometimes made out of shallow basins into which the water could run. These areas are found along the banks of canals and are named after the stretch of canal.

A text from the 4th year of Šu-Sin, and probably also coming from Umma, quotes the work necessary on a canal. One and 5/6 SAR work has to be done in the water - the work to be done by GURUS-workers each of whom has to do 7½ ĠIN. 5 and 1/3 SAR work is to be done on the earth (this may refer to rebuilding the levees).

Second millennium

The Old Babylonian period saw a continuation, and even an expansion, of the settlement areas found during the Isin-Larsa period. In
Central Mesopotamia there was an expansion in the area of settlement; the number of sites also increased. In the Warka region there was a slight drop in the settled area and the number of sites also decreases. But the pattern of settlement continued to be more or less the same with few regions completely abandoned and no new areas opened up. There was also a drop in the number and area of settlement in the Diyala region.

There are references to the Diyala changing course in a date-formula 'Year the Diyala River was changed' which has been dated to the period between Iku(n)-pi-Sin and Warassa of Ešnumna. This is contemporary with Sumu-la-el of Babylon or a little earlier. A flood occurred in the Diyala area in the 38th regnal year of Hammurapi. These two periods are about 75 years apart and Ešnumna continued to flourish after the change in the course of the Diyala recorded in the year date. The flood at the end of Hammurapi's reign may have forced some sites and areas to be abandoned.

In the Kassite period the situation began to change. In Central Mesopotamia the pattern is still one of expanding settlement and this area reached its highest density of settlement. But in the Diyala area and around Warka there appears to be widespread abandonment of settlements. The difficulty of distinguishing precisely between the end of the Old Babylonian period and the beginning of the Kassite makes the change difficult to date, but in the Diyala there appears to have been a gradual reduction in settlements and site-size during the Kassite period, despite Agum-kakrine's claim that he caused settlement in the country of Ešnumna and this picture of abandonment of settlement continued into the Middle Babylonian period, the duration of which is uncertain. Again in the Warka region imprecise dating material makes it unclear whether the abandonment was a sudden catastrophic collapse or the result of a slow and drawn-out process. The lines of the watercourses are entirely different from those of the third millennium. The two main branches of the Euphrates have apparently disappeared. There are few traces of waterways in the Jidr area which are insufficient to make into any pattern. In the southern part there seem to be two watercourses running west-north-west to east-south-east. This westerly change in alignment suggests an alteration in the drainage
pattern of the Euphrates system - a change which also appears in the Central Mesopotamian area73 with the increasing importance of the Babylonian branch of the river. This type of change is similar to the shift which occurred in the 19th century, when the Hindiya branch took over from the Hilla. The two watercourses in the Warka-Larsa region are not necessarily contemporary. More than half the new Kassite sites found in the Warka survey were located along the more northerly branch.74 This and the increased number of minor branches from the two watercourses and the reduction in the size of the sites, suggests a fluctuating drainage pattern which provided insufficient irrigation water to support large-scale cities and wide areas of agriculture.

The pattern of abandonment found in the Diyala and Warka areas spread to Central Mesopotamia towards the end of the second millennium. The fact that Central Mesopotamia was well-settled during the Kassite period might be expected from its position as the heartland of the Kassite kingdom. The Kassite dynasty reigned for some 500 years - longer than any other dynasty. Such a long period under one rule suggests that the political conditions were stable, allowing scope for increased settlement and irrigation schemes. It is possible that the Kassites concentrated mainly on the centre of the kingdom and allowed the outlying areas to run down gradually. Alternatively there may have been an exodus from these areas towards the centre - similar to the exodus from country regions towards Baghdad at the present time. As agriculture was the main source of employment, these immigrants would have set up villages and farms. It has also been suggested (1.1.3, pp.8-15) that there may have been a change of climate during the second millennium with a gradually decreasing rainfall. Such changes would affect outlying areas before the political centre of the country. More investment of capital and labour would be available to sustain irrigation and cultivation there.

The latter part of the second millennium was unsettled politically, particularly around 1200. About this time waves of invaders disrupted the kingdoms along the Mediterranean coast and even attacked Egypt. Repercussions were felt across the whole of the Near East. In Assyria Tukulti-Ninurta I was assassinated (in 1208), after a reign
filled with military success, including the domination of Babylonia for six years. The end of his reign saw widespread rebellion which culminated in his murder. In Babylonia the Kassite dynasty came to an end in the middle of the 12th century (c.1150 BC).

All this political unrest, combined with even a slight drop in the rainfall, would create an unstable atmosphere in which settlement and irrigation farming would not flourish. In addition, the widespread settlements and parallel increase in irrigation may have led to increased soil salinity, as was suggested for the third millennium. In the Diyala Report, Jacobsen found that references to the threat of salt appear in the northern part of the alluvial plain. These references are not in the economic texts but in the curses found on kudurrus. Because of the lower water-table in this region, the problem may not have been as severe as it was in the southern plain in the third millennium, but it would seem that the population was aware of the danger.

The settlements continued to follow what would seem to be a pattern of dendritic drainage, along the natural watercourses. But, as appeared in the third millennium, it seems likely that there was a widespread network of small canals serving the settlements and their fields. This network would have been abandoned with the settlements. The importance of irrigation on and the interest taken in it by the leaders of the country can be seen in the texts. For example, many of the year-names of the dynasty of Larsa refer to the construction of canals. These include, in the reign of Abisare 'The year the canal, Šega-Îštar-Zabalam was dug' and 'The year the (canal)-ditch in Larsa was dug'; in the reign of Šumu-El 'The year the canal of the Euphrates was dug'. A group of administrative texts studied by Walters records the collection of barley for the wages of men working on canals, which included the Etellum and the Isin canal projects. Walters considered that landowners have to make a contribution of barley towards the wages of the canal workers for the upkeep of the canals in proportion to their acreage. On occasions emergency work was necessary. A letter from Nûr-Sin to Lú-igi-saq states that Išar-kubi has asked for 1,800 workers to be hired for emergency work on the Nu-bi-tár. Lú-igi-saq is authorized to pay 10 mina of silver to hire the workers.
Hammurapi of Babylon's correspondence with his deputy in the south, Sin-iddinam, is full of references to work on the canals. Examples include orders that men living along the Danum-canal should dig or clear out that canal;\(^81\) that the canal 'inside the town of Uruk' should be cleared;\(^82\) that the waterplants and reeds choking a canal between Larsa and Ur should be removed.\(^83\) An inscription recording the cutting of 'The Abundance of the people' emphasised that the banks of the canal have been changed to be fields for cultivation.\(^84\)

Another area where irrigation was important was the Mari area, on the Euphrates south of Deir-ez-Zor, before the river actually entered the flood plain but while it was meandering through a wide valley. The texts from this site provide a picture of the work involved in the construction and upkeep of canals etc. A properly organised irrigation system was vital to the agriculture of Mari. There were three main canals: (1) The Išim Iahdum-Lim bringing the waters of the Habur through the cultivatable land of the river valley down past Mari; (2) the Narum Rabitum, on the right bank of the Euphrates - starting from the Euphrates at a point about 25 kms above the confluence of the Habur and the Euphrates and ending just below Terqa; (3) the Nar Ashahitum starting from a bend of the Euphrates at about present-day Meyadine and ending at Terqa. The layout of these canals has been plotted on a map by Kupper.\(^85\)

The canal Išim Iahdum-Lim must have been a considerable project; according to Kupper's map it is about 90 kms long. It may in fact be the main course of the Euphrates at that time, although, in view of the uncertain nature of the Euphrates in that area, the canal may have been constructed to by-pass the river. Between Deir ez-Zor and Ana the Euphrates is wide and shallow, at present, with many islands, the bed is rocky and there are rapids in some places. It is doubtful whether the Habur adds much water to the Euphrates.\(^86\) A canal which by-passed the meandering rocky bed of the Euphrates could not only bring water nearer to the cultivated fields, but it could tap the waters of the Habur and thus supply the area with two sources of irrigation water.
Kibri-Dagan, governor of the district of Terqa, seems to have been responsible for the care of the Išim Iahdum-Lim canal, and he wrote a number of letters mainly reporting to the king on the progress of the work. One such report tells the king that work on the canal at Bit-Iaptaharna is more complicated than had been anticipated. Work started in the month of Abum (July/August), the period after the cereal harvest. In this case, the necessary work was considerable because the muballittum (reed barrage/dam) in the feeder canal did not exist. In this report Kibri-Dagan informs the king, Zimri-Lim, that the canal has been built as far as Terqa so that the district and town of Dur-Iahdum-Lim can be irrigated. This reason for constructing a canal (possibly the same one) is given when Kibri-Dagan and an associate tell Zimri-Lim that they have built a dam at Zanipatim and stopped the water at Dur-Iahdum-Lim so that the town can draw water for irrigation.

There are various reports of floodings. Both Kibri-Dagan and Bahdi-Lim, governor of Mari, report the Habur in spate. Bahdi-Lim informs the king that the wadi Haqat Na Mišlan.KI has flooded and inundated the fallow-land belonging to the muškenu-farmers in the Dagilim area but with little damage. On another occasion there were floods at Mišlan and Dir on the same day – the Dir wadi inundated 1000 igū of land belonging to the muškenu but not the palace fields, the Mišlan wadi may (the lines of the text are damaged) have inundated a field belonging to the palace and one belonging to a muškenu. And a flood described by Kibri-Dagan inundated 300 fields near Raqqa and some 140 fields in the plain. Instructions had been given to repair the damage.

Repair and upkeep of the canals was apparently an annual undertaking. For instance, Kibri-Dagan reports that the cultivators and the men who work on the canal had examined it and did not think that any work was necessary that year – that, however, was not his opinion. One of the constant repairs was the removal of reeds, rushes and other obstructions from the canal bed. A labour force was organised, sometimes on a daily basis. Large numbers were required, as Bahdi-Lim considered 2,000 men insufficient to do the necessary work on a wadi and at Dir. Part of this canal had indeed been breached in one year (although the two texts may not refer to the same year).
Breaches were fixed with reeds. One such breach must have occurred in the spring as Bahdi-Lim was returning to Mari to supervise the harvest. Some regulating devices were built of stone. Bahdi-Lim describes how the water was flowing over the upper stone sluice (bitqum e10 ṣa abnim) but the middle dam has been damaged. This Badhi-Lim repaired and he re-opened the sluice. Another (?) stone construction was built in the same vicinity. The piles of an old bridge fell and caused the water-level in the canal to fall - the stone construction was demolished in order to bring the level back and prevent Mari from losing any water. Reservoirs were common. One at Zurubban was said to have fishes in it. On one occasion this reservoir was breached so that Kibri-Dagan has to repair it.

First millennium to c.600 BC

The reduction in the number and size of settlements which took place in the later part of the second millennium continued into the first centuries of the first. In the Diyala region there is a slight improvement by the Neo-Babylonian period (c.600), but the number does not come up to that found in the Kassite period.

Again there is a difficulty in the dating of the index-fossils. Gibson in the Kish region has called the period from 1000 to 500 'Neo-Babylonian', but some so-called Neo-Babylonian sherds came into use before 1000 BC so that there is some overlap between the beginning of this 'Neo-Babylonian' period and the preceding 'Kassite'. Thus the activities of the Middle Babylonian kings and the tribulations involved in the Assyrian wars tend to be obscured. At some time during this period the old Kish branch was abandoned leaving what appears to be practically an unoccupied area between Babylon and Kutha. In the 7th and 6th centuries the size of Babylon increased greatly and it is the largest city in the Central Mesopotamian area. If it is taken out of the picture the actual area of settlement in Central Mesopotamia does not reach that of the Kassite period, nor in fact that of the late third millennium. It is about the same as the settlement area found in the Early Dynastic period.
In the Warka area there was an increase in sites which has been dated to about 800 BC. This date is a somewhat arbitrary one because of the lack of precise knowledge of the dating of the pottery in this area. However, some references in texts give a picture of a resurgence of settled life. The Assyrian Annals talk of populous districts in the Warka area. Bit Dakkuri, said to have 33 strong walled towns and 250 hamlets, apparently lay to the north-west and Uruk (Kullab) and Larsa were included in the 8 towns and 100 hamlets of Bit Yakin. Patterns of settlement started in the Neo-Babylonian period persist with little change into the Parthian times.

2.2.3 Farming techniques in the alluvial plain

Before discussing the farming techniques used in Mesopotamia c.3000 - c.600 BC it is probably best to outline the traditional methods of farming carried out in Iraq until recently. The uses of the tractor and other machinery will not be included.

The tillage practices are based on one year fallow, one year cultivation. After harvest the fields are left alone so that the shok (Prosopis stepheniana) and agul (Alhagi maurorum - camel thorn) can grow. The importance of these plants is that they are deeply rooted and can be supported on the subsoil water. They go dormant in November. This helps to lower the water-table and lessens the risk of salinity in the upper soil layers. Sheep, goats and cattle etc may be allowed to graze in the fields during the summer, but sometimes the fields are left empty so that a good winter growth of wild grasses and legumes may take place. These plants act as winter pasture in January and February. The fields are not ploughed during the spring because of this pasture. In the summer no ploughing or tilling can be done because, once the pasture plants are over, the ground becomes too hard. In May the shok and agul return and lower the level of the sub-soil further.

Preparation of the fields rarely begins before October. Farmers need to wait until the weather is cool with a high humidity and if possible some rain. The soil softens and can be loosened by the
plough. Some seasons it is necessary to wait until November before conditions are right.

The plough used is the parting plough or ard. In Iraq there is no serious summer weed problem because of the lack of water and high temperatures, so that there is no need to have a turning plough which cuts off and turns over the deep rooted weeds. Most deep-rooted weeds which grow are, as mentioned above, valuable for lowering the water table. In addition, the leguminous weeds are nitrogen fixers and help to replenish the soil nitrogen. All these weeds would die out if turning ploughs were used each year.

The preferred low-land plains plough is made from a trunk or branch of a tree but has no clear-cut type except that the share is shovel-pointed rather than like an arrow. The point itself varies in shape. It may be like a triangle with a base width of 5 to 7 inches, or it may be rounded or square with parallel sides. It may be set at an angle of 45° or 20° and any one plough can be made to operate at different angles. The advantages of this plough are that the shovel-point pulls fairly easily as it does not tend to penetrate the soil deeply and it will also rise and fall when cross-ploughing land previously planted with vegetables or cotton. Although it is not particularly easy to handle nor does it loosen soil well, its action will help to kill the shallow rooted weeds, such as wild grasses, which are competitors of barley and wheat in the upper soil zones.

The first ploughing is done across old furrows and old irrigation borders. Then the seed is broadcast by hand and the field is ploughed again to cover it. This ploughing is done crosswise over the first ploughing. The field and irrigation borders are rebuilt and the field is then irrigated. Irrigation is by the basin method. Plenty of water is used so that salt is carried as far down as possible. In this way the seeds can germinate in a fairly salt-free environment.

There are many variations on the simple one year fallow/one year cultivation system. Examples include grain/fallow/spring or autumn broadcast crop/fallow; early spring planted vegetables/grain/fallow. The tillage practices vary slightly according to the system used.
These tillage practices evolved because of the conditions and in many cases are more efficient locally than more 'modern' ones. For example, Iraqi farmers do not usually weed fields after the crop is planted as they say it is not good for the crop. It was observed that when weeds were removed, the shade which they gave to the surface of the soil was removed, thereby increasing the chances of evaporation and the rise of salts. On one occasion a government manager insisted that part of a tomato field was weeded. The tomato-plants on the cleared half were spindly while those on the weedy half had good tomatoes.

Harvesting takes place in the spring. The main harvest month is May but some areas may begin in mid-April. Ignoring any machinery the reaping is carried out with sickles. The sheaves of grain may be left for a few weeks on the fields to dry out before being taken to the threshing grounds.

2.2.4 Farming in the alluvial plains c.3000–600 BC

Fallow

While it is not conclusively proven it seems likely that the system of farming in use in ancient Mesopotamia was one in which areas were left fallow for periods of time in order to recover fertility and to allow any salinity caused by irrigation etc to decrease. At Umma in the Agade period a text gives details of areas of fields measured out for various people. Certain areas are to be cultivated with barley while others are to be left fallow (NU.TUK). The ratio between the cultivated and the fallow varies between half and half and one-third and two-thirds.

Landsberger reconstructed a two-year cycle for reclaiming land and for cultivation based on land lease contracts from about the time of Šamšu-ilum (Old Babylonian). These contracts were made out for two years. In the first year, the sowing was done by seed-plough before the flood-water penetrated the soil. The crop was a legume or some other summer crop. The earth then was left fallow for six months but in November/December a furrow was made for an early ripening barley.
This barley only produced about 45% of the normal yield. After harvest the lessee had to prepare the field for autumn-sowing by breaking it up and harrowing it. Another fallow period lasting the summer months led to a normal cultivation with a full yield. There was no ploughing or harrowing before the sowing in this year.

It can be seen that this description varies from the present-day methods in the breaking up of the ground immediately after the flood and the planting of a summer crop. It is possible that the land referred to had never previously been cultivated so that the breaking-up after the flooding was an action used only for new lands. The growing of the summer crop is more difficult to explain but it may have been an attempt to break up the ground, or the planting of a nitrogenous legume or deep-rooted plant (shok and agul are both) which had the observed effect of improving the soil.

There are also textual references to the fallow system being in use in Assyria in the first millennium (see below, 2.3.2, p.83-84). Although these references are spread over a long period of time they do suggest that this two-year cycle was the one in general use.

Ground preparation

Detailed instructions are given in 'The Farmer's Almanac' about the preparation of ground before ploughing. First there should be a preliminary irrigation (to soften the ground) which was to drain away. The weeds were then to be removed and the ground levelled. Different types of hoes were used to dress the ground and eradicate the marks of ox hooves. It is not clear whether the oxen were used in the levelling of the field or whether they had been pastured on the field during the fallow year. Quite light tools were used. 'The Farmer's Almanac' refers to hoes, one type of which (TUN.SAL) was described as weighing 2/3 MINA of copper (approx. 1/3 kg.). A cylinder seal which may illustrate this dressing and break-up of the ground comes from Susa, dated to Uruk V/IV. The impression shows rows of men working on the ground, each with a three-pronged tool: the prongs are hafted at right-angles to the handle, in the manner of a hoe or adze.
The use of irrigation before tillage is not normally practised in present-day Iraq. This is because some irrigation borders must be built before such watering - something which could not easily be done on hard soil; soils which are heavily irrigated are slow to come to the correct moisture content for ploughing, so that the seeding would be delayed; if only a light irrigation is done a second irrigation will be required after seeding. If this second irrigation is a heavy one the growth of the plants is retarded, if it is a light one it will not leach the salts down into the subsoil. The earlier in the autumn irrigation is carried out, the more there is a danger of salinity because the risk of evaporation is greater.

It would seem that the advice for a pre-preparation irrigation is not sound. However, it is possible that when the text was first written the problem of salinity was not as acute as it is now and it was felt that the advantages of sowing the seed by September outweighed the dangers. Grain sown then will have a higher yield than later sown grain. 'The Farmer's Almanac' allows a period for the field to dry out. In this period the farmer was supposed to make his tools ready.

Ploughs and hoes

The main tool-types involved with the farm-work are the hoe and the plough. A text, 'Disputation between the Pickaxe and the Plough' lists the different tasks for which the hoe and plough are used. The hoe's tasks include digging canals, building houses, palaces and temples and preparing the fields for the plough, while the plough makes the furrows for the crops.

The hoe can be defined as a blade which is fastened transversely to a handle, at an angle of 90° or less. It is operated with a hacking motion, in front of the worker who advances across the field. Another type of implement, often called 'dutch hoe', is set at an angle of 180° to the handle and is operated with a pushing movement. It is used for weeding and is not found in Mesopotamia. Metal implements which could have been hafted as hoes have been found on many sites: these include Kish, associated with the Y-Cemetery and dated to the mid-third millennium, and Mari (dated to the Agade period).
These implements tend to have one end bent round with the ends overlapping for hafting. Hoes with this type of socket for hafting have been found in use, mounted in 'elbow'-shaped handles, in Central Sudan and Lower Niger, used by the Baja and by the Mossi. A similar 'elbow'-shaped hoe, strengthened with a cross-support between the two 'legs' of the handle, is shown in use on an Egyptian tomb painting dated possibly to Tutmosis IV, c. mid-second millennium. The hoe-blade appears to be similar to those found in Mesopotamia. This type of blade could also have been hafted at the end of a straight handle when it could be used as a weed-cutter rather than a hoe.

Another type of implement found on many sites in Mesopotamia and generally dating to the early part of the second millennium, is the 'split-blade'. These sites include Tell Sifr, Susa, Ischali and Khabajeh, Kish, Nippur, Sippar, Tello and Ur. These blades have two main shapes: rectangular, sometimes with a slight indentation on the upper edges, V-shaped in profile with rivet holes for securing the blade to a handle; and U-shaped or crescent-shaped, again with a V-shaped profile and rivet holes for securing. These blades tend to be small: the one found at Nippur was 7.8 cm wide while those found in the Sifr hoard were in the region of 10 cm long and 5-10 cm wide. Moorey has suggested that this type of blade could have been used as a 'shoe' for a wooden spade. Because of the narrow size of the blades it is here suggested that they could have been attached to wooden blades after the manner of a hoe-blade.

Ploughs in general are divided into two main groups: the ard which scratches a furrow without turning the sod, and the mould-board plough, which turns the sod. Only the ard was used in Mesopotamia.

There are few actual remains of ploughs in Mesopotamia. The ideograms used for plough (for example GIS.APIN/eppinu; GIS.APIN.TUK.KIN, GIS.APIN.SU.KIN/barbu, majru) almost always include GIS as determinative indicating that wood was the main material from which the implement was made. In some cases the share may have been shod with metal: iron shares were found at Khorsabad and it is possible that some implements of the hoe-type (see above page 67) may have been fitted to the points
of the wooden shares. Indeed these 'hoe-blades' answer the description of shovel-points used on plough-shares today in Iraq (see p.64).

There is quite a body of pictorial evidence for ploughs in Mesopotamia, on cylinder-seals and on reliefs etc. One of the earliest representations of a plough is the pictogram for APIN dating to Uruk IV (about the end of the fourth millennium). In this the 'business' part of the plough is made up of two stilts joining to form a point: this point acted as the share which cut the furrow and the stilts acted as mould-strokers, their angle widening the furrow. A plough-beam and yoke were fastened to the body of the plough.

This simple type of plough, continued with some modifications, throughout the third-first millennia. In a cylinder seal from Fara (Early Dynastic), a bullman is shown ploughing with a span of lions. The plough has two stilts attached to the share-beam. There appear to be two struts joining the share-beam to the plough-beam. The bullman has an attendant to help him guide the lions. Another cylinder seal (dated to Early Dynastic III) has as its main theme the sun-god in a boat. In the field of the design is a plough (Fig.9): this plough has a central stilt to which two side stilts are attached. The side stilts act as handles, and as mould-strokers to the share, which is the end of the central stilt. The side stilts are joined to the central stilt by a cross-bar.

A seal dating to the Agade period may also show a simple plough with a central stilt and two side stilts acting as handles. The plough is drawn by one ox. One man is guiding the plough while a second man walks beside it. He appears to be holding a stick in his right hand. A seal, dating to around 1300 BC and found at Assur, shows what appears to be a plough with a single stilt which acts as both share and handle. The plough-beam is fastened to the single stilt. One man both guides the plough and the single ox. He has a stick in his left hand to help guide the ox. Another plough, from the Achaemenian period, consisting of two stilts joined in a point to act as a share, is drawn by two oxen, but is driven by one man. These ploughs can probably be identified as the ploughs used to work the ground after the initial stage of working over the field with hoes etc.
A more complex tool is the seeder-plough also illustrated on cylinder seals, reliefs etc. This consists of an implement of the above type which has a funnel fixed to the share-beam, behind the share, so that the share can cut the furrow, seeds are dropped into the funnel and fall into the furrow. The man dropping the seed into the funnel can control the rate of seeding and the spacing of the seeds. The seeds can then be covered roughly by the man handling the seeder-plough scuffling some soil back over them with his feet as he walks.

Representations of such seeder-ploughs appear on seals dating to the Early Dynastic III period and Akkadian period. It is common on seals depicting a deity in an anthropomorphic boat, and in presentation scenes. (Fig.10)

A seal-impression which appears several times on a Kassite tablet represents a more complicated seeder-plough. The plough appears to consist of a central stilt which acts as the share. To this two handles have been attached, and two side-stilts are also attached to the central stilt. The seed-funnel appears to be attached to the central stilt behind the point where the two side stilts join it. Strengthening struts from the seed-funnel appear to join one of the side-stilts but this is not completely clear, and the central stilt would provide more support. The plough-beam and yoke are also attached to the seeder-funnel. The plough is drawn by two oxen. It is driven by one man, with a second walking beside the oxen, and a third putting the seed into the funnel. A boundary stone, dating to the 12th century, from Susa, shows a simpler seeder-plough. It consists of a share made up of two stilts with a funnel attached behind the share. The plough beam appears to be a rope.

The entrance to the Sin Temple at Khorsabad (dating to the 8th century) has a glazed tableau which includes a seeder plough in the design. The plough-body is flat and more or less horizontal to the soil. The seed-funnel is attached at right-angles to the soil, behind the share, and the plough-beam is attached to the share at the base of the funnel. Behind the funnel are what appear to be three stilts, the ends of which come into contact with the soil. Strengthening struts
from the funnel go to the plough-beam and to the stilts. None of these stilts appear long enough to act as handles which may have been attached when the plough was in use. A similar plough appears on a boundary stone, dating from the time of Esarhadden. The share was made up of three pieces (one of which is shown as curved): a central stilt to which are attached two side stilts. Again the handles were probably attached when the plough was in use. Strengthening struts from the seeder-funnel go to the plough-beam and the central stilt. These two Neo-Assyrian ploughs are similar to the Kassite plough except that the share is set more flatly on the ground. The side stilts would act as furrow wideners.

Ploughing

'The Farmer's Almanac' gives instructions about the ploughing of the land. First a border is ploughed and then the field is ploughed cross-wise. After this it is harrowed and raked, and any large lumps are either broken up with a hammer or taken off the field.

Other texts refer to these activities. At Umma, in the Third Dynasty of Ur, the daily work of a field-worker is given as 1 ikû per day. The work is done with a plough (TUK.ŠE.KIN) and a harrow (GIŠ.UR.RA.). The harrowing is done three times. Harrowing is also mentioned in the Isin/Larsa period: one text from Larsa, dated to the 34th year of Rim-Sin, and another one, undated, list fodder provided for the operations of harrowing (šakšku) and levelling (šešru). The issue of fodder for these activities indicates that oxen were used for them.

In the Diyala period, in a letter found at Tell Harmel, reference is made to harrowing the irrigated fields, possibly in preparation for planting šanzarni.

Two laws of Hammurapi's discuss what steps must be taken by the renter of a field if he does not cultivate it. In one case he must plough and harrow the field (ma-a-sri i-ma-šš-Š-aš i-ba-šk-ka-šk) and return it to the owner (together with a fine of barley); in the second law, in which fallow or wasteland is involved, if the renter has neglected the field for three years (that is, for the first year of
preparation, the first year of cultivation and the first year of fallow), on the fourth he must plough, hoe and harrow (A.SA ma-a-ar-ti i-ma-ar-ha-as i-mar-ra-ar \ i-ša-ak-ka-ak)\textsuperscript{147} and pay a fine of barley according to the size of the plot. In both laws the owner of the field had it returned prepared ready for seeding and with a fine of barley to compensate him for the loss of his share of the previous season's crop.

The main words for plough are GIŠ.APIN.TUK.KIN, GIŠ.APIN.ŠU.KIN/ḥarbu (also maįaru/GIŠ.BAR.DIL).\textsuperscript{148} The ḥarbu is sometimes translated as a 'sub-soil' plough, but no true sub-soil plough could have been used on the soils of Mesopotamia, and such a description must be incorrect. The ḥarbu would be better translated as 'plough', used for the preparation of land for cultivation. GIŠ.APIN/epinnu is the seeder-plough

Seed-ploughing

'The Farmer's Almanac'\textsuperscript{149} gives detailed instructions about the setting of the plough-share and the depths of the furrows and their numbers. The man responsible for using the seed-funnel had to drop the grain carefully - a grain every 'two fingers'. There are also details about the type of furrows to be ploughed: where a straight furrow has been ploughed, plough a diagonal one and so on. Thus the seed-plough furrows are made across the preparation plough furrows. After the ploughing, clods of earth are gathered up and the furrows adjusted and smoothed.

Texts from Tello record areas of fields to be ploughed, cross-ploughed and seeded and the amount of fodder issued to the oxen used in the work. One text,\textsuperscript{150} dated to Lugalanda year 6, records a field of 8 bur 3 iku to be ploughed and seed-ploughed with oxen. The amounts of fodder average at 24 ȘILA per ikû for the first ploughing, and 12 ȘILA per ikû for the seed-ploughing. Another field (in the same text) is ploughed and 1 bur is cross-ploughed (KUR₅.RA).\textsuperscript{151} An allowance of 18 GUR.SAG.ĊAL is made as fodder for the first ploughing and an additional allowance of 3 GUR.SAG.ĊAL is given for the cross-ploughing. Seed-corn averaging 12 ȘILA an ikû is provided. Part of this field was planted with onions.
A letter to Lu-kala, in the Ur III period, gives instructions for barley to be given to two individuals for removing clods from the field. This activity is also mentioned in an Old Babylonian text from Larsa recording amounts of grain issued for fodder, seed-corn and rations.

In 'The Farmer's Almanac' 8 furrows per NINDAN are recommended. Texts from Nippur in the Ur III period show that the number of furrows per NINDAN varies between 8.5 and 9, while in Umma they varied between 9 and 12. The seed allowed per furrow also varied. 'The Farmer's Almanac' suggests 1 GIN (probably about 1/60 of a litre) per NINDAN. The Almanac rates work out at 13.33 SÌLA per ikû (1/60 x 8 x 100 x 1) while the Nippur seeding rate is around 14 SÌLA per ikû, and at Umma the rate is 16.7. Thus the more furrows per NINDAN the higher the amount of seed used on the field.

Irrigation and care of crops

'The Farmer's Almanac' does not mention weeding while the crops are growing, but it does recommend that the birds be kept away. Four irrigations are recommended. The first irrigation should be done when the barley is showing along the bottom of the furrow; the second when it is as high as a mat in a boat, and the third when it has reached the 'royal' stage (perhaps beginning to form ears). If the irrigated barley goes red then it is diseased, possibly a reference to rust. A fourth irrigation, when the crop is ripe, will increase the yield.

It is customary in the Diyala region in recent times to allow flocks on the fields to graze on the young shoots before they have produced ears of grain, and later to graze on the straw and stubble. This grazing on the young shoots can reduce the grain yield by about 10%. Such a practice may have been in existence in the Old Babylonian period. Two laws of Hammurapi's outline what fines exist if a shepherd of a flock brings his sheep and goats into a field to graze before the harvest, without the owner's permission. The main problem appears to be that the owner of the field did not give the shepherd the right to use his crops in this way and so has not been paid for them. In the Law No.57, the fine is 333.33 SÌLA per ikû but in the Law No.58, the fine is 1000 SÌLA per ikû. No reference is made to the owner.
harvesting the field in Law No.58, so that the heavier fine may represent the expected harvest plus a fine for the misuse of the field. As the owner is instructed to harvest the crop in Law No.57, presumably the sheep had not completely destroyed it.

Harvest

The harvest is described in the Almanac: the barley should be reaped before it has begun to bend over. Three men work as a team: one reaps, one bundles the mown barley and the third sets up the sheaves. After the harvest is over the gleaners may come into the fields, but they must take care not to do damage nor to take anything from the sheaves.

The tool used in harvesting is the sickle: the basic shape of which is a crescent. It can be made of pieces of flint set with bitumen in wood, of baked clay, of copper and/or bronze and of iron. Examples of sickles have been found in sites across Mesopotamia from nearly every period, from c.3000 to 600, including Kish, Nippur, Tello, ANShur, Warka, Nuzi, Nimrud and Khorsabad. Sickles made with flint teeth were found in all three millennia at Nippur, suggesting that they were in continuous use. Copper/bronze sickles were used in the third and second millennia and the only examples of iron sickles come from the first millennium from Assyria. The type of sickle used may have been dictated by the taste and wealth of the farmer.

There are few illustrations in Mesopotamia of actual scenes of reaping. But a painting from the tomb of Nakht (No.52) dating to about the reign of Tutmosis IV from Thebes in Egypt, illustrates the harvest and the subsequent preparation of the ground. A number of texts refer to the actual activities involved in harvesting. For example, a letter from the Ur III period gives instructions for builders to harvest 3 ikû each, after which they must perform an agricultural task (TAB) on 3 ikû and then thresh 3 GUR barley each. TAB probably refers to the bundling of the cut grain into sheaves and this order of activities is followed in other texts, for example in two from Ur.
Lists of the amounts of barley gleaned and the people who did the gleaning appear in texts attributed to Lagaba, a town probably between Sippar and Babylon.\(^1\) The lists date to the reign of Marduk-apla-iddina in the Old Babylonian period. Many of the gleaners are women. The dates of the texts give March/April for the harvesting and April/May for gleaning; these are early in comparison with the dates of today (see 1.1.3, p.12). It is possible that these particular areas may have been planted early or else that the climate around that time was a little warmer than now so that the crop ripened earlier.

**Threshing, winnowing and storage**

*The Farmer's Almanac*\(^1\) records the preparations to be made before the threshing and winnowing: for instance, the storage bins should be prepared, the threshing floor made level, the threshing machines made ready. The sheaves had to be transported to the threshing floor and piled into a mound. Various prayers and ceremonies were carried out before the threshing began. Teams of two men were responsible for the winnowing, and after that the barley was stored.

Groups of texts, probably from Umma in the Agade period, list amounts of threshed barley, emmer-wheat and 'bread'-wheat.\(^2\) These texts are dated to the 4th and 5th months (probably June/July and July/August). The specific reference to threshed grain would suggest that the threshing had just taken place. This in turn would suggest that the harvest time in the Agade period was at about the same time as the present day (late April to early June) and a little later than in the Old Babylonian period.

There is little archaeological evidence for threshing tools but there is some textual evidence, and some ethnographic parallels.

There are four main methods of threshing:

1. Pounding or grinding with a mortar and quern; Helbaek found evidence for the use of this method on cereals at Tepe Ali Kosh.\(^3\)
2. Beating with a stick: this is the method which is described in the phrase 𒂍.𒈾.RA - grain beaten (that is, threshed: RA) with a stick.\(^4\)
(3) Using animals to walk across the piles of grain and thresh it with their hooves: this is illustrated in Egypt, where both donkeys and cattle are used. 

(4) The use of threshing-sledges (with flint-teeth fastened underneath or with wooden paddles): 'The Farmer's Almanac' advocates the use of threshing sledges. There the 'teeth' are fastened with leather and bitumen (?), and oxen are used to draw the sledge. This method of threshing is still carried out in the Near East, although the sledges may sometimes have revolving metal discs or wooden paddles instead of flint teeth on the bottom. (Fig.11)

Winnowing is another technique which leaves little archaeological evidence. Textual references suggest it would have been carried out with a spade (GIŠ.MAR.ŠE.UR.RA - spade of the winnower) or a fork (GIŠ.AL.ZU.LIMMU.BA = ti-ten-nu = (mar-ru) za-ri-i - hoe with four teeth, winnower's fork). These spades and forks would be used to scoop up the threshed grain and toss it in the air so that the lighter chaff is blown away by the breeze and the heavier grain falls to the ground (Fig.12). An illustration from Egypt shows scoops being used to toss the grain in the air.

In Southern Iraq at the present time, millet is threshed by beating with a stick or treading by animals, and rice is threshed by muzzled animals being driven over it. Cattle and occasionally donkeys are used for threshing. Winnowing, usually done by women, is carried out with baskets - men use winnowing forks or paddles.

Agricultural year

It can be seen that the same sequence of events was followed in cultivation in ancient Mesopotamia as in present-day Iraq. Some attempts have been made to place the agricultural cycle of ancient Mesopotamia within our calendar. One such attempt was made by Landsberger and in the table below his list is compared with the sequence of work found in the Diyala area by Adams in connection with his settlement survey.
Table 5

<table>
<thead>
<tr>
<th>Activity</th>
<th>Ancient Mesopotamia</th>
<th>Diyala</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early barley harvest</td>
<td>April (I)</td>
<td>April</td>
</tr>
<tr>
<td>Main barley harvest</td>
<td>May (II)</td>
<td>May</td>
</tr>
<tr>
<td>Threshing, winnowing and delivery of barley</td>
<td>May-June (II/III)</td>
<td>July-September</td>
</tr>
<tr>
<td>Storing of barley</td>
<td>July (IV)</td>
<td>July-September</td>
</tr>
<tr>
<td>Preparation of fallow land and land for sowing</td>
<td>June (even May) (III)</td>
<td>October-November</td>
</tr>
<tr>
<td>- Reclaimed land</td>
<td>July-August (IV/V)</td>
<td>October-November</td>
</tr>
<tr>
<td>Early sowing</td>
<td>September (if early rain) (VI)</td>
<td>October</td>
</tr>
<tr>
<td>Main sowing</td>
<td>October (VII)</td>
<td>November</td>
</tr>
<tr>
<td>Late sowing</td>
<td>November-December (VIII/IX)</td>
<td>December</td>
</tr>
<tr>
<td>Irrigating crops</td>
<td></td>
<td>March</td>
</tr>
</tbody>
</table>

Some of the differences between the ancient Mesopotamian dates and the Diyala dates may be due to the fact that the Diyala lies slightly further north than the south of the alluvial plain and the weather becomes hot earlier in the south. In addition Landsberger's table is based on all his evidence and therefore does not apply to any single period or area. However, it is interesting as a general guide for agricultural activities.

The most striking differences between the two timetables is the preparation of land during the summer months and the beginning of sowing in September in Mesopotamian times. Some comments on these points have already been made (see pp.65-66). At the present time work cannot be carried out during the summer because the heat and because the soil is so hard that it cannot be broken up by the shovel-pointed ploughs. In some areas soil conditions may not become suitable for cultivation until November. 'The Farmer's Almanac' instructs that there should be a preliminary irrigation before preparing the ground for ploughing, which suggests that the soil was too hard to be worked without being softened. A heavy irrigation, which will leach the salts down through the soil, means that there must be a delay before the soil can be ploughed, during which time it may harden again, and further
moistening will be necessary. A light irrigation will not only not be enough to wash down the salts but will tend to increase them because of evaporation. However, if the ground can be prepared during the summer the seed can be sown in September, ensuring a higher yield. There seem to be two main possibilities: either the Mesopotamians lived only for the current season, being content to get the highest possible yield for that year and ignoring the accumulating damage to the soil, or the threat from salinity was not as great as it is today. It seems unlikely if not impossible that they would not observe the damage done by increasing salinity nor that they would not know its cause. It is possible that they believed that the use of the fallow system would allow the soil to recover, but such recovery will not continue for ever. There will be a gradual deterioration each year and eventually salinity will increase to such an amount that the soil cannot be cultivated and the area must be abandoned. Some of the changes in settlement pattern may be due to new areas being colonized for this reason, although changes in river systems due to flooding are likely to have provided more urgent reasons. There are sufficient references to salinity in the third millennium texts (see 2.4, pp.88-9) to show that this was a recognized problem then and decreasing yields during the Isin/Larsa and Old Babylonian periods indicate that, although there are fewer known references to salinity, agricultural problems continued. It would seem that the practice of preparing the soil during the summer months was not an efficient one, but rather contributed to the exhaustion of the soil. It is possible that it was first advocated at a time when salinity was not a pressing problem but it might be expected that the farmer would have learned to adapt his activities to the changing conditions. Not to do so argues a slavish dependence on tradition.

2.3 Agriculture in the northern plains of Assyria

The main difference between agriculture on the alluvial plains and agriculture on the northern plains of Assyria is that the latter is for the most part within the 300 mm isohyet and therefore depends on rainfall for its main source of water, rather than irrigation.
2.3.1 Irrigation

There is only slight evidence for irrigation being used to assist rainfall in northern Mesopotamia. At Tell Rimah, near Tell Afar, in the early second millennium, two letters give instructions for water to be provided for fields - in one case the water is to be provided for a town so that the fields may be cultivated and in the other, water is required for fields belonging to the governor. At Nuzi, near Kirkuk, in the mid-second millennium, a text records a lawsuit brought by a woman with regard to irrigation water assigned to her by officials but cut off by another person for his own fields. The lady won the case and received compensation of one ox from the defendant. A study of texts by Zaccagnini at Nuzi has shown that out of a total of 147.5 imEru of cultivated land listed, 44.5 imEru was either irrigated land or land bordering on watercourses - 30% of the area listed. These local instances of irrigation in the second millennium show that supplementary sources of water were used in the north. This was probably because irrigated fields were found to give higher yields than rain-fed fields: at Nuzi Zaccagnini found that many of the higher yielding fields were irrigated or lay near watercourses while few of the low-yielding fields were irrigated.

In the first millennium the Assyrian kings had various large-scale irrigation works constructed. Nimrud, in the 9th century BC, was situated above the flood plain of the Tigris, with the river running immediately beneath the citadel and on the eastern edge of its flood plain. Ašurnaṣîrpal II records building a canal from the Greater Zab which he used to irrigate the 'meadow-land' of Kalhu (Nimrud). He apparently planted gardens and orchards in the area. The line of this canal has been traced over part of its course. Following it back from the city itself it ran from near the south-east corner of the outer walls of Kalhu, south along the east edge of the alluvium following the contours of the land, until it reached the Greater Zab. Here it entered a rock-cut channel on the bank of the Zab. During part of its course it received water from the Zab through a rock-cut tunnel, which was made by linking two shafts sunk from the surface. This tunnel runs from east to west through a prominent conglomerate
bluff on the north bank of the river near the village of Quwair. At the foot of the first vertical shaft a low barrier was carved out of the natural rock and pierced by three round-headed openings which probably acted as sluices. Steps had been cut to serve the sluices and reach the bed of the tunnel. A branch tunnel off the river to the southern edge of the bluff is now filled with silt. It seems to have been provided with sluices and may have been an alternative regulator and feed for the canal. The two regulators were probably not built at the same time but represent successive answers to the same problem. A third, open, channel cuts through the bluff some 500 m north of the tunnel and can be traced for another 3 km upstream. Beyond this point it has been suggested that the unusually straight line of the western channel of the Zab was originally the bed of the old canal into which the river may have cut its way. Aššurnaṣirpal's canal may have originated at the confluence of the Upper Zab and the Khazir, about 17 kms above the tunnel. The different tunnels and open channels cannot be dated. Tiglath-Pileser records restoring a canal (the Ḥatti-‘uṣurḫû) and this may have been the southern regulator tunnel, now filled with silt. If so, the other tunnel with the vertical shafts could have been built by Esarhaddon who left an inscribed stone tablet in it. Thus the long open channel may have been part of Aššurnaṣirpal's original canal but its use as a feeder for the canal would have been lessened by the changes in the course of the Zab. One of the reasons for providing Nimrud with this extra supply of water for irrigation may have been because of the increased population, partly due to the immense labour force required for all the building-work at the city.

Sennacherib was responsible for various irrigation works in the neighbourhood of Nineveh. The most elaborate of these was the digging of a canal from Bavian, near Hines on the Gomel River, which joined the Khoṣr river, a tributary of the Tigris. The work included a masonry and cement aqueduct to carry the canal over a natural wadi at Jerwan. Corbelled arches, with breakwaters, to control the wadi's flood waters, supported the canal which may have been used as a roadway when not required for irrigation. The project was completed about 695 BC, an inscription found on the cliff face above the head of the canal near
Hines includes an account of Sennacherib's first eight campaigns. This canal system increased the amount of water available from the Khoar river and the streams from the Jebel Bashiqa which were used by Sennacherib to irrigate orchards and a royal park around Nineveh. The irrigation water was also used for grain crops – said by the Hines inscription to grow between Nineveh and Tarbiṣu. More water was provided for this area by the diversion of a stream coming from the Jebel al-Qosh, at Bandwai 30 kms west of Hines, to join the wadi al-Milh. This wadi now joins the Tigris east of Eski Mosul but was then diverted near its mouth along a second canal which followed the course of the Tigris. Both the canal joining the Bandwai stream to the wadi al-Milh and the canal running from the wadi to Nineveh along the Tigris have been traced on the ground.¹⁸⁹

Sennacherib was also responsible for a project supplying Erbil with more water.¹⁹⁰ The entrance of a tunnel on the left bank of the Bastura Chai was marked by Assyrian masonry. An inscription on one block near the entrance records the digging of three rivers in the mountains near Erbil, to which was added the waters of the springs, all of which was brought by canal to the city of Erbil. Three streams fitting this description can be seen at Susah, Zujarat and Qirzah. The line of the supposed canal was marked by wells found at regular intervals and it is suggested that this may in fact be the remains of the shaft-openings for a qanat-type canal. Laessoe has suggested that this and the tunnel cut by linking vertical shafts on the Pattir may have been inspired by the Urartian qanat system of irrigation which was seen by Sargon II during the 8th campaign. The principle of irrigation by qanats is that the subsoil water is tapped. A series of shafts are sunk from the ground surface until they reach the water-level. The shafts are connected by a tunnel which continues at a slope which is slightly less steep than the ground surface, until it cuts the surface and reaches open air. The subsoil water drains along the tunnel and is then carried by other means, for instance canals, to the area where it is required. The shafts are kept open in order that the tunnel can be kept clear of soil-falls and mud etc. The course of such qanats can be followed on the land surface by the circles of earth which gradually build up round the mouths of the shafts. This form of
Irrigation is common in Iran at the present time where qanats can vary in length from ones sufficient to supply a single house and small garden to others which can supply a whole city such as Kerman. South of Kirkuk these underground canals are used today to collect water from the gravel hills and take it to the lower-lying fields. This type of irrigation was certainly used by the Achemenians in Persia and in Lydia but the evidence for its use in Assyria is not certain. Laesoe makes it plain that it is not clear whether Sennacherib’s tunnel, nor the Patti-tunnel were used to tap the subsoil water. However, as the Bastura Chai is dry during the summer while the subsoil drainage continues it is possible that, at least in the case of the Erbil project, the purpose was the tapping of the subsoil water and the canal can be reasonably called a qanat.

Land could be watered by canal and by buckets; \( \text{bit aTq} \) refers to land irrigated by gravity flow from a stream or canal and \( \text{bit dálání} \) refers to land irrigated by using buckets to draw water from wells or cisterns. Sennacherib encouraged the storing of water in reservoirs and the building of wells. One of his inscriptions tells how he made arrangements so that water might be drawn (from wells) every day. One of the improvements consisted of replacing shadufs by some sort of hoist. The water-table in Assyria is low, and shadufs can only raise water about 2 m so that these would have been an inefficient method of raising well-water. However, Sennacherib’s reference to replacing them together with the illustration of shadufs in use from his reign show that they had been in use in Assyria at that time at least. All these references to irrigation suggest that irrigation was only used as a supplementary source of water. The region which could be irrigated by Assurnasirpal’s canals stretches from the river to the edge of the flood plain. At present that area is not more than 10 kms by 5 - some 5000 hectares. It would have been a smaller area in the first millennium because the river flowed nearer the eastern edge of the flood-plain, so that probably only half (2500) that amount would receive irrigation. Some of the land was planted as orchards but some appears to have been used for barley as there are references to barley grown on irrigated meadow land being used for rations of the workmen. Even if half the area was set aside for barley, only a
further half could be cultivated each year giving some 625 hectares of irrigated barley fields.

2.3.2 Farming techniques in Assyria

Farming in the Assyrian plains in present day Iraq follows the fallow system. Half the land is left fallow and half cultivated with winter grain. The fallow land is ploughed first in about March so that the soil is loosened while it is still moist with winter rain, and to make sure the best use is made of the spring rain. No particular attention is paid to the direction of the ploughing. A second ploughing is done across the original ploughing a few weeks later. The fields are usually then left alone for the summer so that weeds grow. This allows the leguminous weeds to add nitrogen and organic material to the soil. In addition the weeds prevent wind removing soil. Sheep and goats are allowed to graze on these weeds. A third ploughing is done in September, the seed is then broadcast, and a fourth ploughing is done crosswise to cover the seeds. The seeds will not germinate until the rains come. The grain, now predominantly wheat, is harvested in May and June. Flocks are allowed into the fields as soon as the harvest is completed. During the fallow year flocks are also grazed on the fields during the winter.

Fallow

It seems likely that the fallow system was also followed in Assyria. The evidence comes mainly from the first millennium. For example, there is a record of a loan of silver with interest on the loan being paid by the transfer of a field of 6 homers. In the details of the transactions it is stated that the field is to be of 4 homers of cultivated land and 2 homers of fallow land, but the areas of cultivation and fallow are to be so arranged that there are 4 cultivated plots and 4 fallow plots. This suggests that the areas of cultivation and fallow are to move around within the 6 homer field. One third of the field is left fallow at one time.

Other texts suggesting that fields were cultivated for one year and left fallow for the next were found at the Temple of Mamu at Balawat, also from the first millennium. In one, a field is leased
for 20 years and it is specifically stated that 10 years it will be
cultivated and 10 years it will be left fallow. In another example
the lease is 30 years, 15 cultivated and 15 fallow. This latter field
is at Nineveh. Probably the farmer cultivated half the area of the
field each year.

Ploughing and sowing

The ploughing was probably carried out in much the same way as
in the southern plains. Some texts from Tell Rimah, dating to the
Old Babylonian period, refer to breaking the ground. A letter from
Ili-Samaš to Warad - Šarrim says that a man is to be given 20 ｉｉｉｉｉｉｏｆ
land and 'let them break the ground' (ｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉｉ
This may refer to the first work on the fallow ground with a spade
or to the first ploughing of the ground.

Cylinder seals, found at Ashur and dated to the 13th century,
include ploughing scenes. In one example a man is using a plain plough
drawn by a humped ox while in another, although the design is obscure,
a man drives a seeder-plough drawn by a humped ox. The seeder-plough
also appears to have been known in Assyria in the first millennium
(see also 2.2.4, p.70-1). In one cylinder seal a man is shown
drawing a seeder-plough pulled by a humped ox. It should
be noted that Russel feels that the plough on the Khorsabad temple was
not workable and represents an artist's idea of a seeder-plough.

Three iron plough shares were found in the Magasin 144 Room 84, of
the Palace at Khorsabad. These had sockets for fitting onto the wooden
plough. In Place's illustration the ends appear to be blunt rather
than arrow-pointed as the northern ploughs are in Iraq today.

Harvest, threshing and winnowing

The techniques involved in these activities were similar in the
southern plains and in Assyria. The types of sickles cited in Note
162 show that copper sickles were in use at Ashur in the third
millennium and at Nuzi in the second. Iron sickle blades were common
at Nimrud and Khorsabad in the first millennium.
2.4 Yields and Seeding Rates

The test of all arable farming techniques is the yield of grain from the fields and the return of grain over the amount of seed used.

The following discussion is based on a limited number of examples and does not pretend to be based on all the existing evidence. It is recognized that other texts may alter the averages which have been calculated. Another factor which must be remembered is that yields can vary from year to year and that the results drawn from a few examples may be biased by a particularly good or bad year, or by the efficiency of individual farmers. However, when a random selection of examples (as these texts can fairly be called) is made, it is probable that they will be characteristic of the situation as a whole. It has been assumed, therefore, that the texts examined provide reasonably accurate evidence for the yields and seeding rates of Mesopotamia.

Early Dynastic

Lagash: Seeding rate: 12 SILA per ikū\(^\text{209}\)

Lagash: Yields per ikū

<table>
<thead>
<tr>
<th></th>
<th>Barley:</th>
<th>Emmer-wheat:</th>
<th>'Bread'-wheat:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lugalanda Yr. 4: 210</td>
<td>917.3 SILA</td>
<td>1171</td>
<td>702</td>
</tr>
<tr>
<td>Lugalanda Yr. 6: 211</td>
<td></td>
<td>Mixed barley and emmer: 720212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barley: 1086 212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average rate for barley only:</td>
<td>1004.6 SILA per ikū</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on seed: 83.7 fold.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the text for Lugalanda Yr. 4 gives a higher yield for emmer-wheat than for barley, when the text from Yr. 6 with a return for mixed barley and emmer-wheat is compared with the one for barley alone, it would seem that the emmer-wheat may have kept the yield down.

Average of barley in litres per hectare: 2316
### Post-Agade

<table>
<thead>
<tr>
<th>Region</th>
<th>Yields per ikû</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lagaš</strong></td>
<td></td>
</tr>
<tr>
<td>Gudea's reign: Barley:</td>
<td>481.5 (213)</td>
</tr>
<tr>
<td></td>
<td>Barley:</td>
</tr>
<tr>
<td><strong>Average rate for barley:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Average in litres per hectare:</em></td>
</tr>
</tbody>
</table>

As can be seen there is a considerable drop in yield since Lugalanda's reign in the Lagaš area. Information about the seeding rate used is lacking, so that no figures can be calculated for the return of grain over seed.

### Ur III

**Seeding rates**

<table>
<thead>
<tr>
<th>Region</th>
<th>Rate per ikû</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lagaš</strong></td>
<td>25.6 SîLA per ikû (215)</td>
</tr>
<tr>
<td><strong>Nippur</strong></td>
<td>14 SîLA per ikû (216)</td>
</tr>
<tr>
<td><strong>Umma</strong></td>
<td>16.7 SîLA per ikû (217)</td>
</tr>
<tr>
<td><strong>Farmer's Almanac</strong></td>
<td>13.3 SîLA per ikû(218)</td>
</tr>
<tr>
<td><strong>TCS I No.93</strong></td>
<td>29.4 SîLA per ikû (219)</td>
</tr>
</tbody>
</table>

It can be seen that the seeding rate in the Lagaš area has doubled since the Early Dynastic period but at Umma it is about 17 SîLA per ikû. At Nippur it is only a little higher than the rate advocated in the Farmer's Almanac.

### Yields

<table>
<thead>
<tr>
<th>Region</th>
<th>Yields</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lagaš</strong></td>
<td></td>
</tr>
<tr>
<td>Šulgi</td>
<td>500 (219)</td>
</tr>
<tr>
<td>?Šulgi</td>
<td>430.5 (220)</td>
</tr>
<tr>
<td>Amar Sin 7:</td>
<td>530 (221)</td>
</tr>
<tr>
<td>Amar Sin 8:</td>
<td>417 (222)</td>
</tr>
<tr>
<td>Ibbi Sin 3:</td>
<td>719 (223)</td>
</tr>
<tr>
<td>undated:</td>
<td>1000 (224)</td>
</tr>
<tr>
<td></td>
<td>75 (225)</td>
</tr>
<tr>
<td></td>
<td>330 (226)</td>
</tr>
<tr>
<td></td>
<td>400 (227)</td>
</tr>
<tr>
<td></td>
<td>120 (228)</td>
</tr>
</tbody>
</table>
As can be seen, there is a considerable drop in yields at Lagaš although the yield at Ur is slightly higher than that found at Lagaš in the Early Dynastic period (see Appendix I for different values of Sīlās in litres). The return of grain over seed at Lagaš averages 14.8. If the seeding rate at Ur is assumed to be that recommended in the Farmer's Almanac the return averages 68. Taking an average of all the seeding rates, 19.8 - the return from Lagaš and Ur together averages 32.5 fold. But this average masks the contrast between the conditions at Lagaš and those at Ur, even allowing that the return at Ur was an exceptionally good one.

Old Babylonian period

Seeding rate

<table>
<thead>
<tr>
<th>Location</th>
<th>Seeding Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rimah</td>
<td>10 Sīlā per ikū²³³</td>
</tr>
<tr>
<td>Larsa</td>
<td>22.22 Sīlā per ikū²³⁴</td>
</tr>
<tr>
<td>?Sippar</td>
<td>26/27 Sīlā per ikū²³⁵</td>
</tr>
</tbody>
</table>

Yields

<table>
<thead>
<tr>
<th>Area</th>
<th>c.1900-1700</th>
<th>c.1700-1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sippar &amp; Dilbat area</td>
<td>799.25²³⁴</td>
<td>395.38²³⁷</td>
</tr>
<tr>
<td>Lagaš</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hammurapi Yr. 32;</td>
<td>306.7²³⁸</td>
<td></td>
</tr>
<tr>
<td>15 &amp; 16th Simānu:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average for period: 500.4 Sīlā per ikū Av. in litres/hectare: 1390
Return on seeding rate (excluding Rimah): 20.5

The yields at Lagaš appear to be still falling - they have fallen by two thirds since the Early Dynastic period. During the whole Old Babylonian period there would seem to be a gradual drop in yields.
The seeding rates from Rimah have not been taken into the average seeding rate for the south because Rimah is situated in the north of Mesopotamia and therefore conditions there are less readily comparable to the other towns listed. Unfortunately there is no information at present about yields at Rimah.

**Mid-second millennium**

**Nuzi**

Seeding rate - average per hectare: 38.5 litres

Yields - litres per hectare:  

<table>
<thead>
<tr>
<th>Cereal</th>
<th>Yield (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>gajätu</td>
<td>593</td>
</tr>
<tr>
<td>barley</td>
<td>181</td>
</tr>
<tr>
<td>emmer wheat</td>
<td>212.3</td>
</tr>
<tr>
<td>bread wheat</td>
<td>118.66</td>
</tr>
</tbody>
</table>

It can be seen that gajätu (a word normally taken to refer to a dish or preparation made from a cereal but at Nuzi used to describe an actual cereal grown there)\(^{240}\) and emmer-wheat outyield barley at Nuzi, and the return of barley over seed only averages 4.7 litres per hectare.

The role of irrigation in cereal cultivation at Nuzi is complex. Zaccagnini in his study of Nuzi agriculture has found many references to fields being irrigated and to fields lying along rivers and canals. He considers that the variations of yields found from field to field may indicate that the high yielding fields were irrigated (see above 2.3.1, p.79, and Note 184). However, the yield for all these cereals is lower than any found for barley in southern Mesopotamia. The return of grain over seed found in Zaccagnini's study varies from 10 to 1.5. The highest figure of 10 is lower than the return found at Lagaš in Hammurapi's reign (12.5 - based on the average seeding rate 24.5 from Larsa and Sippar). All this suggests that the main source of water at Nuzi was rain and that irrigation was not widespread.

The steady drop in yields from the Early Dynastic period until the end of the Old Babylonian period and especially in the Lagaš area is striking. There are probably a number of causes. Firstly, there is the problem of soil salinity. References to areas of ground left
unworked because of salinity are found in texts dating to the reign of Urukagina at Lagaš. In one text 5% of the area recorded is called saline. Similar references occur during the Agade and Ur III periods, and in the latter period the references come from Ur as well as Lagaš. The yields, however, indicate that the salinity was not such a serious problem at Ur as it was at Lagaš.

The increasing seeding rate, especially in the southern part of the plain around Lagaš, and then later in the Old Babylonian period in the northern area around Sippar, suggests that the fertility of the soil was not being renewed so that more seed was required to get a reasonable return.

The situation at Lagaš appears to have been worse than in the rest of the alluvial plain. It is possible that the fertility and high yields of the Early Dynastic period were mainly due to the increased water-supply brought about by Entemena's canal to the Tigris which would have allowed more areas to be cultivated and irrigated. Excess irrigation, without adequate drainage, will raise the water-table and the soil will become saline. The Agade and Ur III rulers in the south were more interested in other areas than in Lagaš and it would seem that the fertility of the land had already begun to fall by Gudea's reign in the post-Agade period.

2.5 The Adequacy of the Grain Crop

The test of the adequacy of a grain crop is whether it will feed the population, the flocks and herds, provide the next year's seed corn and provide a surplus for trading and storage against bad years. While the population of ancient Mesopotamia is by no means established, estimates can be made (see Appendix 2) so that some idea can be got of whether the average yields for each period would have been adequate.

The following figures have been calculated on the basis of 2 litres per head of population per day (see Chapter 4). This total has then simply been doubled to cover fodder, seedcorn, taxes, surplus,
etc, and the total calculated for the whole year (365 days). The number of hectares required to provide the annual grain is calculated according to the average yield for the period. That area has also been doubled to allow for an equal area to be left fallow each year. Finally the number of hectares per head of population required has been worked out.

Table 6

<table>
<thead>
<tr>
<th>Period and estimated population</th>
<th>Yield litres per ha. per year</th>
<th>Nos. of ha. required under cultivation</th>
<th>Total of land area occupied in hectares per head</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARLY DYNASTIC 1,578,953</td>
<td>2800</td>
<td>2,305,271,380</td>
<td>1,002,291.9</td>
</tr>
<tr>
<td>AGADE 1,266,470</td>
<td>1400</td>
<td>1,849,041,200</td>
<td>1,320,704.3</td>
</tr>
<tr>
<td>UR III 1,560,421</td>
<td>1700</td>
<td>2,278,214,660</td>
<td>1,340,126.27</td>
</tr>
<tr>
<td>ISIN/LARSA 1,994,223</td>
<td>1500</td>
<td>2,911,565,580</td>
<td>1,941,043.7</td>
</tr>
<tr>
<td>OLD BABYLONIAN 2,611,831</td>
<td>1300</td>
<td>3,813,273,260</td>
<td>2,993,287</td>
</tr>
<tr>
<td>KASSITE 2,581,297</td>
<td>1000</td>
<td>3,768,693,620</td>
<td>3,768,693.6</td>
</tr>
<tr>
<td>NEO-ASSYRIAN 821,310</td>
<td>640</td>
<td>1,021,709,640</td>
<td>1,596,734</td>
</tr>
</tbody>
</table>

For comparison, in 1957/58 (AD) the cultivable area in all the liwas in Iraq were 7,536,402 hectares with 3,553,946 hectares under wheat and barley;245 with a population (in 1959) of 6,413,658246 approximately .55 hectares of land under cultivation per head of population (1.17 hectares of cultivable area per head). The production of wheat and barley was 1,682,930 tonnes247 about .73 kg per head per day. In the pre-1930s248 there were some 1,675,367 hectares under wheat and barley. The population in 1943 was estimated at 3,995,000249 and in 1937 there were about 1,835,215 hectares under wheat and barley averaging .45 cultivated hectares per head of population. The approximate yields of wheat and barley for 1937/38 was 1,171,144 tonnes250 which works out at roughly .8 kg per head of population, per day.
As can be seen, the land areas required for fallow and cultivation are within the cultivable areas of 1957/58, with the exception of the Kassite period which is just over. The area of hectares required to be cultivated are also within the areas under wheat and barley in 1957/58, except again for the Kassite period, which is just over. The Isin/Larsa, Old Babylonian and Kassite periods are all outside the areas under wheat and barley in the pre-1930s and in 1937.

The number of hectares per head of population are within the limit of cultivation. In 1957/58 the average area cultivated in the north, by one agricultural labourer (including those below 14 and both males and females) was 7 hectares. In the southern liwas the average was 4 hectares. (The average for the whole country is 4.9 hectares.\textsuperscript{251}) Remembering that the hectares per head of population include the fallow areas, this suggests that there would have been no problem from a labour point of view in cultivating the required areas of land.

The picture of a gradually falling yield may be deceptive, especially as the yields used for the Kassite period and the Neo-Assyrian periods are taken from other periods. It might be better to take the Kassite yield as 640 litres per hectare (that is, to include the figures for Nuzi which come from a comparable period) rather than 1000. If this is done 5,885,459 hectares are required to be cultivated (11,770,918 hectares of cultivable land altogether) with 4.5 hectares a head. These figures are on the high side. It would seem likely that if the population and yield figures for the Kassite period are roughly right, then the average amount of food a day must have been lower than 2 litres. This possible lowering of the food supplies could have been a factor in the drop in population suggested for the later second millennium. However, too much should not be made of this point as so many of the figures involved are estimates.

2.6 Pastoral Farming

Pastoral farming — that is, the keeping of herds of domestic animals — played an important part in the economy of Mesopotamia. Wool and hair from sheep and goats were required to manufacture cloth
- the profession of weaver\textsuperscript{252} is one of the most common recorded in the administrative texts and 'factories' of weavers were established in many cities, for example Mari and Karana (Tell Rimah) in the Old Babylonian period. In fact the textile industry formed a backbone of trade, especially during the third and second millennia.\textsuperscript{253} Tanning was another important industry and hides from sheep, goats and cattle were used for many items, such as bottles,\textsuperscript{254} inflated rafts,\textsuperscript{255} to cover quivers and shields etc., and even to cover ritual drums.\textsuperscript{256} In addition cattle were used as plough teams and to draw carts. The dung from the flocks and herds may have been one of the main sources of fuel, as it is today in the marshes.\textsuperscript{257} As suppliers of food, sheep, goats and cattle may have been more valued for their dairy products, than for their meat, the use of which would destroy a capital asset. Pigs were also kept in many periods, mainly as suppliers of meat and fat, although their hides may have been used by the tanners. (Pigs and dairy products will be dealt with in Chapter 3.)

Evidence for the existence of these animals comes from the discovery of bones on excavated sites and representations on cylinder seals, plaques, stone jars, reliefs etc. Some information about the care of the herds can be found in the economic and administrative texts.

\textbf{2.6.1 Care of the herds}

The animals were grouped together in herds under shepherds. In general sheep and goats were herded together while cattle were kept separately.\textsuperscript{258} (Fig.14) There may have been sub-divisions within large herds of sheep and goats. In the late Early Dynastic period at Lagaš ration lists from the reigns of Lugalanda and Urukagina include amounts issued to a cattle herder (SIPA.GU₄), shepherd of breeding flock (SIPA.AMA.GAN+ŠA), shepherd of wool-sheep (SIPA.UDU.SIG.KA), and occasionally goat-herder (SIPA.MAŠ).\textsuperscript{259} This suggests that sheep kept specifically for wool were kept apart from those animals used for breeding - or, rather, that shepherds were given responsibility for specific categories of animals.
A text from the Ur III period gives information about the growth of a herd of cattle. It shows how a herd starting with six grew to 32 in ten years. The rate of fertility seems to be 1 calf to every two cows each year. In the case of this herd, no bull was listed so that one must be either brought to the cows or else the cows taken to the bull.

In the Old Babylonian period it has been shown that a birth rate of 80 lambs per 100 ewes is expected, in 'state'-owned flocks at least. The sheep were handed over to the care of shepherds after the spring shearing which usually took place in the 11th or 12th month (around February/March). The shepherds may have been allowed to keep any additional lambs (that is over the 80 per 100) as part of his remuneration and as an incentive to keep the flock in good health. Losses of sheep due to carelessness on the part of the shepherd had to be made good, and this also appears to apply to a drop in the birth rate. If animals died because of attacks by lions or certain unpreventable illnesses (called lipit ilim - touch of a god), the shepherd was not penalized provided he took an oath to that effect. If however he allowed sheep to stray, and could not produce their skins to show that they had died, he had to replace the losses. If the owner of the sheep wanted to kill a sheep he had to supply the shepherd with a tablet saying so and the shepherd brought this with the flock when he returned them to the owner at the next shearing.

An essential factor in the care of sheep and goats is the availability of adequate pasture for feeding, and this may involve the shepherds in a semi-nomadic way of life in which they had to move the herds from area to area in search of grazing. Today the Bakhtiari tribes of Khuzistan move their herds and all their people into the high mountains for summer pasture and return to the plains in the winter. A similar sort of regime is followed by the herdsmen of Iraq, although on a smaller scale. During the winter, the herds are grazed on land away from the areas of cultivation, and on fallow areas, while after harvest the animals may be brought into the reaped fields to graze on the stubble. In some cases sheep and goats may even be allowed to graze on the young barley shoots before the harvest, the herder paying the owner of the field for this privilege.
It is probable that these were the sort of practices in use in ancient Mesopotamia. A text from Early Dynastic Lagash refers to an area of a field set aside for pasturing cattle, possibly left fallow.\footnote{263} And a law of Hammurapi's (from the Old Babylonian period) may deal specifically with the practice of grazing sheep and goats on other peoples' cultivated fields.\footnote{264}

Sometimes special steps were taken in the feeding of the animals. At Old Babylonian Mari, two rams, two ewes and 2 lambs are recorded as being placed in the hands of a gardener;\footnote{265} they were to graze in the grass of the orchard tended by this man. In addition, or perhaps instead of, feeding on pasture, there are many cases in which animals received barley as fodder. Sometimes this may have been to supplement the ordinary grazing, or because the pasture was poor that year, but in most cases the barley was deliberately given to fatten the animal.\footnote{266} The place where the animals were sent for this fattening is often specified as bētu mārû - house of fattening. Chopped straw (kissatu) was also used as fodder.\footnote{267} In the Neo-Assyrian period this was sometimes written with the determinative ŠE and it may then have referred to supplied fodder (that is, not pasture) other than straw. For instance in a letter to the district governor the writer says 'We are collecting much straw and fodder' (ŠE.IN.NU.MEŠ ŠE ki-su-tu ma'-da nu-sa-dan)\footnote{268} The ki-su-tu referred to in a letter to the king in connection with supplies of fodder and bread for the army\footnote{269} may also mean supplied fodder (possibly a mixture of barley and straw) rather than chopped straw alone. The practice of fattening animals on barley continued into the Neo-Assyrian period as fattened cattle (GU₄.MEŠ ŠE.MEŠ) formed part of the provision for Ashurnasirpal's banquet at Nimrud.\footnote{270}

The number of male animals which are listed as belonging to herds\footnote{271} suggest that the majority would be castrated. This would mean that breeding could more easily be controlled. However, there are few references to this in texts. One text from Lagash, which gives a list of cattle and donkeys with their ages and descriptions of the state of their eyes (i.e. blind, good eyes, one eye etc) described some three-year-old and four-year-old oxen as AMAR TAR AM₅.\footnote{272} One of the
suggested readings of TAR is メ책 - castrate but an alternative is KUD - AMAR.KUD - healthy young beast. References to males capable of siring young occur, for instance 'bull (for breeding)' (GUD.NINDÁ/biru). A text from Ugarit from the second millennium refers to geldings so that the practice of castration certainly existed.

2.6.2 Main types of pastoral animals

Sheep

Hilzheimer has identified three breeds of domestic sheep in Mesopotamia during the third millennium. He classified them as (1) hairy short-tailed sheep, with pendant ears; the male has a mane and horizontal corkscrew horns; (2) wool-coated sheep, with very short lean tail, and erect or pendant ears, the males have heavy coiled horns; (3) fat-tailed, wool-bearing sheep, the males have coiled horns.

Type (1): hairy short-tailed sheep:

Examples of type (1) are found on the Warka vase from the Jemdet Nasr period at Warka. On this, a file of male and female sheep are depicted walking round the vase on the second register from the base. The males have convex profiles, heavy chest manes, short upright ears, short tails reaching to the top of the thigh and heavy twisted horns carved as if lying horizontally across the head of the animal. The females have no horns or manes and a straighter profile; their ears and tails are similar to the males. Cylinder seals showing sheep with similar horns, manes, tails and ears have been found at Warka but the rams and ewes displayed on the Warka trough (also dating from the Jemdet Nasr period), while they have similar profiles, tails, manes and horns, have long pendant ears. This type with pendant ears fits with Hilzheimer's description of Type (1) and he suggests that the upright ears on the Vase etc may represent a more primitive form of the same breed.

Representations of sheep with horizontal horns have also been found at the Diyala sites of Khafajeh and Tell Asmar. A cylinder seal from the Jemdet Nasr period at Khafajeh shows a file of animals including
one with horizontal horns and a chest-mane.\textsuperscript{281} A cylinder seal with a horizontally horned sheep came from Tell Asmar,\textsuperscript{282} dating to the Early Dynastic II period, and from the Khafajeh dating to the Early Dynastic III levels.\textsuperscript{283} Fragments of a plaque, with a horizontally horned animal were found at the Temple Oval III-II, Khafajeh, also dating to Early Dynastic III.\textsuperscript{284} While the representation of a physical trait of an animal on an object such as a cylinder seal or plaque, which may incorporate archaic and traditional ideas in its design, does not necessarily mean that the trait is still in existence in the animal, Hilzheimer, on examination of sheep bones from Tell Asmar, dating to Early Dynastic III, and Agade levels, was of the opinion that they came from the horizontally-horned sheep with maned chest. He based this identification mainly on the horn-cores found. This suggests that the hairy-coated sheep continued to be bred, at least in the Diyala area, until near the end of the third millennium.

Type (2): wool-coated sheep:

A cylinder seal portraying two ewes of Type (2) was found (probably of Jemdet Nasr date) at Warka - they have pendant ears and thin tails but the scale is too small to do more than guess at their type of coat.\textsuperscript{285} Also from Warka, but from the Early Dynastic levels, come stone heads of an ewe and a ram. The ewe, which came from the Early Dynastic building on the east corner of the High Terrace of Eanna (Level I\textsubscript{2}), has a convex profile, and long pendant ears. The ram had horns which curved down round its pendant ears and its profile was similar to that of the ewe. Although none of the body exists, it is thought that wool is represented between the ears,\textsuperscript{286} which could mean a wool-bearing coat. Pieces of clay inlay were found in the latest Early Dynastic levels, Level I\textsubscript{1} (PsXV5, Qa, Qb, XV\textsubscript{4}): one piece, W 17924, shows a flat-faced ewe, with drooping ears and scratches on the neck which may represent a hairy or wool coat. W 17792 also represents a flat-faced ewe with pendant ears, but here the coat is shown by means of impressed circles. Other pieces, including a shoulder, hindquarters, and part of a leg, are decorated with similar impressed circles, and the hindquarters include a short thin tail.\textsuperscript{287} These circles may represent a wool-coat.
Rams with coiled horns and an ewe with pendant ears, being milked, are included in shell inlay scenes found at Kish. No detail of coat is shown here. At Early Dynastic Ur, on the 'Peace' side of the Royal Standard, two sheep with down-curved horns, erect ears, short tails and long coats are driven with a goat and bull, as part of the provisions for the banquet on the top register. The markings on the coats may represent a long-haired fleece. A rough and damaged statue of a ram with down-curving horns was found in the Early Dynastic II levels at Khafajeh. The profile is convex and the thickness of the animal's body may represent a wool-bearing coat. Figurines of rams with down-curving horns were found at Nuzi and a ram with pendant ears and long curving horns is depicted on a small fragment of an ivory plaque at Nimrud. This suggests that the Type (2) sheep continued through the second millennium and into the first.

Type (3): fat-tailed sheep:
The fat-tailed sheep appears in the third millennium and is probably the most important breed of sheep by the first. The profile tends to be concave, rather than convex, and the ears are erect. Representations suggest that they were wool-bearing.

An early example of a fat-tailed sheep appears on a stone bowl from the Uruk III period at Ur. The tail is clearly indicated, including the upward turning end. A ram, with slightly concave profile, erect ears, curving horns and a definite fat tail (the tip is not clear) is depicted on the Standard at Ur. The evidence is slight from the second millennium but the fat-tailed sheep is common on the Neo-Assyrian reliefs in the first millennium. It is thought by Epstein that the development of the fat-tailed sheep may have been due to deliberate selection, possibly because the breeder believed that such an accumulation of fat provided the animal with reserve energy. In addition, the fat tail itself is a useful source of animal fat for human consumption.

It is not easy to assign these three breeds of sheep names in Sumerian or Akkadian. GUKKAL (UDU.HUL)/gukkallu is thought to be the fat-tailed breed of sheep. This word appears in archaic Ur, and
in economic texts from the Early Dynastic, Ur III and Old Babylonian periods at other cities, but in later periods it is more common in literary documents. It is possible that GUXXAL was used in the third millennium to distinguish this particular type of sheep from the other, thin-tailed, sheep, but that during the second and third millennia when the fat-tailed breed became the most important type of sheep this was no longer necessary as far as the administrative and economic texts were concerned.

The words listed in the lexical list BAR.ra = ḫubullu XIII referring to sheep describe specific features - such as whether the animal is fed with barley (UDU.UG.SE) or grass (UDU.Ú), or where it was bred (UDU.MAR.TU), (UDU.ÚRI.KI), whether it was sick (UDU.Š). SUR - sheep with diarrhoea), its colour (UDU.SA5 - brown sheep) etc, which cannot easily be applied to different breeds. One exception may be the UDU.SIG. SUD/sulumḫ. This may mean a wool-bearing sheep with a long-haired coat (SIG here standing for SIG = wool) which could refer to Type (2). The herds of UDU.SIG referred to above (2.6.1, p.93) may also be of Type (2).

The evidence of the cylinder seals, reliefs etc suggests that Hilzheimer's Type (1) gradually ceased to be bred during the third millennium - indeed it may have died out by the Ur III period. Its disappearance is probably due to the discovery that Type (2) not only produced better wool for weaving, but was easier to domesticate - nearly all the scenes involving sheep being milked are of the Type (2), suggesting it was easy to handle and was a good milker. The development of Type (3), with its supply of fat in the tail, would hurry the phasing-out of Type (1).

Goats

The domestic goats of ancient Mesopotamia were screw-horned. They usually had erect tails, and ears which were either erect or lop. They are often depicted with a beard. A zoomorphic vessel of this type of goat, but without a beard, is included in the offerings shown on the Warka Vase from the Jemdet Nasr period. Both horns are shown, slanting back from the animal's forehead and ending in a twisted
loop. Other presentations of the goat are found at Ur, for instance the gold and lapis lazuli statuette of a goat browsing in a tree and on the Royal Standard of Ur, dating to the mid-third millennium here the horns rise like a V from the animal's head. Another way of depicting the goat's horns can be seen on a plaque from Nippur. In this the horns appear to rise as a single horn from the centre of the animal's forehead, and then divide in two horizontally. The goat on this plaque has a long coat and lop-ears.

A finely carved head of a goat, with a slightly concave profile, small erect ears, a pair of short horns and the vestige of a beard carved beneath the chin and on the upper throat was found under the floor plaster of Room 39a of Sín-kṣīd's Palace at Warka, probably dating to the Isin/Larsa period. Goats with twisted horns, erect tails, lop-ears and beards are frequent on the Neo-Assyrian reliefs. The horns are usually shown as going back from the forehead at about an angle of 45° and are either straight or have a slight twisting curve. (Fig.14)

There are many words used for goats. As with sheep, terms for sick, different colours of aged animals exist. The basic term is Maṣṣṣurīṣu - goat, and Uṣ/eznzu - she-goat and goat.

Cattle
The cattle of Mesopotamia can be divided into two main groups: humpless and humped.

Humpless cattle:
Representations on cylinder seals, inlays, reliefs, statuettes etc depict humpless cattle with long horns and with short horns. Epstein traces the earliest domesticated cattle of Mesopotamia from the long-horned humpless breed which he takes to be Bos primigenius Nāniādu, Falconer et Cautly, the Asiatic sub-division of Bos primigenius. Artistic representations of long-horned humpless cattle show the horns coming out sideways from the head and then curving forwards. The tips of the horns usually sweep up and the bull may have an emphasized crest. It is this horn shape which appears on
Halaf pottery designs, although it is not necessarily taken from domesticated animals.310

Representations of domesticated long-horned humpless cattle can be difficult to identify. On small-scale artifacts such as cylinder seals, especially when only the profile is shown, it is not always clear whether the animal is truly long-horned, or whether it is in fact short-horned. A cylinder seal from Susa, dating to the early third millennium, shows a file of bulls with horns which answer the description of long-horns but the other files of animals include the ibex (or wild goat) and possibly the horizontal horned maned sheep, so that it is not clear whether it was the artist's intention to portray wild or domesticated animals.311 Another seal, dating from the late IV/early III millennium, depicts a row of walking bulls with emphasised crests with a head of grain in the background. Only one horn's profile is shown – this sweeps forward and up and can probably be accepted as intending a long-horn animal. A 'bump' on the forehead of the bulls suggests that the second horn may have been cut off – such an action would indicate domestication and possibly the bulls were made less difficult to control by this.312 A cylinder seal from Khafajeh (early third millennium) shows animals with similar horns moving from a byre from which two horned calves emerge.313 The connection of the adult animals with calves in a byre suggest a domesticated herd. And the two bulls lead with rings through their noses on the Peace side of the Royal Standard of Ur, and classified by Epstein as long-horned,314 can be taken as domesticated.

Other representations of the humpless long-horned cattle include the golden bull's head from a harp in the Royal Graves at Ur,315 copper horns from Warka,316 a head from Tello317 and a bull statue from a temple frieze at al-Ubaid,318 all dating from the early to mid-third millennium. Long-horned bulls also appear, taking part in a ritual, in a wall-painting from Mari.319 There is no real evidence to suggest that any of these animals were domesticated, and they may represent the herds of wild cattle which roamed the plains of Mesopotamia and which are shown being hunted by the Assyrians in reliefs from the North-West palace of Ashurnasirpal in Nimrud.320
Short-horned humpless cattle seem to have replaced the long-horn during the third millennium. Possibly the earliest example of a short-horn bull is on a steatite bowl carved in low relief, from Ur and dating to the Jemdet Nasr period. A shell-inlay from al-Ubaid shows short-horn cows with their calves in a milking scene - the frieze also includes bulls with 'horns of medium length' which Epstein has classified as short-horned because of their connection with the cows.

It seems likely, especially in the third millennium, that there was intermixing between the short-horn and long-horn humpless cattle. The short-horns may have been preferred; they tend to produce the best dairy herds and the shorter horn would be less dangerous, but their size can deteriorate because of the necessity to keep milk-cows close to settlements so that the milk and other products can be utilized, thereby restricting their grazing and risking lowering their living standards. A policy of inter-breeding with the probably wild long-horn cattle could have been seen as a way to increase the size of the domesticated short-horns.

Humped cattle:
The hump on the humped cattle (zebu) is caused by the development of muscles in the shoulder region, in conjunction with layers of fatty tissue. Epstein has divided the zebu into two main groups: those with the hump formed in the cervico-thoracic region and those with the hump only on the thoracic region. In his opinion the zebu's hump developed from the cervical crest of the long-horn bull and this development was due to deliberate selection on the part of breeders who considered that the crest was of value to the animal, possibly believing that it presented reserves of energy. The cervical crest of a male animal is an important secondary sexual characteristic and is often associated with strength and good reproductive powers, so that the early breeders may have selected the bulls with the largest crests in the belief that they were perpetuating these characteristics.

However, the development of the zebu may not be quite as straightforward as that. The evidence from India and Pakistan suggests that there Bos indicus was the universal type of cattle, except in Harappan
and pre-Harappan contexts in the Indus valley where humpless cattle of the *Bos primigenius* type are found on seals and figurines. These may have had Mesopotamian origins. The study of bones from Harappa and other parts of the Indian sub-continent indicate that the animals belonged to the humped cattle type and there seem to have been several breeds of *Bos indicus* by the end of the third millennium.325

The development of the humped cattle in Mesopotamia may have been partly due to interbreeding between zebu and the humpless cattle. Selection by breeders may also have contributed.

An early representation of a humped bull appears on a steatite vase found at Tell Agrab, dated the late Early Dynastic.326 The hump is large, and the dewlap is also clearly shown, while the horns are long. What may be a humped bull, dating from c.300 BC, was found in Level 4 of Chagar Bazar, and other rough figurines of humped bulls were found at the same site probably dating to early Level I (early second millennium).327

Good examples of humped zebu appear in the second millennium. A plaque from the Diyala region, dating to the Larsa period, shows a man sitting astride a zebu. The animal's horns appear to be short. On a storage vessel at Nuzi, found in a private house and dating to the mid-second millennium, the figure of a zebu had been scratched upside down.329 From the middle of the second millennium from Nippur, a cylinder seal impression shows a humped ox (probably a pair) pulling a plough,330 and humped bulls are frequently associated with the deity Adad on cylinder seals from this millennium.331

In the Assyrian reliefs humped cattle are common — for instance they appear in a fragment of wall painting from Ashurnasirpal's palace at Nineveh;332 on reliefs of Tiglath-Pileser III at Nimrud, probably as spoil from a southern or south-western city, because of their proximity to canals and date-palms;333 on reliefs of Sennacherib, also as part of spoil from the south,334 (Fig.16) from Nineveh; and possibly on reliefs showing Ashurbanipal, receiving spoil from an Elamite town,335 also from Nineveh. The cattle in this last example may not be true
zebus: the hump is not clearly indicated but swells smoothly into a thick neck. The calves shown with them are too small to be sure whether they have humps at all. It is possible that these may be a short-horn cattle which have been crossed with the zebu.

It would seem that by the second millennium the humped cattle had become of greater importance than the short-horn humpless cattle: there are few examples of humpless cattle from the first millennium and even the oxen drawing carts and ploughs can be seen to have some sort of hump from the middle of the second millennium. That some humpless cattle did still continue to be bred can be seen from the reconstructed facade of the Sin Temple at Nineveh and from the representations on the Balawat Gates. On the latter, humpless cattle are shown in scenes of spoil being brought from Carchemish and in events during the expedition to the source of the Tigris.

The fact that the Balawat scenes mentioned portray events in northern Mesopotamia while the Palace reliefs which can be placed shown scenes from the south, may indicate that humped cattle were more common in the southern part of the country while the humpless breed was more northerly during the first millennium.

Water buffalo:

The water buffalo (Bos bubalis Linnaeus) appears to have been known in Mesopotamia only in the third millennium or earlier. Horn cores found at Grai Rash in the Sinjar region, and dating to the Uruk period, have been identified as those of the water buffalo, but there is nothing to indicate whether they were from a wild or domesticated beast. An early representation of the water buffalo comes from a cylinder seal from Ur, on which there is an inscription of a servant of Enheduanna, daughter of Sargon of Agade and it was common on cylinder seals in the later Agade period. Examples include a scene where a pair of water buffaloes are each being given water from a vessel by a bearded and ringletted man - a stream running along the bottom of the design underlines the connection of the water-buffalo with marshy and watery areas.
Scholars are divided on whether the water-buffalo was domesticated in Mesopotamia during the Agade period. Van Buren, for example, considers that it was wild but Epstein thinks that such scenes as the man or god watering the animals indicate that it was domesticated. The lack of evidence for the water-buffalo in the second and first millennia indicates that the animal stopped being used, and it has even been suggested that it became extinct during the third millennium. But two phrases, GU₄.A/alap me and GU₄.1D/alap na-a-ri, translated as 'water ox' and 'river ox' are listed in the XIII tablet of BAR.ra - hubullu, suggesting that knowledge of cattle which lived in water had continued. It is possible that the Agade period saw the domestication of the water-buffalo, thus increasing its numbers and importance, and the decorative potential of its horns appealed to the cylinder seal engravers. Later the animals may not have been considered either interesting enough or suitable as seal-designs - particularly if their care was assigned to the poorer elements of marsh society as it is today. However, it should be noted that Hatt in his study of mammals of Iraq appears to agree with the 'extinct' theory, and suggests that the water-buffalo may have been re-introduced from Persia in the 8th century AD.

As with the sheep and goat, it is difficult to differentiate between the breeds of cattle in texts. The wild ox (AM/rImu) is specified; the sex e.g. ox (GU₄/alpu), cow (Ab/littu); and often the ages are given. But there seems nothing to distinguish whether the animal in question had long horns, or short horns, or whether it was humped or humpless. AB.ZA.ZA./apsasgro has been tentatively translated as 'exotic bovine, possibly a zebu', but the humped cattle are so common that this seems unlikely, and Boehmer has put forward the suggestion that this may refer to the water-buffalo. By the late Early Dynastic period the domesticated humpless short-horn had probably superseded the long-horn, and the development of the humped bull which more or less replaced the short-horn during the second millennium may have been too gradual to show up in the economic texts, which probably only found it necessary to distinguish between male and female, adult and calf, etc.
CHAPTER 3

TYPES OF FOOD AND DRINK AND THEIR PREPARATION

The different types of food and drink consumed in ancient Mesopotamia can be divided into eight main categories: 1: cereal preparations including bread and beer; 2: animal flesh including meat from cattle, sheep, goats, game, birds and fish; 3: dairy products such as milk, butter and cheese; 4: vegetables and legumes; 5: oils and fats from vegetable and animal sources; 6: fruit; 7: seasonings and sweetening agents such as spices, salt and honey; 8: fermented drinks such as wine.

It is proposed to discuss the evidence for the use of each of these food categories, the sources of their supply and their preparation.

3.1 Cereal preparations

Cereal preparations form the main part of the Mesopotamian diet. Cereal grain can be prepared and eaten whole in a number of dishes, such as gruel, or they can be ground into flour and baked as bread. They can also be mixed with water to make a drink which may be sweet or fermented. The use of cereal grains as a foodstuff will be discussed according to these methods of preparation.

3.1.1 Whole grain preparations

Roasted or parched grains

The simplest method of preparing wheat and barley grains for consumption is by roasting or parching. This can be done at an open hearth where the grains are spread on hot stones or on pottery plates. As the moisture has been withdrawn from the grains they keep well and are suitable for storing or for carrying on journeys. The parched grain can be eaten without further cooking, or they can be ground into a kind of flour or made into a gruel or porridge.
Archaeological evidence for roasting or parching of grains is difficult to obtain. The palaeobotanical remains indicate only the occurrence of barley or wheat but not what, if any, method was used to prepare them as food. Any simple hearth or kitchen range could be utilized for the parching, and such structures are common on excavated sites - for example at Nippur, Level TB IV Houses H & I (Ur III) and Level TA IV House C (Neo-Assyrian). It is unlikely that any specific pottery vessel was used only for parching grains as any fairly shallow dish or plate, which could be set on a hearth or a kitchen range, would suffice.

Burghul

Another method of preparing the whole grains of wheat and barley is the manufacture of burghul. (This cereal product is mainly associated with wheat but the same processes can be used with barley.) The whole grains are boiled in open vessels with as little water as possible until they are soft. They are then spread out in the sun to dry (a process which can take two to three days), after which the coarse particles of bran can be removed by sprinkling a little water on the grains and rubbing off the particles. The vitreous grains are then cracked between stones or in a hand mill. Burghul keeps well and can be stored in pottery storage jars.

The boiling of the grains in the first stage of preparing burghul is thought to have the effect of diffusing some of the nutrients in the bran into the endosperm, so that the loss of nutrients from the grain due to the separation of the bran is less than takes place during milling. When burghul is required for eating it can be prepared by steaming or boiling: only a small amount of liquid is required. The burghul can then be eaten with the addition of oil, meat or vegetables, or it can be added to soup.

A study of burghul making was carried out by the archaeological team working at Agvan in Turkey in 1972. They found that burghul is made once a year, over specially constructed hearths. Sometimes a trench about .5 m wide by 2 m long and .15 m deep was dug. Willow twigs were used for fuel. The grain was boiled in cauldrons set over
the trench, which was filled in again the same day after use. The amount of charcoal produced during that one burning was considerable, and it was not cleared away before the refilling of the trench. Other hearths might be built in courtyards for the manufacture of burghul and these were also dismantled as soon as the cooking was over.

This use of a trench recalls the 'Opferstätten' trenches found at Warka in the Eanna precinct. Dating to Level III, Jemdet Nasr period,5 to the south-east of the temple terrace are the remains of a court bounded by a niched wall on its south-west side. A number of troughs had been dug into the earth, in line with this wall. They were lined with clay plaster. Burnings took place within the troughs and after each burning the debris was cleared away and the trough replastered with clay. When the troughs filled up their walls might be built higher with mudbrick. These troughs continued from the earliest Level III to I₂ (ten building phases), and each layer was destroyed before the next one was put down. In Level IIIb, each pair of troughs was enclosed in low brick-walled compartments. When the troughs were filled up with replastering, first a shallow depression was hollowed out in each new floor, but eventually a new trough had to be dug through these.6

Similar troughs were found in other areas: for example four troughs were found in Squares PeXVII, 1, XVI, 5, and QaXVI, 5, in that part of the Eanna precinct where traces of the outer retaining wall of the terrace belonging to the Ur III period were found. They lay about 8 m from each other, and it seems that only one 'ceremony' was performed in each trough although the floors were thickly covered with wood ash. The troughs were filled up with previously used fire-reddened bricks. The excavator thought that the troughs might be associated with foundation sacrifices made at the building of the Ur III wall but Van Buren feels that their layout is so similar to troughs known to date to Level III that they should be placed in that period.7

Beside some of the troughs in Level IIIc, in the south-east court, were sherds of big pots, three of which contained traces of
in Level II (Early Dynastic), in Room 1023 of the court, some pots stood on one side of the troughs. One pot contained a pictographic tablet inscribed with a list of offerings. The clay in which the pot was sunk was barely reddened and the bones in other vessels were hardly singed. Above the pots lay burnt bones and above this a pan-shaped depression had been sunk. Nothing had been burnt in it but the clay plaster had a rippled appearance.

In shape the troughs were about 4.20 m long and about .85 m wide. In the earliest examples one end was about 20 cm below floor level while the other was 60 cm deep - presumably for ease of clearing out when the trough had been finished with. The fire seems to have been kindled at the deeper end. This 'slope' was gradually filled in with the replastering after each burning.

The usual purpose assigned to these troughs is that they were used for offering places for the gods. On the other hand, the preparation of food for the gods is an important part of ritual texts, and it is probable that this was so by the Jemdet Nasr period. The fact that the troughs were apparently infrequently used may mean that their main purpose was for the production of a foodstuff which only required periodic preparation - in other words burghul. The width and even the depth of the troughs recall the burghul-trenches at Agman - the greater length at Warka would mean that more vessels could be set along the top. The positioning of the troughs in the Eanna precinct, the niched boundary wall of the south-east Court, and, in particular, the care which was taken to clear out the troughs and reline them before they were used again suggests that the foodstuff produced was for the gods and their priestly-staff, and not simply for members of the secular community. (Whether more than one trough was in use in any one session, or whether one trough was 'shut down' before another was dug cannot be certain; the enclosing of pairs of troughs within low partition walls suggests the former.) The discovery of animal and fish bones etc in pots alongside the troughs in Level IIIc suggests that other dishes may occasionally have been cooked on the troughs. Of course, these pots may contain the remains of the meals of the men supervising the burghul-preparation.
Similar troughs have been found at Khafajeh, in the Nintu temple, Court 53, and Sin IX, Court, Q42:3, both dating to the late Early Dynastic II period. And the pit–oven found in Mari, Room 204, under the floor of a corridor, could possibly have been used to prepare burghul. Its internal measurements were 38x19x8 cms with a depth at one end of 18 cms, and it was found full of cinders.

The preparation of burghul requires only a gentle heat to steam rather than boil the grains. The use of a trench with a fire at the bottom, and the cooking vessel placed on top of the trench, would help to achieve this slow heating. The use of a slow burning fuel, such as the willow used at Agyan, would also help. The vessels in which the burghul was prepared would have to be large, both to cope with the quantities of grain to be cooked and to sit on, rather than in, the trenches.

**Semolina**

Semolina consists of the ground or crushed endosperm of wheat; its particles are larger than those of flour. It is produced by coarse crushing or grinding, but as it is not ground into a 'flour' it has been included in this section on whole cereal grains. Semolina is the basis of couscous - a dish particularly popular in North Africa - and it is also used to make macaroni and other alimentary pastes and can be made into biscuits, cakes etc, sometimes with the addition of flour and different flavourings. Couscous is also made with chickpea flour or with a combination of wheat semolina and chickpea flour.

The grain to be made into semolina would be ground in a saddle quern or pestle and mortar. The material would not be ground as finely as grain to be made into flour. Sorting and sifting would be necessary to remove the large pieces of bran.

**Textual evidence**

A number of words appear in texts which have been identified as roasted or parched grains and other whole grain preparations.
$SE_SA/\text{laptu}$: roasted barley.\textsuperscript{12} $SE_SA$ may also be read $qat\hat{u}$ and $qat\hat{u}ti$ which can also mean 'roasted grain or barley'; $qat\hat{u}ti$ however can be read as the adjective 'roasted' and $SE_SA.A$ has sometimes been used as a way of writing this word.

Roasted barley ($SE_SA$) appears in issues of food to individuals in the reign of Lugalanda of Lagaš,\textsuperscript{13} and in lists of provisions, also at Lagaš, in the Ur III period.\textsuperscript{14} Roasted barley ($SE_SA.A = qat\hat{u}ti$) and parched barley ($SE_SU.HU.UZ = \text{gubib}\hat{\text{e}}\text{te}$) appear in a Neo-Assyrian vocabulary\textsuperscript{15} and in the list of provisions for Ashurnasirpal's feast to celebrate the opening of the palace at Nimrud.\textsuperscript{16} However, an alternative suggestion for the translation of $SE_SU.HU.UZ/gubib\hat{\text{e}}\text{te}$ is kebab - pieces of meat cooked on a stick - or $kuba$ - a paste of burghul mixed with meat. The identification with $kuba$ may be possible because of the use of the term for grain or barley ($SE$).

The appearance of terms meaning 'roasted barley' in economic records dating from the Early Dynastic and Ur III periods and among the provisions for a feast in the Neo-Assyrian period testifies to the continued manufacture of this type of foodstuff.

There seem to have been special ovens or grills used for its production,\textsuperscript{17} for example $UDUN.SE_SA.A/\text{laptu}$, oven for roasted barley $\text{NIG AR RA}/\text{mundu}$;\textsuperscript{18} semolina (Assyrian $\text{simdu}$).\textsuperscript{19}

The term $\text{NIG AR RA}$ appears consistently in texts. For example during the Agade period, it occurs at Umma in a list of foodstuffs (including beer-bread (BAPPIR), and malt (MNU.\textsubscript{4})) issued to individuals\textsuperscript{20} and in a list of foodstuffs held in reserve.\textsuperscript{21} At Kish it was issued to individuals probably for cooking and preparing for others - one of the recipients is a cook (MU).\textsuperscript{22} During the Ur III period at Lagas, $\text{NIG AR RA ZIZ}$ (semolina made from emmer-wheat) was included among issues made during the month of Dumuzi\textsuperscript{23} and it was listed among foodstuffs which included beer ($KA\hat{\text{s}}$), bread ($\text{NINDA}$) and beer-bread.\textsuperscript{24} It also occurs at Nippur among foodstuffs.\textsuperscript{25}
During the Old Babylonian period at Mari NIG.AR.RA is recorded as part of supplies for the kitchen. In addition two other products, a type of flour, ZI sammi'datum, and a type of bread, NINDA sammi'datum, occur in provisions for the king's meals (naptan barrim) at Mari, and ZI sammi'datum forms part of the provisions for the king's meal at Hanat, and for the king's meals at Chagar Bazar. Sammi'datum comes from the verb samdu - to grind, and this is the grinding technique which seems to be the one used to produce NIG.AR.RA/simdu, so that these types of flour and bread in use at Mari, Hanat and Chagar Bazar are likely to have been made from semolina.

Later in the second millennium NIG.AR.RA occurs at Nippur included with issues of malt and beer-bread. Mundu is mentioned at Nuzi coming from the towns of Kulu'dtu and Zinismaniwa. Barley was used for its preparation at Nuzi.

NIG.AR.RA appears to be connected with the preparation of beer, although its precise use is unclear. It is included in a list of malts and 'groats' in the 'Beer and Brewing' text EXXIII. In this case NIG.AR.RA may refer to a processing stage before the malting of the grains or to part of the material used in the making of beer-bread. It is also listed with items connected with the making of beer in an Assyrian vocabulary.

 Arsānu: 'kind of groats'. This is thought to be similar to the Syrian 'arsana which is made from coarsely broken-up dehusked barley mixed with water.

In the Agade period AR.ZA.NA is issued (together with NIG.AR.RA) to five people at Kish; in the Ur III period it is listed among food items (including NIG.AR.RA US and A.TIR) at Umma. It is also occasionally part of the king's meals at Mari and at Chagar Bazar.

It occurs at Nippur in the Kassite period where it is listed against an individual with amounts of barley, bread-wheat and emmer wheat and flour (ZI). The totals of the cereals amount to 9 (CUR) 1 (PI) 2 BAN and the totals of the processed material, flour and pots
AR.ZA.NA equal 9 (GUR) - it is possible that the three cereals were to be processed together to produce 8 (GUR) flour and 1 (GUR) AR.ZA.NA (with a waste of 1 (PI) 2 DĀN). Alternatively the account may refer to a straightforward issue of 3 types of cereal and two types of prepared grain.\textsuperscript{42}

At Nuzi barley for arsānu is given out as rations to women, who receive amounts varying from 4 SīLA to 30 SīLA.\textsuperscript{43} It is also included in the Practical Vocabulary of Ašturbanī.\textsuperscript{44}

The fact that arsānu and NĪG.AR.RA frequently appear in the same food lists indicates that they are two different foodstuffs. That NĪG.AR.RA was associated in some way with beer-making is clear from the number of times it turns up in lists which include beer-bread and malt and other ingredients of beer. But its issue as a foodstuff suggests that it would be eaten as a food in its own right. Its identification with a coarsely-ground semolina-like product, made from either wheat or more usually barley, which was used as the basis for other food dishes and beer, seems reasonable. Arsānu always appears to be made from barley, and may have been a burghul-like product.

A.TIR (EŠA)/Sasqû. Mundī kunāši (semolina made from emmer wheat) is explained by sasqû in the commentary to ḪḫIII\textsuperscript{45} so that sasqû must be a semolina-based dish. The writing A.TIR suggests that water is connected with this dish - Jones and Snyder have even suggested the possibility of A.TIR being a type of rice.\textsuperscript{46} However, rice is not usually considered to appear in Mesopotamia until the Neo-Assyrian period and there has, as yet, been no botanical evidence for it.

At Nippur in the Ur III period, A.TIR was apparently made of mixed milk and emmer-wheat (A.TIR GA.ZIZ.A) and possibly also of barley and oil (A.TIR ḫ.Ē.ĐU?).\textsuperscript{47} In this text it is listed with other foodstuffs, including NĪG.AR.RA.

A.TIR/sasqû forms part of the offerings to the gods, and is used in rituals.\textsuperscript{48} In the Agade period sasqû- flour with dates
(ZU.LUM ZI.A.TIR) forms part of a daily offering, and this type of preparation continued to be used in offerings.

At Mari, during the Assyrian interregnum, amounts of sasqû-soup, made from emmer wheat, are listed (sasqû 8a ZI.Z a-na me-e sasqûm). Sasqû is a frequent part of the provisions for the king's meals at Mari during the reign of Zimri-Lim. In the 'Year Zimri-Lim counted the land', sasqû was issued on 59 separate days in ten out of the eleven months recorded - the total amount recorded as issued over the year was 1 (KUR) 78 SILA - an average of under 3.5 SILA a day, larger amounts were used for rituals, for instance 20 SILA for GIS'PISAN+AS dumqî during the month of Kiskissum and for the kispū-rituals in the month of Abu 3 SILA and 15 SILA were issued.

Sasqû was evidently a dish as important for cultic matters as for secular meals. It would seem to have been a creamy or soup-like dish, prepared from emmer wheat or barley, ground into semolina, and mixed with water, milk or oil. It could be served plain, or mixed with dates (although the latter is mainly confined to ritual occasions).

Pappgû. Hrozny considered this to be a very fine flour dust made from emmer-wheat (taking it to be the Akkadian of ZI.BA.BA/BA.BA.ZI), but in the 'Beer and Brewing' text, it is given as the equivalent of BA.BA.ZA.MUNU - translated as a 'pulpy dish (prepared) of green malt'. In the Practical Vocabulary of Aššur pappgû (unfortunately its equivalent is damaged) is included in a list of types of floor.

In the text describing the death of Irra-mitti, King of Isin, pappgû, possibly the cause of his death, is described as being ground or crushed - im-mi-his - suggesting a coarser product than flour.

Bread made from ZI.BA.BA may have been made in the Ur III period. NINDA.BA.SIG and ZI.BA.BA.SIG are listed with other foodstuffs including A.TIR, NIG.A.R.A, flours and beer in this period.
At Mari, pappasu appears in small amounts at the king's meals; it is issued in all the eleven months recorded for the 'Year Zimri-Lim counted the Land'. The total number of days for which pappasu is recorded are 73 with an average of just under 2 SILA a day. One text gives monthly totals of 21 SILA pappasu and 31.5 SILA ṢE. pappasu for the month of A mum and 14 SILA pappasu 20 SILA ṢE. pappasu for the first ten days of Ḡibirtum - both in the 'Year Zimri-Lim counted the Land'.60 These figures give the quantity of the pappasu as around two-thirds of the quantity of ṢE. pappasu, suggesting a loss in preparation of one-third.

Pappasu is also recorded with NIG. AR. RA at Nippur in the Kassite period, and barley (ṣE) is issued for its manufacture at Nuzi.62

It seems probable that pappasu is a type of coarsely crushed, possibly malted, grain from which other dishes or bread could be made. Its association with emmer-wheat found by Hrozny for the Ur III period seems to have dropped during the second millennium when it is usually made with barley.

Sasqū and pappasu would seem, especially from the evidence of the Mari texts, to have been side dishes rather than the main part of the meal.

3.1.2 Milled grain preparations

Milling is the process by which the threshed cereals, such as wheat, rye and barley, are turned into flour. After milling and sieving the flour is then ready to be made into bread, biscuits, cakes, gruels etc. Wheat provides the best bread-flour and its proteins possess special physico-chemical properties which allow the flour to form an elastic-like dough and use the leavening action of yeast or other raising-agents to make a firm well-risen, open-textured loaf.63 Bread made in the same way from barley or rye is not as palatable nor as well-risen. The action of milling reduces the cereal-seed to a powder which includes the bran (outer covering of the grain) and the germ - this is called nowadays 100% extraction flour and is
brown in colour. The bran and germ are removed by sifting or bolting through cloth screens (before the second world war these, in mills, were of silk, but now tend to be of nylon), a process which continues, sometimes using rollers to reduce further the size of the endosperm, as well, until the flour is as fine and as white as is required for its end product. In the United Kingdom white flour is usually about 73% extraction with the remaining 27% being used for animal-fodder. The higher the extraction rate used for flour the browner its colour. 64

Milling equipment

The quality of the flour produced therefore depends on the methods and equipment used for milling and sifting. In ancient Mesopotamia the milling was carried out by hand (that is, without animal or non-human power) either by crushing and pounding with a pestle and mortar, or by rubbing and grinding with a rubbing stone on a quern. Stone mortars have been found at many sites, often in association with stone hammers or pestles. Limestone and tufa mortars were found at Kish, although their dating is uncertain. Mackay dated one at least to the graves period (c. Early Dynastic II). 65

At Nuzi, tripod-footed mortars of limestone or basalt were common. They were roughly made, very heavy and had smooth interiors. One was found with a stone pestle still inside it. This type of mortar was found for example in Shilwa-teṣup, Room 14, and at P.302, and measured between 20 cm and 25 cm across the top. Small hand mortars were also quite common. The larger mortars could have been used to pound grain and/or dried vegetables for flour, but the smaller ones were probably used for spices, or cosmetics. Flat grinding stones were also found, for instance at F.31, where it was in association with two large storage jars and from fragments of domestic pottery. 66

Stone rubbers and querns were found, with wheat, barley and linseed, in Rooms 14 and 15 at Akkurnaṣirpal's palace at Nimrud (9th century). 67
The evidence for rotary hand-mills is scanty. At Tell Halaf two types of mills which used handles to aid the grinding were discovered. One type consisted of loaf-shaped millstones which had a lengthwise deep furrow on the top into which a wooden stick could be fitted to rub the upper stone on a lower flat one, but the movement is still back and forth. The other type is the 'hopper-mill'. This is a squared stone with a slit in the top through which the grain was poured on to the lower stone. Slots for handles were made on the narrow side so that the upper stone could be pushed back and forth. The mills are not clearly dated. The hoppers come from the upper layers. The possible date is around the 9th century BC, but the city had later Hellenistic layers also.

Small round millstones which had a prong in the middle fitting into another stone which had a hole in the side for a handle to turn it, were also found at Tell Halaf. These are like the 'paint-grinders' found at Tell Mutasellim in Palestine, dated to the 4th and 3rd Semitic period (late second millennium). These implements were usually about 4-6 inches across and consisted of a lower stone with a tenon in the middle which fitted into a mortice in the upper stone. Sometimes the lower stone had a 'collar' into which the upper stone fitted. No hole for a handle was ever found. The small size of these mills make their use for grinding grain unlikely, but their existence shows that the principle of a rotary grinding movement was appreciated.

In the texts, the use of AN.TA/elitu and KI.TA/ıpiltu to mean upper and lower millstone respectively does not necessarily imply a mill made up of two stones with plane-faces fitted into each other; elitu could refer to the rubbing stone and ıpiltu to the lower slab. NA₄ HAR.(HAR)/erṭ which is translated as 'grinding slab (i.e. saddle quern)' is used in texts in connection with the grinding of grain, spices and nuts, flour etc.

The saddle quern is usually operated by a kneeling worker. The saddle quern in action is well illustrated on the Assyrian reliefs where workers attached to the Assyrian army are shown preparing grain in camp. (Fig.21)
Flours (zi\textsuperscript{?}/q\textsuperscript{?}umu\textsuperscript{73})

Flours of different fineness can be produced according to the amount of grinding. That different grades and qualities of flour existed in Mesopotamia is shown by the number of words and phrases used to describe them. For example 'coarse barley flour' zi\textsuperscript{?}se/tappinnu,\textsuperscript{74} a flour sometimes issued as rations; zi\textsuperscript{?}kal/hilletum - translated as (a) 'flour of groats',\textsuperscript{75} or coarse flour, and (b) fine first-class flour;\textsuperscript{76} zi\textsuperscript{?}kal appears frequently in texts from the third millennium;\textsuperscript{77} zi mirqu, probably finely ground flour\textsuperscript{78} is included in an issue of foodstuffs to individuals at Nippur in the Kassite period.\textsuperscript{79}

Isq\textsuperscript{?}qu/zi\textsuperscript{?}kum. A type of flour which is mentioned frequently is zi\textsuperscript{?}kum/isq\textsuperscript{?}qu. This is read by the Assyrian Dictionary as 'a kind of flour',\textsuperscript{80} and in its discussion it is pointed out that the logogram for isq\textsuperscript{?}qu is zi\textsuperscript{?}ud which is read ZIKUM in Sumerian and phonetically rendered zi\textsuperscript{?}gu in the Ur III period and zi\textsuperscript{?}kum in the Old Babylonian period. At Mari the Dictionary also reads NINDA.\textsuperscript{81}kum as isq\textsuperscript{?}qu (bread).

Zi\textsuperscript{?}/babbar is 'white flour' and suggests a high quality fine flour but Bottero\textsuperscript{81} takes KUM to equal \textsuperscript{82}pax\textsuperscript{?}lu 'crushed' and considers isq\textsuperscript{?}qu to be a flour made like semolina or a type of burghul. Oppenheim and Hartman also described it as 'flour of crushed barley',\textsuperscript{83} which suggests a coarse rather than a fine flour.

Zi\textsuperscript{?}/kum appears in Ur III texts from Puzri\textsuperscript{?} s Dagan and Tello.\textsuperscript{84} At both these sites and at Umma a flour product zi\textsuperscript{?}/gu also occurs.\textsuperscript{85} At Tello both zi\textsuperscript{?}/gu and zi\textsuperscript{?}/kum are included in the same list of products.\textsuperscript{86} This also happened in the Old Babylonian period at Chagar Bazar: zi\textsuperscript{?}/kum is issued for the king's meals and zi\textsuperscript{?}/gu (included in a general total of zi\textsuperscript{?}/se) is issued to individuals on journeys to and from Hibetum and Qatnu.\textsuperscript{87} At Mari zi\textsuperscript{?}/kum/isq\textsuperscript{?}qu is issued for the king's meals and zi\textsuperscript{?}/gu is listed among other products in a record of distributions for various purposes. However, the issues of isq\textsuperscript{?}qu are small: for example in the month of Uru\textsuperscript{?}m 'Year Zimri-Lim counted the Land' it is recorded for 21 meals (in 20 days) and the average amount per meal is 2.8 SILA. The average over the whole year (for 83 recorded meals) is 3.7 SILA a day.\textsuperscript{88}
At Kassite Nippur ZI.BABBAR is included in a list of different flours and in the Practical Vocabulary of AŠšur isqūqu is given as the equivalent of ZI.KUM.

If ZI.GU, ZI.KUM and ZI.BABBAR are all to be read isqūqu it is difficult to see how ZI.GU and ZI.KUM can both appear at the same site during the same period and even in the same text. It is possible that during the Ur III period the product ZI.GU underwent some changes and for a while two slightly different foodstuffs were produced. ZI.KUM may have been considered a slightly superior type of ZI.GU - hence its use in Mari and Chagar Bazar for the king's meals, while ZI.GU continued to be given to people going on journeys and for more general purposes. By the middle of the second millennium the earlier name, ZI.GU, seems to have been dropped.

The logogram ZI.BABBAR 'white flour' suggests that this flour was a well ground and sieved type but the other terms suggest a coarser product and it would seem, on the whole, that Bottero's equation of ZI.KUM/isqūqu with a semolina or burghul type of product is to be preferred to the identification with a fine flour.

Sieves

After the grain is ground into flour it must then be sifted to remove the bran. A certain amount of the large particles of the bran can be removed from coarsely-ground flour by hand-sorting, but sieves are required to remove smaller pieces, especially from the finer flour. Sieves could have been made from cloth, either linen, wool or hair, or from reeds. The perishable nature of these materials makes their archaeological discovery unlikely. Linguistic evidence points to the use of reed sieves for sifting flour. The term for 'reed sieve' is GI.MA.AN.SIM and this is listed for NIG.AR.RA, ZI.ŠE, and ZI.GU, suggesting that a different mesh was used for different types of flour. The finer the mesh the more of the bran is removed and the whiter the flour becomes.

It is commonly considered that the whole-meal flour is more nutritious than refined flour, but what is often overlooked is that
the wholemeal flour contains a great amount of fibre which decreases
the digestibility and which is excreted, together with some nutrients,
instead of being retained in the body. However, it is thought that
it may be this fibrous content, found in Arab bread, which protects
its eaters from such ailments as bowel cancer.

Breads

Many preparations can be made from flour but probably the most
common one is bread, of which there are two basic types: unleavened
bread which is made by simply mixing flour and water to make a dough,
and leavened bread which consists of the mixture of flour and water,
plus yeast or another type of leaven, which causes the dough to rise
through fermentation. Salt is usually added to both types of dough
and is particularly important in the making of leavened bread.

Unleavened bread: Unleavened bread can be made very simply.
Once the dough is mixed it is shaped, usually by flattening between
the hands until it is thin and like a pancake, and it can be baked
on hot stones, in the ashes or laid on a heated thin metal sheet.
These methods of baking are used among the Near Eastern villagers to
this day. Layard in his travels in the Near East in the 19th century
AD described how his Arab guides in the Dead Sea area had lived
entirely upon 'cakes of unleavened bread which they had baked in the
hot ashes' and how a Bakhtiyari chief had provided him, in addition
to soured milk, curds and cheese, with 'large cakes of unleavened
bread, crisp and thin as a wafer, baked upon a concave plate over
the hot embers'. Musil, when he was travelling with the Rwala
Bedouins, also describes how the bread was made on an iron sheet set
on three stones above a fire, while the paper thin bread cake laid
on it.

That bread was made in ashes in ancient Mesopotamia is suggested
by the phrase NINDA,IZI,NINDA,MUR,RA... a-kal tu-um-ri and IZI,NINDA.
MUR,RA; tum-ri = bread (baked in) ashes. A concave pottery dish
could probably be utilized in a similar manner to the metal sheet of
the modern villager. An illustration of making bread on a hearth may
be seen in a Middle Assyrian seal impression, found on a tablet from
Tell Rimah. The impression shows a woman, in a hut or shelter of some kind, kneeling before a fire while flattening a circular lump of dough between her hands. The fire appears to be blazing and it is probable that the woman would either dampen down the flames, or allow them to die down a little before placing her dough in the ashes.98

Another representation of making bread in the ashes appears on an Assyrian relief of AMurbanipal's campaigns against the Elamites.99 In a scene in which the Assyrians are guarding some Elamite prisoners, a figure is shown kneeling by a fire and tossing a flat bread between his (or her?) hands. A disc of flat bread is already placed among the flames to cook. Other prisoners are seated nearby, presumably awaiting their meal. (Fig.17).

**Leavened bread:** Leavened bread requires more preparation than the unleavened kind. It cannot be made from parched grain because of the destruction of certain enzymes, and therefore its development is held to follow the cultivation of species of wheat (such as *Triticum vulgare* possibly to be identified with *GIG/kibtu* - see Chapter 2), whose outer covering can be removed without parching.100 Although *emmer* (*T. dicoccum*) is more common, evidence for *T. vulgare* has been found from around the end of the fourth millennium, so that leavened bread made from this wheat could have been prepared from that time on. There is no reason to suppose, too, that barley was not made into leavened bread, nor that emmer-wheat, despite the difficulty of removing all the outer covering, was not used in this way. Examination of 'buns' found in the Iron Age village of Glastonbury in Somerset showed 'whole unbroken wheat grains with a noticeable proportion of glumes and fragments of awn,'101 suggesting that fine-ground floor was not considered a compulsory constituent of bread or cake in England at that time, so that a coarsely ground emmer wheat including the palaea which could well have been made into bread. However, it should be noted that Helbaek found no evidence for leavening in his examination of the 'buns' and 'bread' at Iron Age Glastonbury.102

Leavened bread is made by mixing flour and water, and a little salt. A leaven is then kneaded into the dough, which is put in a warm
place for fermentation. When the dough has risen, that is becomes
aerated and spongy, it is then kneaded again to distribute the ferment-
ing agent evenly and increase its activity. The dough is then shaped
into its final form and left to rise again, after which it is cooked
and baked at a high temperature.

There are several ways of leavening the dough. The leaven may
be a piece of the previous batch of dough, called a 'sour' or 'starter'
which has been kept for this purpose, or the dough may be fermented by
the wild yeasts or bacteria which settle on the exposed dough and
ferment it naturally. This latter is a slow process. Yeast taken
from the manufacture of beer may also be added. In modern bakeries
especially cultivated strains of yeast are now used, replacing other
types of leaven.

In Iraq at the present time bread is made by fermenting the
dough, either by the yeasts in the atmosphere, or more usually by the
use of a sour. It is then flattened by tossing and patting from one
hand to the other until it is very thin. It is then baked either by
placing it on the inside of a tannour-oven, which has been pre-heated,
or on an iron plate.

Tannour ovens are constructed of clay and curve gently up like a
dome. They have an opening at the foot for stoking and clearing out
the ashes, and a larger opening at the top for the insertion of the
flattened dough. Sometimes mudbrick walls are built on either side
of the stoke-hole to retain the ashes etc, and the whole structure
may be given a protecting wall of mud-brick around the outside (Fig.18).
Portable ovens of the type can be built.

A fire of wood and sometimes chaff or dried dung is lit inside
the oven and allowed to burn until the structure of the oven is heated
through. The fire is then quenched. The ashes are raked out through
the stoke hole and the inside of the oven may be wiped over with a
damp cloth. The dough, which is already prepared and fermented, is
lightly floured and patted and tossed from hand to hand until it is
paper thin. It is then put on the inside wall of the oven, through
the top opening (Fig.19). When the required number of pieces are in the oven the opening and the stoke hole are covered. Cooking time takes between 5 and 10 minutes.

In the Mosul area of Iraq, the dough is kneaded more than in the south and a large flat wooden board is used for this. Rolling pins are sometimes used to flatten the dough. The prepared dough is placed in the oven directly by hand, or else it is laid on an oval cushion which acts as a buffer against the heat. Commercial manufacturers of tannour-bread use rows of ovens, each of a much larger size than the single family oven, but worked on a similar principle, although the heating now is done by gas jets instead of wood fires' (Fig.20). Because of its low water content tannour bread keeps well.

Leavened bread can of course be cooked in ovens other than the tannour. Balady bread, common today in Egypt and the Lebanon, as well as in other parts of the Near East, is made by using a sour from a previous batch of dough. Round flat loaves about 25 cm in diameter and about 1-2 cm thick are baked at a very high heat for about 1 - 1½ minutes, normally in a stone oven. The very high heat causes the bread to puff out into two layers which are often stuffed with mince meat or other savoury mixtures.

Some of the processes involved in preparing bread can be seen on the Balawat Gates, dated to the reign of Šalmaneser III 858-824 BC, and illustrating campaigns of the Assyrian army. In one scene, a man is shown grinding the grain, suggesting that it was the whole grain that was usually carried on campaign, while another man can be seen bending over a deep bowl which has either a thick heavy foot or is set on a potstand. He is probably kneading the dough. The bowl is shown in section so that the man's hands can be seen inside. Each man has a curved 'mound' in front of him. The one in front of the grinder may be the pile of ground floor or grain while the other may represent a portable oven. However, this is not at all certain. (Fig.21) On another band an army camp contains a man grinding, and a second man standing, possibly kneading or mixing dough (unfortunately the vessel with which he is working is unclear). Behind this pair a man is standing
at what may be a bin (an unattached triangle near this bin may be a measuring vessel for the issue of grain to the grinder) or an oven (with the 'triangle' representing its lid). Beyond this man is a fourth figure who kneels in front of a two- or three-footed bowl, and mixes or kneads something inside it (Fig.22). Although the small scale makes it difficult to be certain of details, this scene may show the issue of grain, its grinding, and the first and second stages of kneading. (Alternatively the 'issue' of grain may be the actual baking of the prepared dough.) In yet another register a man is shown grinding in a similar manner to the others, but this time the 'kneader' appears to be rubbing something up and down a flat board which is inclined towards him. Another scene showing this action can also be seen on a stone relief. This may represent another method of kneading, such as the one used with a board in Mosul area nowadays.

Shapes of bread: Leavened dough can be made into many shapes such as rings and crescents. Representations of different shapes of bread can be seen on cylinder seals and impressions, reliefs or on stone vases etc. Many of these scenes indicate some of the different ways bread could be served in a meal.

A cylinder seal impression, dated to the Early Dynastic III period by Frankfort, shows a table covered with a cloth on which a bird has been placed on top of four (?) loaves of bread. The bread is flat but not wafer-thin. A similar method of serving bread appears on a cylinder seal which has been dated to the Akkadian by Boehmer. The scene is a presentation before the deity Ištar. On the top of a stepped altar a sheep's head is set on two flat flaps of bread. On the lower step of the altar is a small-footed goblet containing either some burning substance or possibly a steaming liquid (Fig.24).

The base of the statue of Ur-Ningirsu of Lagaš, dating to c.2100 BC, shows men kneeling on one knee and holding baskets containing what appears to be bread. The first basket contains triangular flaps of bread, possibly tannour-bread folded in this manner, another has rectangular shaped loaves, a third round bun-shaped loaves and a fourth flat loaves apparently stacked so that the outer edges stick up out of the basket (Fig.23).
The Assyrian reliefs include several scenes of meal-times, and one type of foodstuff frequently shown appears to consist of several layers or flaps laid on top of each other and bound together at one end so that the other end fans out slightly. A good example of this can be seen on the table at the feast of Ashurbanipal and his queen in the garden. Here the foodstuff is set on a small box or dish (Fig.7).

There has been speculation about the nature of this food-stuff. Bonavia has identified it as 'bananas' which he suggests could have been cut while green and shipped (from India) along the Persian coast, up to the Gulf and thence by river to Assyria. Attractive though this idea is, the length of the journey involved and the type of climate experienced in the area makes it unlikely that the bananas would have arrived in an edible state. Sadly there appear to be no representations of anyone eating a banana on the Assyrian reliefs. It seems more probable that these are in fact flaps of bread bound at one end for stuffing or serving.

A drawing of an Assyrian relief shows four men holding lion-headed goblets and seated at a table. On the table is a pile of bread flaps and a curved object which may be a crescent-shaped loaf of bread — although Bonavia suggests it is a slice of melon.

The actual remains of carbonized bread were found at Nuzi (mid-second millennium). Small flat circular pats of bread, presumed to be made of barley flour, and averaging 60 mm diameter and 6 mm thick, were found in a storage pot in the Palace, L.22. Allowing for a reduction in size through carbonization, these 'pats' may have been similar to balady-bread.

Terms for bread: The word for bread is NINDA/akalu and this can also mean 'edibles, food'. Many varieties of NINDA are mentioned in the economic texts. Some refer to bread of different shapes (for instance NINDA.ŠU — bread shaped like a hand, perhaps similar to the 'banana-shaped' bread of the Assyrian reliefs) while others refer to bread made from different kinds of cereal or grades of flour or with added ingredients such as apple or milk.
The common tannour-type of bread may not usually have received a more detailed name than NINDA or NINDA HIR or NINDA HIR A. It and barley (SÅ) are the terms most associated with the ration issues. NINDA HIR is read kusÅpu in the Neo-Assyrian period. This is connected with the verb kasÅpu 'to trim, break off a piece' and the method used in eating the thin tannour-bread is to tear off a portion and use it to lift other food to the mouth.

That bread was made from barley is shown by the use of the term NINDA Å and NINDA HIR sÅ SÅ bas-lat-ti. This bas-lat-ti derives from KUM/hasÅlu suggesting a certain grade of flour.

NINDA KUM (see also above in the discussion on isqÅłu = p.117-18) formed the basis of all issues for the king's meals (naptan Åarrim) at Mari. It is almost always listed first in the list of provisions and in the greatest quantities. Birot considers that it was a coarse unleavened bread of the type still common in the Near East and India. It may have been made with the same semolina-type of flour that was used to make the isqÅłu dishes for the king's meals.

Another type of bread which is common at the king's meals at Mari (and is also issued at Chagar Bazar) is NINDA emsu. Emsu/BIL.LÅ/BIL.LÅ is read as 'sour'. It may be that NINDA emsu was a leavened bread, made from a sour or starter, of a type similar to balady-bread today, while NINDA KUM was the flat tannour-type bread.

It is likely that the NINDA KUM and NINDA emsu at Mari were made from burrum-cereal. At this city daily and monthly records were kept of the issues of the provisions for the king's meals. Both NINDA KUM and NINDA emsu are included in the totals on these records, as NINDA or as burrum as if the two expressions were alternative ways of saying the same thing. These categories also included all the other types of foodstuffs with the exception of drink, oils, dates and honey. Burrum is regularly recorded as a receipt from various estates. Barley (SÅ) and emmer-wheat (ZÅÅ) are also recorded as receipts and it would seem that these three items were regarded as separate cereals. The connection of burrum with the king's meals suggests a
high quality cereal was used to make the dishes for the king's table (unless stated otherwise, for example ḫaṣṣāt) and it is therefore possible that burrum can be identified with a bread wheat, and it may be a Mariš term for GIG/kibtu. GIG was also used at Nuzi for NINDA emsu.

Cakes

Apart from plain breads, different types of sweet confections can be made from flour. A preparation, GİR.LAM, which is usually translated as a type of cake, is mentioned in a number of texts. It can be made with fruit of different kinds or even with semolina-cream (A.TIR/sasqi).

GİR.LAM cakes weighing 5 SīLA each and made with dates, and with apples, formed part of offerings for the temple of Sara at Umma(?) in the third year of Šu-Sin. And GİR.LAM cakes weighing 10, 5 and 4 SīLA each and containing pomegranates (NU.UR.MA) are included with date-cakes for different deities and the Tummal.

In a text from Ur, dated to the 8th year of Ibbi Sin, a list of mixed provisions from the temple of Nannar for the King's household include dairy produce, pigs, birds and fruit and fish, and 5 GIR.LAM. KU₆.A of 2 SīLA each. This may be a 'fish-pie'.

Another confection recorded in the texts is NINDA. rigged/A/mersu. As its name suggests, this was a preparation of flour and oil to which other items could be added. In the Ur III period at Ur it was part of offerings at the Temple Gates. Here it was made from ZI.KUM-flour and ghee (I.NUN) was added. A suggested translation is '(bread) and marmalade' but the use of 'marmalade' implies a connection with jam made from oranges or lemons, so that 'bread mixed or spread with oil' or perhaps 'sweetened bread' would be better.

NINDA. rigged/A/NINDA mersu is a recurring part of the king's provisions at Mari, in the Old Babylonian period, and it is nearly always present when large quantities of food are provided.
Many different things appear to have been used in the making of NINDA mersu at Mari. 1 KUR of dates and 10 SÍLA pistachio nuts (butumatum) were issued for the king's meal, while spices including differing types of cumin, and coriander were given for mersu in a text which also included the issue of spices for the cook (MU.MU) and for the ABR/AB arakkātum suggesting the existence of cooks who specialised in making delicacies for the king. Namẖaru-vessels of 40 SÍLA, 30 SÍLA and 5 SÍLA were given for the makers of mersu (Na NINDA mersu) and these may represent the vessels in which the mersu was mixed or cooked.

NINDA mersu is also found at other towns. At Ur it is included in a list dated to the Old Babylonian period of mixed foodstuffs including dates, oil, beer and ghee etc, and it is included in a list of grants of land, towns and food-items made by Kurigalzu, in the Kassite period, to the temple-estate of Ishtar, near Girsu. It is also included in a lexical list of the Neo-Assyrian period.

Two other types of sweetened cakes or bread are recorded in the texts: NINDA mutq/NINDA.LAL.LAL was occasionally issued for the king's meals at Mari and at Nuzi, where it was made from bread wheat (KIB/kibu); NINDA.KU.KU/NIqlu was common throughout the second and first millennia. It was made with 'linseed' oil (ES.GI.S.) in the Kassite period at Nippur and emmer wheat was also used in its production, particularly in the Neo-Babylonian period.

The differences between these confections is difficult to assess. The terms LAL.LAL and KU.KU both are translated as 'sweet', in lexical lists so that it may be that the main distinction between the two confections is their degree of sweetness. On the other hand, there may be something more fundamental, such as the difference between a cake and a pastry.

Sweetened cakes and breads, often stuffed with dates, figs or other fruits, are popular nowadays in the Near East. A traditional way of decorating such cakes is to use a klaicha-mould. These moulds,
now usually metal, have a design on the inside base. When the pastry
and the stuffing are prepared, the inside of the mould is lightly
oiled and a layer of pastry is pressed into the mould so that it fits
into the design. The filling is added and more pastry is used to
cover it. After the edges have been pinched together, the mould is
turned over so that the pastry-cake comes out with the design now
impressed on its top. The pastry-cake can then be baked.

Many pottery moulds were discovered in the tumble of Room 77
in the Palace at Mari. These moulds are round or rectangular
plates with raised sides. The round ones vary in diameter from .277
to .186 m, with depths of .032 to .038. The rectangular ones are
about .225 long by .197 wide and .077 deep. The bases are generally
about .02 thick. The designs cut in the bottom include combinations
of circles, concentric circles, chevrons, parallel lines, goats
growing from a 'sacred' tree, lions stalking bulls, rows of animals
cut into concentric circles, rosettes etc. Some of the concentric
grooves are cut on the slant or get deeper towards the centre.
Other moulds are shaped like lions and fish giving a three-dimensional
effect. The moulds were probably kept in an upper storey above Room
77, reached by a staircase from Room 70, which contained large ovens.
The nearness of these moulds to the ovens suggests that they were
used in food preparation, probably for the king's meals.

In an experiment it was found that a pastry made from plain
flour, water and oil, and filled with chopped dates and nuts, could
be pressed into a reproduction of one of these moulds. It turned out
and baked satisfactorily, retaining the design.

Similar types of moulds, tentatively dated to the Larsa period
but without proper provenance or publication, are on display in the
Iraq Museum in Baghdad. At Assur, dating to the Old Assyrian period,
two copper 'handled-pans' were found in graves. The inner bases
of these 'pans' are decorated with concentric raised circles with a
central boss. They are c.25 cm and c.19 cm in diameter. It is
possible that all these moulds were used in the manner of klaicha-
moulds today, possibly to decorate NINDA nersu, NINDA mutqû or mutâqu.
There is little evidence of these types of moulds continuing through the second and first millennia, but if they were made of metal it is not likely that many of them would survive because of their value for re-use.

3.1.3 Ovens

The remains of ovens have been identified at many excavated sites. At Jarmo (Operation II, levels 5 & 6, dating to the sixth millennium), ovens with chimneys were found incorporated into the house walls. It appears that the ovens were completely domed over with the stoke-hole cut through the wall into the adjoining room or courtyard. The chimney was built into the wall immediately above the opening of the stoke-hole. The floor of the oven in the best example, in II 6, was slightly higher than the bottom of the stoke-hole and it sloped gently up towards the back of the oven. Such an oven could be used for parching or roasting grain, as suggested by Braidwood, but it could also be operated in the manner of the modern pizza-oven; that is, heated by a wood or chaff fire until both the floor and the dome are hot, the ashes then swept to the sides and the bread or other food cooked on the floor of the oven. Similar ovens were found at Umm Dabaghiyah, although here the body of the oven was outside the house and the fire-door opened into the room. A plaster curb inside the room marks out the hearth. The chimneys are much more complete than those at Jarmo.

The so-called Round Operferstätten which were excavated at Warks, Stratum I5 (mid-third millennium), which apparently succeeded the troughs (see above, pp.117-19) may have been operated in a manner similar to the ovens at Jarmo and Umm Dabaghiyah, although they did not have chimneys incorporated into a wall. These ovens consist of an area enclosed by a mud brick border inside which a foundation of thick potsherds was laid. This was then covered with a clay coating and with a limestone wash, which was burnt and blackened whenever used. It seems as if the limestone wash was frequently renewed - Van Buren suggests this was done for every ceremony. Sometimes bitumen was used to cover the whole circle and charcoal ash and burnt animal
bones were found on the bitumen. These circular areas continued into Stratum I₂ when they no longer lay along the edge of the South-east court only and their construction was increasingly careless. They had died out by Stratum I₂.

The mud-brick foundations of these areas may have formed the base of a domed circular oven - albeit very large, about 4 m in diameter - the superstructures have been destroyed when the oven was re-plastered and rebuilt. There could even have been a chimney incorporated into the dome but as no traces of the superstructure exist this is only speculation. Flat unleavened bread, leavened bread or cakes could all have been baked in such an oven, as could joints of meat or birds. The use of bitumen to cover the floor of the area suggests that some sort of cooking-plate or vessel was used to contain the food, as one would expect the bitumen to soften in the heat and contaminate the food. However, as no trace of superstructure has been found, these round areas may not be ovens but hearths, perhaps used for preparing burghul or similar foodstuffs.

In Khafajeh, circular structures (called 'kilns' by the excavators) were built in a secondary courtyard (Q42:21) in the Sin Temple, IV and V (dating to the early third millennium). Those in Sin IV had projections flanking their entrances and the walls give the impression of curving over - perhaps to form a dome. They were rebuilt during the occupation phases of this level, and the floors were plastered and slightly convex because of the earlier brickwork beneath. By Sin V the structures were larger and closer together because of the constant rebuilding and the projections at the entrances were gone.

Another large circular oven with projections at the entrance was found in the south-west corner of the courtyard (Q43:16) in the Small Temple (9th building period, Early Dynastic III). Here the excavators state that the dome was still partly preserved. The probability that this type of circular structure was used for cooking food is increased by the discovery of a similar structure in the private house area at Tell Asmar (Level IVb, early Agade). This structure (with an approximate diameter of 2 m) was built of mudbricks
with a paving of baked bricks. Traces of burning were found on the floor and wall, the opening had flanking projections and the wall slanted inwards suggesting a dome. The excavators found no traces of fusion of bricks or cracking of the pavement to indicate the great heat required for a kiln. The proximity of other circular ovens, the fact that it was found in a residential area and the declaration of a workman that it was similar to modern ovens used for baking leavened bread, reinforce the excavators' suggestion that the structure formed part of a bakery, and the local people may have brought their more fancy breads and cakes there for baking.

The use of large-sized ovens, connected with public rather than private buildings, seems to continue into the second millennium. The kitchens form a prominent part of the Gipar-ku temple at Ur. The rooms consisted of two covered rooms and a courtyard. The courtyard contained a well and a bitumen-lined tank, presumably for water storage. At the south-east end there were two fireplaces: one was a range-type oven with a single fuel-chamber. The opening at the top ran almost the full length of the structure. It had a curb at the stoke-hole entrance. The other fireplace was an open-ended raised trough. The wall above the hearths was blackened with smoke. Opposite this, on the south-west wall, between the two entrances to the kitchen rooms, was a table of burnt brick covered with bitumen. The bitumen was worn and the exposed bricks were covered with criss-cross marks. It has been suggested that this was the place where meat was cut up and that these marks came from the knives of the butchers. A saddle quern was also found in the courtyard.

The kitchen rooms held the ovens. One contained the base of a large beehive oven. Only the lower courses survive because a later wall cut through the room. In the other room there was a range: there were two fuel chambers which were approached by tunnels. The fuel chambers were round with a clay column in the middle and there was presumably a chimney at the back, but this had disappeared. The top of the range was flat with two circles of holes which led down into the two fuel chambers. The cooking vessels would have been set on these rings. A small flight of steps had been built at the side of
the range, probably to enable the cooks to move the full cooking pots and to attend to the contents more easily. Storerooms, one still containing large storage jars, were situated near the kitchen.

This complex seems to contain most of the facilities necessary for preparing meals. Water was on hand in the well as were the food stuffs, from the storerooms. There were open fires suitable for boiling water or for stewing, and the range could also be used for stewing and boiling meat and vegetables. The beehive oven was presumably the main bread oven. There were also facilities for slaughtering the animals and for cutting up the joints. This is a layout similar to that used by a local sheikh's household in Daghara in the 1950s AD.161 There, for a special feast, freshly slaughtered sheep and cattle were cut into chunks which were boiled over open fires in the courtyard, while other dishes were cooked over open fires or in brick ovens in covered rooms.

At the Palace of Mari, two large ovens were found in Court 70, in the group of rooms directly west of Court 65 and in the middle of what would seem to be the service area of the palace. Court 70 had originally eight doors, of which two were later walled up, probably when the ovens were built.162 They both appear to be later than the first phase of the palace. A circular oven, with a diameter of 3.75 m, takes up most of the area of the room. It was built of mudbricks with a circle of baked bricks. The construction was corbelled but the mudbrick vault has collapsed onto the base. A double arch of burnt bricks forming the door survived. Two baked brick steps led up to the entrance and the interior is marked with smoke and ash.

An oval oven was built in the south-east corner of the room. It consists of a base of baked bricks with a vault of 'half-baked' bricks - because the construction is an oven it is difficult to say whether the bricks were originally baked or whether it was the use of the oven that baked them. The oven measures about 2.15 m by 1.50 inside. An unusual feature here is a flight of six steps leading apparently either to the top of the oven or to the room over Room 77 (which contained the klaicha-moulds).
A chimney oven was also found at the Palace of Mari, in Room 4, which is also in the service area. A chimney made of pottery funnels, 63 cm diameter at the base, and fitting into each other to form the chimney, was found in the south-west corner. It had an outer covering of mud-plaster. Five large jars were also found along the south wall, and could have contained the material used for baking in the oven below the chimney. Again the principle of operation would appear to be the same as a pizza-oven.

The tannour-oven is common in most sites in Mesopotamia. What may be one was found at Umma Dabaghiyah, Level III. Beehive-shaped ovens were very common in Level X at Tepe Gawra (at the end of the fourth millennium). Circular ovens are found in nearly every house level at Tell Asmar, for example in Level Vb, House II (Arch House) J20:10. At the north east end of the room, two ovens were separated from the rest of the room by a low screen wall about 60 cm high, which may have been built to protect the rest of the room from the hot ashes which would be raked out of the ovens as soon as they were sufficiently hot to bake the dough on the inner face.

Four ovens of this type were found in Level IVb, J18:10 and 21, in what was probably a service area belonging to House XXVII. They were enclosed by a curved clay wall and were next to the 'leavened bread oven' discussed above (p.130-31).

At Nippur bread ovens are recorded for the Ur III period (Level VII, House J, Room 287, Floor 2) and for the Isin/Larsa period (locus 85, TB Level I2) and in the Old Babylonian period (e.g. TA I3-2 House J, 163) and an example with a flanked opening for firing, was found in the middle of Room 53, House C, TA Level III dated to the Assyrian period. At Ur too, tannour ovens are common. One was found in a side room in the kitchen suite of the Gipar-ku and others were found in the houses dated to the Larsa period, e.g. House III, Straight Street and House XIV, Paternoster Row.

The tannour was also common at Nuzi, already being found in Pavement VI and V (late GA.SUR). In Temple C, H6, an oven had a
base about 35 cm below floor level so that there must have been a trough down from the room floor to serve the draught hole at the base of the oven. The walls were about 2-3 cm thick and converged inwards. At about 75 cm above the base, 40 cm above the pavement, the walls were too damaged for reconstruction, but it was thought likely that they did not close completely but left a gap like the modern tannour ovens. Some ovens in private houses were insulated by layers of clay and sherds (e.g. Stratum III C 20) and ordinary circular ovens come from houses in both Stratum III and II.

Bread ovens were also recorded from several places at Nimrud (e.g. Private Houses III) but some of the best evidence for tannour ovens in Assyrian times comes from their representation on the stone reliefs. In a relief from Nineveh a man is depicted in an Assyrian army camp, standing by a cylindrical structure. He is bending into this as if placing something against one of the internal walls, in the manner in which tannour-bread is placed. The mouth of the structure is wide and the stoke-hole is not shown. On the Balawat Gates, some of the curved 'mounds' beside the men grinding grain and kneading dough may be tannour ovens, although the small size of the representations make positive identification difficult. It would seem logical that the cooking of the food would be illustrated as well as its preparation. These ovens are probably portable tannour carried as part of the cooks' equipment.

There seem to have been metal ovens. This is suggested by an inventory from Kar-Tukulti-Ninurta which lists a 'bronze' oven (kanûnu ZABAR) and a bronze vessel. Both were fastened by bronze nails. The stand for the oven (I Na Napal kanûni) was made of wood with metal (bronze) sides. The oven appears to have four openings or flues on top for the heat to reach the cooking vessels.

A great many terms are used to describe different types of ovens - both those used for food and those used for such industrial purposes as pottery-making and smelting - braziers and grills. The term for tannour is ti-in-ru/IM.ŠU.ΝΙΓΙΝ.ΝΑ. Another term IM.ŠU.ΝΙΓΙΝ.ΝΑ.ΔУ.ДУ/τινûru mut-tal-li-ku in all probability refers to a
portable tannour. Another Sumerian phrase equalling tinûru is UDUN.MUḪALDIM (=MU). MUḪALDIM is cook or baker in Sumerian so it would seem that this refers to another type of oven used by the cook or baker, possibly the large so-called 'leavened bread oven'. UDUN is also used for an oven suitable for roasting grain (see also UDUN.SE.SA.A. = maqlû, qalû, laptu - see above p.110 and note.17).

Taken broadly, the archaeological evidence for baking-ovens indicates that the large ovens with one stoke-hole used both for firing and for placing the food, were attached to large-scale establishments such as temples (as at Warka and Khafajeh) or at palaces (as at Mari).181 They do not seem so common in the later second millennium and after, whereas the tannour oven is common in private houses through the period and in the north and south of the country.

3.1.4 Fermented preparations

This section will deal with the preparations of fermented grains which give rise to the alcoholic drink of Mesopotamia traditionally translated as beer.

The term 'beer' today covers all malted liquors known as beer, ale, stout, porter and lager. The chief raw material for all these drinks is barley, which has been malted, and many of the differences derive from the use of caramelized sugar, darker malt, local waters used in the brewing process and variations in the techniques of fermentation. Hops are added for preservation and flavouring, the amount used varying according to the type of 'beer' to be produced. For instance lager is more lightly hopped than ale and stout.182 Hopped beer was not known in England until the early 16th century AD183 and its predecessor the old 'ale' was a cereal preparation which could be brewed at home. It was probably similar to the traditional country beers still made in many parts of the world.

A study of the production of Kaffir beer in Africa was made by Platt and Webb184 who found that the beer was made from malted grain (e.g. millet, maize) which was dried and pounded and mashed in cold
water. This was then mixed with milled starchy material (such as cassava) which had been mashed in boiling water. The action of the enzymes, produced by the grain during germination or microbiologically, caused sugars to form, and bacteria working on these sugars produced lactic acid and certain B vitamins. The beer could be drunk at that stage, after only one day's fermentation, but for an alcoholic beer, it had to be heated after the first day and allowed to ferment for about a further four. This beer formed an important nutritional part of the local diet.

Mesopotamian beer-making

A study of a text ḫAR.ŠA = ḫubullu Tablet XXIII, which was published and discussed in great detail by L.F. Hartman and A.L. Oppenheim in 1950, suggests that brewing techniques in Mesopotamia may have followed similar lines to those used by the Kaffir beer-makers.

The text, copied in the middle first millennium from an earlier tablet, consists of part of the second column (on the obverse), the third and fourth columns and part of the fifth. Hartman and Oppenheim deduced that the tablet should be read backwards— that is, that the beginning of the text dealt with the finished beers and that the earliest stages of preparation were dealt with at the end. Within each section the lines should be examined in the orthodox manner, first to last. For instance, Col.IV, line 3, starts with MUNU₄/buqlu— green malt, and the following lines deal with the preparation of malt and its treatment, ending with line 23, BA.BA.ZA.MUNU₄/papp₂au— a dish of green malt.

Other texts deal with the process of beer-making. Among these is one from the Sumerian period.

A suggested outline of brewing processes in Mesopotamia, reconstructed from these and other texts, is as follows:
When the barley is to be malted, it is thoroughly soaked, kept moist and spread out in a dark and warm place until it starts to germinate. After a few days sprouts will have reached between half and the full length of the grain. During this process, by the action of the enzyme diastase, the endosperm has changed from starch to more soluble and fermentable sugars. The grain is then roasted, or sun-dried, to kill the sprouts, which can be removed if desired, and the malt is pounded or crushed. Sometimes earth was used to cover the grain for malting to keep it dark to assist in its germination.

There is a gap at the end of \textit{Up.XXIII}.Col.II to the beginning of Col.III, about 10-15 lines long, so that the stage after the making of the bappiru-bread and its crumbling and setting in water (lines 11 and 12, Col.III) is missing. It presumably contains the mixing together of the two beer-breads and the final fermentation. This is an important stage when the wort produced by the infusion of the malted TITAB-beer-bread and water is mixed with the crumbled bappiru-bread, plus any spices or other flavouring, heated and left standing for fermentation. It is during this period that the yeasts...
which lead to alcohol (and further B-vitamins) are produced. This happens automatically because of the growth of micro-organisms which produce certain enzymes which the naturally occurring yeasts utilize. The type of yeast culture formed controls the fermentation, taste and strength of the final brew and if the brewer wishes to produce specific qualities of beverage he must use the same type of yeast. This can be done by always using the same vessel for fermentation as the organisms which produce the desired quality of yeast will continue to grow in any cracks and corners of the mash-tun. It can also be done by retaining some of the yeast formed in previous brews and adding it to the bappiru-bread (in the manner of a leaven) or to the mash.

The stage of preparation called DIDA, and translated by Civil as 'sweet wort' may be the stage in which the two types of beer-bread are mixed. Sweeteners, such as honey and wine, might be added, presumably to aid fermentation. The mixture at this stage may not be alcoholic but can be taken as a drink.

The word for beer is KAS/sikaru and this was originally represented by a pictogram of a necked jar with a pointed bottom. This vessel may be the container in which the brew was stored, or it may be the vessel in which it was made. Oppenheim considers that the latter explanation is the probable one, and has pointed to a cylinder seal impression of the Akkadian period which shows a man working with a vessel set on a stand as illustrating a brewer at work (Fig.26). The brewer may be heating the mash as the vessel seems to be set over a fire.

A similar scene appears on a seal found at Susa which stylistically may date to the Agade period. The main theme of the impression is the presentation of offerings to a seated goddess, but in a subsidiary scene, the small figure of a man bends over a vessel which is set on a stand, over what appears to be a fire. He is stirring the pot and stoking the fire. A second, larger, pot sits beside him on the ground. The inscription above this figure reads UR.ZU.LU.BAPPIR. The brewer in Sumerian is written LÚ.BAPPIR (ŠIM+GAR) (In Lagaš
apparently KA$+GAR until the Agade period\textsuperscript{202}). In view of the inscription it seems likely that the subsidiary scene does represent the brewer at work, possibly at the stage in which the bappiru-bread and the TITAB-bread mashes are mixed and heated. Another scene of a brewer at work apparently draining off the wort, appears on an Agade cylinder seal.\textsuperscript{203} (Fig.27)

The sign for brewer and bappiru-bread is made up of ŠIM, the pictogram for which is a pointed vessel, with a square added to the bottom which could represent a stand or a stove, and an infixed GAR (NINDA). The element ŠIM is associated with perfumes and aromatic substances and its connection with beer and brewing suggests that certain aromatic substances were added to the drink.

Bappiru-bread and malt were important not only because they were the main ingredients of beer. At times they were issued as food-rations. This was particularly so in the pre-Agade period: for instance NINDA.BAPPIR was issued to named individuals for the month EZEM.D.BAU, during the reign of Lugalanda of Lagaš\textsuperscript{204} and MUNU ($\) (green malt) forms part of the name of a month EZEM.MUNU .KU (festival (?) of eating the green-malt) at Lagaš.\textsuperscript{205}

At Umma in the Agade period, BAPPIR, NÎG.ÂR.RA and MUNU were issued (possibly as foodstuffs, but equally possibly as ingredients for making beer) to individuals.\textsuperscript{206} In the Old Babylonian period, MUNU and ŠIM (possibly to be taken as ŠIM+GAR = BAPPIR) are included in what may be a list of foodstuffs distributed to workers. If this is so it means that the practice of issuing malt-products as foodstuffs did not go out with the Ur III period as is usually believed.\textsuperscript{207} Indeed, malted barley (ŠE.MUNU .MEŠ) was included in the list of provisions for Amûnûnûnûnûpûl's feast at Nimrud in the first millennium.\textsuperscript{208}

The issue of NÎG.ÂR.RA MUNU and BAPPIR as travel provisions occurs in a ritual designed to get rid of evil demons.\textsuperscript{209} These items are in a form which would keep well and could be consumed on a journey with only a little preparation. The NÎG.ÂR.RA and MUNU (malt) could be made into gruels and the bappiru bread could be used as bread.
They also form the basis for more elaborate dishes including alcoholic and non-alcoholic drinks.

Varieties of beer

Once the basic recipe for producing an alcoholic beverage from cereals was known many different sorts and strengths of beers could be made, depending on the type of cereal used, any mixing of cereals, the amount of malting, fermentation, type of yeast etc etc. That this is what happened is clearly shown by the number of words used to describe beer in each period. \(^{210}\) While many descriptions may have been 'commercial' names given by particular brewers to advertise their own products, other names do refer to the ingredients and to the strength of the drink.

At Laga both barley and emmer-wheat were used to make beer, and some information about the proportions of the grains and the malt can be found. Barley (ŠE) was issued for the manufacture of BAPPIR-bread for both strong beer (KAS.KAL) and dark beer (KAS.GIG/GIL). \(^{211}\) In another text \(^{212}\) strong beer (KAS.KAL) is made from 18 ŚILA emmer-wheat (ZIZ.AN), 18 ŚILA BAPPIR and 30 ŚILA MUNU for 5 NIGIN-vessels. Emmer-wheat, bappiru-bread and malt are also used to make red-brown beer (KAS.SI), and filtered beer (KAS.SUR). Dark beer (KAS.GIG) was made with these three items plus NINDA.KUM. \(^{213}\) For the red-brown beer, the proportions are 2/3 emmer-wheat and 2/3 bappiru-bread to 1 part malt - similar proportions as those for strong beer. For the dark beer the proportions are 1 emmer-wheat, 1 NINDA.KUM, 1 bappiru-bread to one part malt. For filtered beer it is 1 emmer-wheat and 1 bappiru-bread to 1 part malt. Thus there was a greater proportion of malt to the other ingredients in red-brown beer and strong beer than in dark beer and filtered beer.

This text records the beer in NIGIN-vessels. Assuming these vessels to be of standard size the amounts of each ingredient is as follows:
Table 8

Contents of each NIGIN-vessel:

| KAŠ.KAL | 3.6 ŠILA ZÍZ.AN | 3.6 ŠILA BAPPIR | 6.0 ŠILA MUNU \[= 13.2 ŠILA] |
| KAŠ.SI₂ | 9.6 ŠILA ZÍZ.AN | 9.6 ŠILA BAPPIR | 14.4 ŠILA MUNU \[= 33.6 ŠILA] |
| KAŠ.SUR | 7.2 ŠILA ZÍZ.AN | 7.2 ŠILA BAPPIR | 9.6 ŠILA MUNU \[= 24.0 ŠILA] |
| KAŠ.GIG | 3.0 ŠILA ZÍZ.AN | 3.0 ŠILA BAPPIR | 6.0 ŠILA MUNU \[= 15.0 ŠILA] |
|          |                |          | 3.0 NINDA KUM |

This would suggest that red-brown beer (KAŠ.SI₂) was the best quality (or thickest) beer, then filtered beer (KAŠ.SUR) followed by dark beer (KAŠ.GIG) and then strong beer (KAŠ.KAL) - the difference in the capacity of the NIGIN-vessel being made up by water.

Another type of beer which included emmer-wheat among its ingredients was KAŠ.ZÍZ/ulušinну. This type of beer is mentioned in texts, for example during the Ur III period at Lagash\(^{214}\) and at Umma;\(^{215}\) at Ur in the Old Babylonian period;\(^{216}\) it is listed, together with KAŠ.GIG/kurunnu, KAŠ.DIN\(^{217}\)ČIG/ulušinnu and KAŠ.ZÍZ.AN\(^{218}\)MAR/ulušinmahu, in the 23rd tablet of ḪA.ra = Ḫubullu;\(^{217}\) and in the Neo-Assyrian period in a letter.\(^{218}\)

It is likely that this type of beer may have been considered 'special' after the Ur III period: the reference mentioned above for the Old Babylonian period includes the beer in temple offerings and the Neo-Assyrian letter deals with the suitable diet to help treat an illness.

A more common beer is KAŠ.Ú.SA read as DIDA in Sumerian and billatu in Akkadian. The phrase has a number of meanings, including 'dry substance used in the preparation of beer' and 'liquid used in the preparation of beer.'\(^{219}\) As has been seen above, this substance may be the mixture of malted and starchy materials in its first still unfermented but drinkable infusion.
Among the occasions in which this type of beer appears in economic texts are: Ur III period, at Lagaš in a list of types of beer\textsuperscript{220} (here described as SIG\textsubscript{5}) and in a list of receipts of foodstuffs etc.;\textsuperscript{221} and among rations for the women of Sabu;\textsuperscript{222} at Umma as part of rations for 'messengers'.\textsuperscript{223}

In the Old Babylonian period it is recorded at Mari as being sent by boat, with barley and flour for rations for the garrison of Iabliya.KI - presumably these rations were dry ingredients for bread and for beer, sent before preparation for ease of transport and to keep better.\textsuperscript{224} It is also listed at Mari, together with bappi\textit{ru}-bread, malt (\textsc{Minnu}) and SIG\textsubscript{5} (possibly KAŠ.SIG\textsubscript{5} - a fine beer) and barley in a text which includes issues for festivals, for fodder, and for the \textsc{marī}MEŠ ummēni. Unfortunately the text is damaged, but it would appear that barley was issued to make the KAŠ. (?)U. SA.\textsuperscript{225} KAŠ.U.SA is also issued for Sippar (for a messenger going there?) in a text assigned to Lagab in the Old Babylonian period.\textsuperscript{226}

The reading of the element U.SA is unknown\textsuperscript{227} and the beer can be written KAŠ.U.SA, KAŠ. U.SA, and KAŠ.U SA. It is possible that the occurrences of KAŠ.UŞ (read usually as second quality beer) should be transliterated as KAŠ. UŞ - a short writing of KAŠ.UŞ.SA.

KAŠ. UŞ occurs at Lagaš in the Ur III period in a list of offerings including sheep, goats, flour and semolina-cream (A.TIR).\textsuperscript{228} It also appears in a text from Chagar Bazar in the Old Babylonian period, which gives details of beers issued for the king's meals.\textsuperscript{229} Other texts from this site give information about the amount of barley required to make a given quantity of specified beers.\textsuperscript{230} The beers involved are KAŠ ūa zumišu biru, KAŠ.SIG\textsubscript{5} and KAŠ. UŞ.

Thus:
Table 9

KAŠ ša zumišu biru:

| A.O.A.T.1, 36: | 45 SÌLA barley = 30 SÌLA KAŠ ša zumišu biru | 46 | 60 | 50 |
| 43 | 30 | SILL |
| 46 | 45 | 50 |

i.e. 1 SÌLA barley will produce between .66 and .83 SÌLA KAŠ ša zumišu biru.

KAŠ.SIG₅:

| A.O.A.T.1, 36: | 40 SÌLA barley = 44 SÌLA KAŠ.SIG₅ | 46 | 110 | 82 |
| 43 | 111 | 92 |

i.e. 1 SÌLA barley will produce between .74 and 1 SÌLA KAŠ.SIG₅

KAŠ.ÚS

| A.O.A.T.1, 36: | 15 SÌLA barley = 30 SÌLA KAŠ.ÚS | 46 | 20 | 40 |
| 43 | 32.5 | 60 |
| Gadd, A 926: | .5 | 1 |
| Iraq 7 A 944: | .66 | 1 |

i.e. 1 SÌLA barley will produce between 1.5 and 2 SÌLA KAŠ.ÚS.

These quantities suggest that the best (or thickest) beer was KAŠ.ša zumišu biru (average beer from 1 SÌLA barley .75 SÌLA), with KAŠ.SIG₅ second (average beer from 1 SÌLA barley .88 SÌLA). The difference is the amount of water used, the more water added to the brewing material the weaker the beer will be.

KAŠ.ÚS forms part of a list of foodstuffs, including other beers (KAŠ.SAG), wine (or grapes) (GEŠTIN.GAL), cereals and sheep probably supposed to cover a period of two months during the reign of Nazi-muruttas at Nippur, and it is also included in the stele of Aššurnasirpal at Nimrud. It is here listed immediately after types of barley preparations and before some fruits and nuts.

It would seem that KAŠ.Ú.SA is prepared from barley but it has a variant, KAŠ.Ú.SA ZĪZ.A.AN which used emmer-wheat. This is read DIDA INGAGA/diziptuḫḫu or alappānu.
Hrozny suggested that **dišiptubbu** (which only appears in lexical lists) is composed of **dišpu** (honey) and **tabbu** (sprinkle) and is therefore a sweet beer, but the Assyrian Dictionary rather takes it to refer to the 'honey of the (beer) dregs', possibly produced by the second squeezing of the mash. Hrozny's suggestion that the Sumerian **DIDA** equals **titu**, clay, mud, if correct, could back up this suggestion that this type of beer was based on the dregs of the mash. However, the connection between **DIDA** and **dišpu** (a sweetener) recalls the process of adding sweetening agents to **DIDA** in the Hymn to the Beer-Goddess and it may be a beer of the **dišiptubbu**-type which is being made in this hymn.

**Alappānu** certainly does not appear to be drink of inferior quality. The Assyrian Dictionary gives it as (1) bitter sweet taste in pomegranates and dates, (2) beer of bitter sweet taste, (3) kind of barley beer is made from occurring at Mari and in the Neo-Assyrian period. Campbell Thompson gives it as a species of pomegranate. This connection between the **alappānu**-drink and the pomegranate suggests that the fruit may have been used to flavour, and perhaps to colour, it.

**Alappānu** is a regular part of the provisions for the king's meals at Mari. Although the ideogram-writing **KAŠ.6.SA ZÍ.Z.A.AN** clearly suggests that this drink was made with emmer-wheat (plus barley), many references at Mari specifically associate it with barley. One text gives a total of 1 GUR 104 SILA **alappānu** made from 8 GUR 72 SILA **še ajappāni**, so that a given amount of barley only produces one third of that quantity in the **alappānu**-drink. That the drink was fermented is suggested by the names of utensils used to make it. These (**nammittum**, **namḫaru**, **māškiratum**) are associated by Oppenheim with the fermenting processes which produce beer.

The occurrences of **alappānu** at the king's meals at Mari nearly always coincide with the issues of large quantities of different types of **NINDA** including **NINDA mersu**, and with the issue of other types of food such as **šammum** (oil), **dišpum** (honey) and **šamimmum** ('linseed' oil), suggesting that the provisions were for a 'banquet' rather than for a routine meal. The issues of **alappānu** are never included under
NINDA in the daily or monthly totals in the king's meals texts, and they are quite often given as a separate total stressing the item's difference from the types of NINDA and from the other ingredients of the meals.

Types of drinks are very seldom mentioned in the texts of the king's meals, and certainly not on a regular basis. This suggests that the \textit{aleappānu} issues were considered something extra special which had to be recorded—perhaps to celebrate a special occasion.

Certain changes in techniques and taste in beer can be inferred from scenes on cylinder seals, votive plaques etc. Cylinder seal impressions showing scenes of banqueting, dating from the Jemdet Nasr period to the Agade period, show the banqueters drinking through tubes from large vessels. This suggests that the liquid contained substances which would be unpleasant to swallow. These substances may have been the hulls of the malted drink, or the drinkers may have been drinking straight from the fermented infusion with little or no intermediary sieving.

Examples of such scenes appear on cylinder seals from Kahafejeh in the Early Dynastic period,\textsuperscript{242} from Kish, probably dating to the Early Dynastic II period,\textsuperscript{243} from Ur in the Early Dynastic III period,\textsuperscript{244} and from Asmar in the Akkadian period.\textsuperscript{245}

In many of these drinking scenes, two participants drink from one or two tubes each. In one example one figure appears to be using both of his tubes at the same time.\textsuperscript{246} (Fig. 28). In the centre of the beer-vessel another tube stands upright, and the bottom ends of the drinking-tubes may be fastened into it. If this is so, the central tube may be hollow with perforated sides. It would thus act as a further filter: the liquid would enter the central tube through the perforations, leaving the largest pieces of sediment behind, while the drinkers suck the beer through their tubes, whose ends are inside the central pipe and therefore filter the liquid again.
Other cylinder seal impressions and plaques show a different method of drinking, that is, from a small cup, which is usually shown as roughly triangular in shape. In these scenes the drinkers hold the cup in one hand and may be attended by a servant. One example, from Pu-abî's grave at Ur, includes a seated figure drinking from a cup, together with two seated figures drinking through tubes from a central vessel. Votive plaques, dating from the Early Dynastic III period, show figures drinking from cups. One from Khafajeh shows the 'banquet' scene in the top register with the participants being entertained by musicians, in the middle register provisions for the banquet are being assembled, including a large narrow-necked vessel suspended in a sling carried on a pole. A fragment of a plaque from Susa shows servants filling cups from a similarly shaped vessel. The representation of figures drinking from cups continues into the Agade period (Fig. 29) and is common in the Old Babylonian period.

It seems likely that at some time in the mid-third millennium some new techniques in brewing were evolved which produced a clearer beer with fewer 'foreign-bodies' in it so that those drinking it did not have to drink it through filtering tubes but could take it direct from hand-held cups. Cylinder seals may have continued to show banquet scenes with drinking-tubes because of some ritual significance but the two types of beer may have continued to be made side by side for some considerable time, at least until the end of the Early Dynastic III period.

However, it is quite possible that the cups were not used for drinking beer but for some other liquid, perhaps even water.

Another change of technique is implied by a change in the writing of the word for 'brewer'. In the third millennium the brewer was written LÚ.SIM+GAR/LÚ.BAPPIR (in Lagâñ, LÚ.KAŠ.GAR), but during the Kassite period there was a tendency to write simply LÚ.SIM, and sometimes SIM+A in the Neo-Assyrian period. This change in writing, together with the fact that BAPPIR is only referred to in religious texts and vocabularies from the late second millennium suggests that the practice of baking a special type of bread to be added to the malted grain for fermentation was to a certain extent abandoned.
Brewers' equipment

Some items of the brewer's equipment can be tentatively identified from archaeological finds.

The pots used by brewers which appear on cylinder seal impressions have round or pointed bases, rounded shoulders with a slightly flaring neck. The pots are set on stands, either over a fire or with another vessel placed underneath. It is possible that these may be the vessels in which the malted grain and other materials are infused with water (called the mash-tun).

In modern brewing practice the liquid (wort) is run off through perforations in the bottom of the mash-tun. The residue left in the vessel can be used as fodder. Actual vessels with holes at or near the base have been found at several sites. The shapes of these vessels varies: examples from Khafajeh, Asmar, Ashur and Chagar Bazar and one from Nuzi have rounded profiles curving into narrow neck openings. The Chagar Bazar examples have flat bases. Two other examples from Nuzi have straighter sides with wide necks, and are more 'vat'-shaped, and an example from Nippur has a wide mouth but a more shapely curved profile. The position of the hole varies from off-centre (at Ashur, Warka) to centre. When in use the bottom hole would be plugged until it was time to drain off the wort. Vessels with metal plugs were in fact found at Chagar Bazar but clay or wooden plugs could have been used.

The linguistic record gives DUG.NIG.DUR.BUR as a fermenting vat with a draining hole at the bottom. This, however, seldom appears in texts. A more common term for a vessel with a hole at the bottom is GAKKUL/namzītu and kakkullu. The GAKKUL was 'a rather paunchy vessel' with a narrow opening, and a second (?) opening called an 'eye'. This is presumably the draining hole at the bottom of the vessel. The GAKKUL-vat was made of clay, though sometimes of metal or of reed coated with bitumen.

If the narrow opening refers to the mouth, and not to the draining hole, then the Nuzi vessels quoted and the Nippur do not answer
the description of the GAKKUL. It is of course possible that the shape of the mash-tun may have varied.

Most of the examples of vessels with bottom draining-holes come from the third and early second millennia. The examples from Nuzi are among the latest to be found. It is possible that the change in brewing techniques which, as suggested above, resulted in bappiru-bread no longer being an important ingredient of the beer, meant that there was less residue in the beer and therefore less need to run the wort off through the bottom of the mash-tun.

Another filtering device was found at Chagar Bazar, for use with the finished beer. This consisted of strips of metal (copper) folded to form a cornet-shaped receptacle with the lower half perforated. Many specimens still contained traces of reed inside. They were usually found at the bottom of large flat-based vessels in Level I graves.

It has been suggested that they were used to prevent the lees of alcoholic beverages from passing into the reed syphon through which the liquid was drunk acting like the central tube in some cylinder seals. If this is a correct interpretation, it suggests that reeds continued to be used to drink beer into the second millennium.

3.2 Flesh, Fish and Fowl

Information about the consumption and preparation of meat for food in Mesopotamia is slight, especially when compared with the amount of information available about cereal food-sources. As mentioned above (2.6, pp.91-92) the main domestic animals were kept as work-animals and for their wool, hair, hides, dung and dairy produce as well as for their flesh. Even wild animals such as gazelles may have been hunted for their hides as much as for their flesh, and in certain periods and among certain levels of society, the element of sport in hunting was important. But some evidence for the use of meat in the diet of Mesopotamia does exist, in texts, on cylinder seals and reliefs etc, and in the presence of animal bones on excavated sites.
At the present time, among the fellahin and bedouin, meat is a rarity. A sheep may be killed for a special occasion, such as a wedding or to honour a guest, but this is not a regular happening. And sick or old animals may be killed and eaten before they die naturally, but on the whole meat is not served more than once or twice a week — and this includes the use of poultry, fish, game and birds such as sparrows. The higher the person's position both economically and socially, the more often meat is included in the diet. In a nutritional survey in Iraq in the 1940s it was found that families from the rich merchants and land-owning classes and from the upper government officials were able to consume 'liberal amounts' of meat, while families from workers in trade or lower government officials consumed 'reasonable amounts' of meat. The poor city dwellers did not have sufficient meat (but were able to make up their protein needs from vegetable sources) while the poor peasants and 'mud-workers' from villages near the big towns had a diet which was very low in animal protein. 'They do not eat meat or chicken more than once every 10 days or two weeks.'

It seems likely that such a pattern of differences in consumption existed during the third-first millennia BC. It is usually assumed that meat was not issued as part of the ration in Mesopotamia. However, there is enough textual evidence to suggest that this is not so, and that the same classes were supplied with meat — even if only for special occasions.

During the Ur III period many texts record the delivery of animals to the kitchen (𒀭𒌆𒅁) and in some cases it is specifically stated that these animals are for particular groups of people. For instance, one text records 6 sheep sent to the kitchen on behalf of the troops (as provisions). The text is dated after the 29th of the month of MAŠDA.KU but it is not clear for what period the sheep were issued nor for how many people. Another text records 5 sheep, 5 ewes and 10 full-grown goats sent to the kitchen on behalf of 'warriors' in the Tummal. And a grass-fed ox (𒆜𒅁) is given to the kitchen on behalf of men who receive provisions (𒈾𒆠.KU(R). RA.NE.ŠE) (this issue is included with a gazelle for the deity Enlil, an equid for some lions and an ox and sheep for the kitchen).
The UKU.US - usually accepted as some sort of soldier - is the most frequently mentioned of the professions which are specified as receiving provisions from the kitchen. Sheep, goats and cattle are the main animals sent to the kitchen.

From Ur come two texts which record the issue of sheep to female weavers, possibly for special occasions such as the new year. Fish were given to servants at the new year also. That mutton, pork, fowl and fish were included in the provisions for the king's household is shown by a text listing these foodstuffs with dairy products, vegetables and fruit sent from the temple of Nannar. But rather more surprisingly, it seems that meat was also supplied for prisoners of war.

All this, plus the record of the animals sent to the kitchen, whose destinations were unspecified, suggests that meat formed quite an important part of the diet during the Ur III period. Kang even goes so far as to suggest that meat may have been more important than grain at that time.

In the Old Babylonian period there are fewer references to the issue of animals to people. But at Larsa, fat-tailed sheep are listed as 𒈵𒈵 - which is translated as 'used for' food. Other entries in this text include three dead sheep and some fat-tailed sheep possibly for named individuals (the text is damaged for two entries but the third gives a proper name). Two texts which probably come from Sippar mention sheep which were taken or which came from food portions. Although the texts are not completely clear, this may mean that the sheep were to be used as food. There is also some evidence for the issue of meat at Mari. Sheep are delivered to the kitchen and are presumably slaughtered, cooked and eaten, although it is not known by whom. Hammurabi of Kurda received food and drink from Zimri-Lim for his meals at Bit-Kapšû and in a letter about this, Zimri-Lim is asked to fix the amount of food, drink and sheep indicating that the king not only provided food for his political dependants but that meat was an accepted part of meals - particularly for the rich and powerful.
the king’s meal are cited as coming from an unpublished text at Mari.\textsuperscript{275} Malāku is a cut of meat\textsuperscript{276} and takbisu has been tentatively translated by Bottero as part of the leg, on the basis that it derives from kabāsu — to walk.

In order to consider the preparation of the various sources of meat, it is proposed to discuss them under the headings (1) meat from domestic animals; (2) meat from game animals; (3) fish; (4) birds.

\subsection*{3.2.1 Meat from domestic animals}

The main domestic food animals are the sheep, goat, cattle and pig. The last will be discussed by itself later in this section.

The first stage in the preparation of an animal for food is the slaughter and subsequent skinning and cutting-up of the carcase. Some representations of these acts exist. In an ivory-inlay from Mari, dating to the mid-third millennium, two men are depicted holding the legs of a ram which is lying on its back. The ram would seem to be held down for slaughter.\textsuperscript{277} (Fig.30) From the Akkadian period comes a cylinder seal consisting of two registers: the upper register shows a file of sheep with a herder while the lower one is described as a ‘farmyard scene’.\textsuperscript{278} The scene includes some birds and a group of sheep together with two sheep which lie on their backs with all four feet straight up in the air. A man works on each sheep, apparently doing something to their back legs. One of the men, who is seated on a stool, appears to be poking something into the sheep or pulling something out of it. There are three possible explanations for this scene: the men may be assisting at lambing — although the position of the sheep would be strange for this; they could be gelding rams — although the sheep would undoubtedly require some sort of shackling or holding which is not shown, or they may be preparing carcasses for food by splitting the carcases in two from the back legs to the head.

Some illustrations of the slaughter of animals appear on the Neo-Assyrian reliefs from the first millennium. In a scene after
the assault and sack of a city two soldiers are shown holding a fat-tailed sheep for slaughter. In another relief, inside a fortified camp, a fat-tailed sheep is being slaughtered on a bench - its head is positioned so that its blood is drained into a basin. The skinning of a carcase is shown in a scene from the time of Amûrânîpal. (Fig.31) Here, in a tent in an Assyrian camp, the body of a sheep is suspended by the back legs from the tent-roofing pole. The butcher is shown removing the skin. The body is hung over a basin, presumably to catch any blood. The reason behind the use of basins to catch the blood of newly slaughtered animals may be no more significant than a wish to prevent the blood from fouling the inside of the tent.

The beginning of the next stage of preparation, that of jointing, is shown on a relief dating from the reign of Amûrânîpal. A butcher and his assistant are depicted, in a fortified camp, preparing the headless body of a sheep. The carcase is on its back on a table. The assistant keeps it steady by holding the legs while the butcher, who has one arm inside the carcase, is either cleaning it or beginning to cut it up.

Some of the joints into which the carcases were cut appear in reliefs, cylinder seals etc. On the sounding box of a harp at Ur, found in one of the Royal Graves (Fig.32) what would seem to be mythical scenes in which animals are doing the work of humans, a dog is shown carrying a table on which there are the heads of a pig, and a sheep and the whole leg of what is probably a sheep.

On cylinder seals dating to the Akkadian period, the heads of sheep are shown set on piles of bread, presented as offerings. (Fig.24) And on a Neo-Assyrian relief what seems to be the jawbone and leg of a sheep (or perhaps cow) are set in a bowl, beside a pile of bread, as an offering at the end of a lion hunt.

It is unclear how these joints were cooked. The most likely methods are boiling or roasting. A text from the Ur III period refers to goats being roasted in the oven for provisions for troops.
(See also Chapter 4, pp. 255–256) for further discussion on cooking methods.) In a series of texts dealing with the cult of Aššur, instructions for cooking meat are given. For example, the sacrificial meat may be placed on a hearth - to roast - and the tail of an animal, in bouillon (ina A.MES.UZU) - perhaps in its own jelly, is suitable to place before the god. Other references to cut-off meat (UZU bat-gū) suggest that these were lumps of meat cut from a carcase and boiled or stewed. Instructions are given to the cook to take the interior organs of a sheep, and the use of these, and the fact that heads, legs, ribs, and bones of animals were included in offerings suggests that little of an animal was wasted.

The use of the head of a sheep has already been mentioned for the Early Dynastic and Akkadian period (see above, 3.1.2., p. 123). A dish today which is very popular in Iraq is parcha, made from the lower legs and feet of a sheep together with the head and stomach. It is served on pieces of bread. The sheep's head set on bread which was offered to Inšar on the Akkadian seal, and the references to sheep's heads and legs on buburtu-bread in the Neo-Assyrian instructions for offerings, may represent similar dishes to the modern parcha.

A possible representation of roasting meat appears in a Neo-Assyrian relief showing spoil being taken from a city to go to Assyria. The scene includes soldiers placing joints of meat on a fire. One soldier holds his hand up to his face to protect himself from the heat, while another is cutting up a fat-tailed sheep. The head of a sheep is on the ground. At first sight the soldiers appear to be throwing the joints on the fire for burning rather than to roast them, but it seems unlikely that such activities would be recorded, as the sheep formed part of the spoil which was being taken to Assyria. It is more likely that the scene represented the roasting of meat for a victory feast for the soldiers.

Preservation techniques

The preservation of meat is a problem. The transportation by boat of cooked meat for the use of troops, in the Ur II period suggests that this was considered the best way to move provisions on
short journeys, but over longer distances and for longer periods the meat would go bad. The animals were therefore probably kept alive until they were required for food. How much drying and salting was done is unclear. The methods were used for fish (see below, pp.174-76), but evidence for their use for meat is slight until the Neo-Assyrian period, when there are references to salted and preserved meat. For instance, **tak-me-ša-a-ni**, translated as 'pickled mutton',\(^{293}\) is used in a ritual for **ABŠur** in the provisions for a feast given by **ABŠurnaširpal**\(^ {294}\) 100 **GU₄** **ME₃ ma-ad-lu-te** are listed (not with the live animals but in what seems to be a miscellaneous selection of foodstuffs such as roasted grains and different types of nuts). **Ma-ad-lu-te** has been translated as 'salted'\(^ {295}\) so that the suggested translation for this line is '100 (pieces of) salted beef'; and a late Babylonian letter instructs the recipient of the letter to put meat which has been brought to him into salt (if he is ready).\(^ {296}\)

There is some evidence for the use of ice. A letter from the 'king at Rimah to his wife instructs her to see that the ice (**Bu-ri-pa**) of Qatara is unsealed (?) and that the ice is guarded.\(^ {297}\) There was an icehouse (**Biṭ Sušipim**) at Terqa\(^ {298}\) and ice, wine, and rams were provided for the meals of some Elamites at Mari.\(^ {299}\) All these references are from the Old Babylonian period but Dalley has pointed out that ice was transported from Beirut by sea to Egypt in the Mtmaluk dynasty and when this was impossible, owing to pirates, relay stations were instituted on land between Cairo and Damascus so that the ice could be brought by camel.\(^ {300}\) Long distance transport of ice in Mesopotamia was not impossible, but the evidence for its use in later periods is so far lacking. It is not clear whether the ice was used for preserving food at Rimah and Mari. At Rimah the king's wife is told to see that the goddess, she and another lady drink regularly which suggests that it may have been mainly associated with cooling drinks.

**Pigs**

The pig is not an animal likely to be kept for any other purpose but for food, so it is reasonable to assume that where it was kept there it was eaten.
The pig is referred to in texts at Lagaš, in the Early Dynastic period where barley is issued to feed reed-fed and pasture-fed pigs; at Umma and Kish district in the Agade period; at Lagaš and at Ur in the Ur III period; in the Old Babylonian period at Chagar Bazar and Lagaba; and at Nuzi in the mid-second millennium.

Archaeological representations of the pig occur in the Jemdet Nasr period at Khafajeh where a large pig is shown beside preparations for a banquet, painted on a Scarlet Ware vessel; at Tell Brak as an amulet; and at Ur in the form of a grey steatite carving in the round of a crouching boar. Terracotta figurines of pigs have been found at Chagar Bazar dating to the early second millennium and at Tello (post-Agade). Vessels shaped roughly like pigs - the so-called 'pig-pots' - were found at Rimah and at Nuzi dating to the mid-second millennium.

In the Agade period a cylinder seal shows wild pigs being hunted: three men are standing in a boat, one is propelling the boat with a pole, the middle figure is a deity, while the third figure is spearing a boar in the reeds. A similar scene from Ḫabur, also probably dating from the Akkadian period, shows men pig-sticking a boar in the reeds. In a relief from the Neo-Assyrian period, a sow with her litter wander through a reed thicket in which a deer is also walking, while in another relief, a stag and boar appear in a thicket in the Royal Park near the scene of Aššurbanipal's banquet with his queen.

All this suggests that the pig was kept as a food-animal during the third millennium, but that this practice died out in the second millennium in the alluvial plain, only continuing in such areas as Chagar Bazar and Nuzi, in the north west and east of the plains. However, hunting wild pig probably continued, especially in marshy, reeded areas; the appearance of the boar in the royal park at Nineveh may mean that this animal was kept for the king's hunting pleasure, although there is no evidence for large-scale hunts such as were arranged for the lion and wild ass. The hunting of the wild pig may have been carried out for sport, for food, or to rid the area of destructive pests as it is in modern times in the marshes.
There are a number of proverbs and popular sayings which are derogatory to the pig. The pig is said to have no sense, to be unholy and smelly, to be unfit for a temple, not allowed to tread on pavements, to be an abomination to all the gods and accursed by Šamaš. These unflattering remarks mainly come from an Assyrian tablet dated to the sixth year of Sargon II and suggest that although the pig was not considered fit for offerings to the gods it was still eaten - one saying states 'His master left him ... the butcher slaughters him.

Although proverbs can be difficult and misleading, two which appear to go together are: Meat with fat is (too) good, meat (with) suet is (too) good (UZU.IA AL.ZE EB UZU.IA.UDU AL. ZE EB), What shall we give to the slave-girl (to eat)? (TA.ĂM.GL.4.IN.NA GA.AN.NA.ĂB.ZE EM.DU), Let her eat the ham (?) of the pig! (DUR.SĂ D'E.KU.E).

In other words, meat from the pig was suitable for the slave-girl to eat while other pieces of meat were considered too good.

There may also have been a taboo against eating pig in the month of DU₆.KU/Teṣritum as there is a proverb that a pig was not slaughtered (or he(?) did not slaughter) in this month, which is equated with September/October. Although this may be for some hygienic reason - such as the speed with which pork would go bad, which would apply to all the summer months - it may refer to something quite different. The next part of the proverb refers to not wearing a new Turban (?) in the month of Ululum which precedes Teṣritum. The proverb could be referring to the straitened circumstances which might exist towards the end of the summer.

3.2.2 Bones from sites

Many bones of domestic animals have been found on excavated sites in situations which suggest that they had formed part of a meal. In a number of graves in the cemetery at Ur, sheep-bones were found in saucers and in one grave animal bones mixed with vegetable remains were also found on saucers. One saucer in PC/1054 contained fragments of immature vertebrae from a sub-adult caprovid, while another contained fragments of rib, probably from a sub-adult sheep. These last fragments showed signs of butchery cuts.
The shape of the saucer - Type 5 - recalls the dishes which are shown either placed on offering tables or held by figures on many cylinder seals. This saucer may have had ritual connections and have been used to deposit representative samples of meals in graves and to offer similar samples to the gods during banquets. On the other hand the saucer would also appear to be a convenient size for handling, and thus could have been used as 'plates' which contained individual helpings of food as well as being used for drinking vessels. The banqueter would hold the saucer in one hand, while using the other to carry the food to his mouth. The use of the saucer in graves may therefore only represent what was considered to be an individual helping.

Some of the bones found in the Ur graves were large and had been deliberately broken, presumably to extract the marrow. In the report on the animal bones found in the Royal cemetery, teeth belonging to sheep, goat or possibly gazelle, were found throughout the collection. A large percentage showed absence of wear and many had not cut the bone, indicating that they had come from young animals. Teeth from young pigs were also found, in PG/88 and PG/144, and are thought to have come from domesticated animals. It can only be assumed that these teeth are either the last surviving remains of animals slaughtered for food or that they were left in the graves to symbolise in some way the whole animal.

Bones from sheep, goats, cattle and pigs were found at Tell Asmar and examined by Professor Hilzheimer. He estimated that the bones represented about 14-16 individual pigs, 6 sheep/goat, and 4/5 cattle (and 10 gazelle and 3 fallow deer and 5 onager) which suggests that the pig was the most important food animal. These bones cover from the Early Dynastic III period down to the Isin/Larsa, and come from different parts of the site. If the individuals are calculated according to find spot and period, a slightly different picture emerges (surface remains are ignored).

In the Early Dynastic period there were a minimum of 1 cow, 3 sheep/goats and 3 pigs; in the early Akkadian (Proto-Imperial) 4 cattle,
5 sheep/goats and 7 pigs; in the full Akkadian period (First and Inter-Imperial) there were 2/3 cattle, 2/3 sheep/goat and 2 pigs. In the Iaín/Larsa period the remains of some 2 pigs were found. If the larger body weight of cattle is remembered this suggests that the three types of animals were equally important as food sources at Tell Asmar. The evidence from the House areas is fairly slight, and it should be noted that the identification of cattle and sheep/goat in House VI rests on horn cores rather than the actual bones, but it can perhaps be assumed that the carcase belonging to the horn-cores was consumed.330

In a report on the animal bones found on the site of Nuzi331 it is said that bones of cattle were rare in both the GA.SUR and Nuzi levels. Goat was said to be common at GA.SUR and Nuzi while the sheep was 'uncommon'. However, in view of the difficulty in distinguishing between sheep and goat it is probably best to lump the two animals together. Bones, described in the main text as 'sheep-bones' were found in many private houses - for example C39 - in association with the 'leg-bone of an elephant'! - and B3 near a hearth and ovens.332 Pigs are recorded as common.333

3.2.3 Game animals

Hunting must always have played an important part in Mesopotamia both for the protection of flocks and man and to secure food and other raw material. The site of Umm Dabbaghiyah, dated to the early Hassuna period, probably existed as a centre based on the trading of onager hides. That the onager was important is shown by the fact that 68.4% of the bones excavated in two seasons were found to be onager, in second place came the gazelle with animals such as cattle, sheep/goat and pigs of relatively little importance.334 Thus animals obtained by hunting (and a wall-painting shows the onagers being hunted) provided not only the reason for the site but the main source of meat. The principle of protecting the flocks is seen in the Lion Hunt Stele from Warks, dated to the early third millennium in which a figure (possibly the king) is seen both spearing and shooting an arrow into lions.335 And figures wrestling with lions and other wild beasts who are
threatening other animals appear on cylinder seals from many periods. It is likely too that the element of 'sport' which appears in the lion hunts in the Neo-Assyrian reliefs from the reigns of Aššurnaṣirpal and Aššurbanipal existed in the earlier periods.

The provision of meat was probably the main reason for hunting and the main animals hunted were the ibex and wild goat, the gazelle, members of the deer family and the hare. Methods of hunting will be mentioned in the discussions on the various animals.

Ibex and wild goat

Ibex and wild goat did not play an important part in the diet of Mesopotamia but they appear either as part of a decorative pattern or as hunted animals throughout, and must therefore be considered as a subsidiary food source.

The ibex (Capra ibex) and the wild goat (Capra aegagrus) are species of the same family (Capridae) and have many outward similarities. Both are bearded and have shaggy coats. The main distinguishing features are their horns. The ibex (adult male) has very long horns, which are curved like a scimitar, with the tips recurved behind and moderately divergent. "Each horn is bilaterally compressed, with the anterior surface flattened, bearing prominent, rather regular and bilaterally symmetrical transverse bosses which project internally beyond the medial surface of the horn... the surface of the horn is marked by annular ridges detectable almost to the tips." The horns of the adult male C. aegagrus are long, curved backwards like a scimitar and bilaterally compressed, "with a sharp anterior keel on which irregular longitudinal bosses develop with age." They may be widely divergent at the tips or curve inwards and even occasionally cross. It is difficult to see clear identifying characteristics on designs of cylinder seals and plaques (many of which are worn), but a study of the two types of horns suggests that the main visual characteristics are the regular raised bosses on the ibex' horns which give the impression of dividing the horn into segments, and the irregular bosses on the upper surface of the C. aegagrus' horns. The ibex may thus be identified by regular markings running the whole of the horn dividing it into sections and the C. aegagrus by irregular markings or by no markings at all.
Both these animals are common on cylinder seals, especially in the Jemdet Nasr and Early Dynastic periods. One cylinder seal shows a C. aegragrus being hunted by a man with a bow and arrow. Two animals appear to be dead or dying while a third, the adult male, has been already hit by an arrow. The animal's horns are shown to have a smooth posterior edge with an angled and irregularly marked upper edge.340 Many of the 'Brocade' style of cylinder seals depict animals which could be either ibex or wild goat (and in some cases gazelles or deer341), but later, in the Early Dynastic period, ibex are clearly shown (with evenly segmented horns) - on one occasion a 'hero-figure' is stabbing a lion who is attacking the ibex.341

A charming example from the Akkadian period shows either ibex or wild goat skipping up and down mountains. They are pursued by lions and a man is firing a bow and arrow up at one animal who is bounding up a hill.343 Later examples of the hunting of wild goat (or possibly ibex, the identification is unclear) can be found on a Mid-Assyrian seal, in which the animals are pursued to the mountains by an archer in a chariot drawn by two horses.344 In Neo-Assyrian times the wild goat or ibex (probably the former because of the longitudinal markings on the horns) was used to decorate ivory.345

Antelope and deer

Gazelle MAŠ DA/gabtu:346 The most common antelope found in Mesopotamia is the gazelle (MAŠ DA/gabtu) which played a very important part in the diet. In Umm Debbaghiyah gazelles are the second most common animal - 11.4% of the identified bones,347 well in excess of the domesticated food animals. And this importance as a food source continued, especially in the Ur III period when there was a month named after the animal at Puzriš-Dagan-MAŠ DA.KU the month of eating of gazelles, this was the first month in the calendar.348 In other references gazelles were issued for the meat-meal of the warehouse (Š.KIŠIB BA.SE)349 and they were sent to the Š.UZU GA (?bird-house).350 Some of the animals sent to the warehouse were dead351 and presumably they were there for storing and perhaps drying.
At Chagar Bazar gazelles were sometimes fed barley, presumably for fattening (0.5 ȘILA per day) and the continuation of the importance of gazelle in the diet is suggested by the provision of 500 for the banquet given by Aššurnāṣirpal in the Neo-Assyrian period.

Gazelle bones have been found on several sites, in particular Tell Asmar where horn cores were found in the Early Northern Palace (Early Dynastic III) and in the Proto-Imperial Northern Palace, in the Single Shrine, II/III, and in House VI, Level Va. Hilzheimer has identified these as belonging to the Gazella subgutturosa Guldenstadt but Hatt does not consider that the horn cores can be identified below the generic level.

The gazelle is a small or medium sized antelope of graceful build. The horns of the male are erect, and may have a slight curve or be lyre-shaped; they are marked with regular ridges. The female's horns are either small and slender or absent. This animal is depicted many times on seals, reliefs, etc. Two examples from the Middle Assyrian period include a cylinder seal on which a gazelle is being rescued from a lion by a naked man with a spear and an ivory pyxis and cover from Aššur. Aššurbanipal took part in organised gazelle hunting: a sequence of reliefs shows a herd of gazelles, including females and fawns, being driven to where the king is hidden in a pit with his bow and arrows, ready to shoot.

Examples of other types of antelopes depicted on cylinder seals include one from Khafajeh, on which a long-horned antelope is kneeling drinking from a stream. Behind him sits a wild goat (?). A similar type of antelope can be seen on pieces of ivory from Nimrud from the Neo-Assyrian period.

Deer: LULIN/šulimu; DARA.BAR/si(j)alu: Red deer, roe deer and fallow deer have all been identified on seals and reliefs etc. They can be distinguished by the difference in their antlers: the red deer has large branching antlers, while the fallow (in particular the Dama dama mesopotamica) is medium-sized, with less branching antlers which
are often palmate. The coat is usually spotted. The roe-deer is small-sized and the antlers are small, erect and usually three-pronged, without a brow tine.362

A good example of the red deer is the copper plaque from al 'Ubaid, on which a lion-headed eagle grasps the tails of two stags with many branched antlers.363 Similar antlers may be portrayed on the 'Brocade' cylinder seals such as one from Tell Asmar364 and from Khafajeh.365 A plaque from Kish on which a lion attacks a deer may also show a red deer: although the antlers are thickened, and may be meant to be palmate, there are no spots on the coat and the number of branches suggests the red deer.366 And a mould from Mari shows a man capturing a red deer stag with the aid of a dog.367 A red deer was one of the animals kept in the royal park at Nineveh by Aššurbanipal.368 Although from these examples the red deer was known in Mesopotamia (and certainly in the third and second millennia) there are no modern occurrences known in Iraq.369

Two fine representations of fallow deer appear on Middle Assyrian cylinder seals. In one the antlers are branching but the coat is clearly spotted, while in the second, both the palmate antlers and the spotted coat are depicted.370 Fallow deer are fairly common on the Neo-Assyrian reliefs; one is shown carried by a winged guardian at the doorway of the Throne Room in the North West Palace at Nimrud371 - the palmate antlers and spotted coat are clear. Also from Nimrud, deer with spotted coats are carved on ivory pieces. The antlers are thickened, but have many branches.372 Deer with similar antlers, but without spotted coats, appear on reliefs in the Palace of Aššurbanipal at Nineveh.373 Stags and does are being chased across hilly and treed countryside. One of the stags has been hit twice by arrows. Their retreat has been cut off by a net which is being erected to prevent them escaping. One stag is shown trying to break through the net: one of the beaters is holding the net and entangling the stag in it. Although the animals do not have the spotted coat of the fallow deer the antlers are thickened, united as if to indicate palmates and the brow tine is clearly shown.
Antler fragments of *Dama mesopotamica* Brooke were found at Warka and at Tell Halaf and *Dama dama* Linnaeus antlers came from the Archaic Shrine of Abu (Early Dynastic I) and the Northern Palace (Proto-Imperial) at Tell Asmar. Hilzheimer states that the fragments from the Northern Palace had been cut off rather than shed so that these were from animals killed during a hunt.

The roe deer is rare in Mesopotamian art. Tentative identifications from the Neo-Assyrian period are the deer which is shot by bow and arrow on a broken obelisk of Amûrâñasîrpal found at Nimrud, the short-antlered deer carved on an ivory piece, also from Nimrud, and the short-antlered animal held by a winged guardian at a building of Amûrânîbâpal, possibly the Central Palace at Nimrud.

Deer appear in the economic texts in the Ur III period. A *LULIM. NITÁ.NICAX* (barley fattened male stag) is sent to the fattening shed in the month *MÂK.À.KU* while the carcase of another was received by Ur-nigin-gar.

*LULIM/lulîmu* is translated as a red deer or stag, and stags and gazelles are often used for rituals and festivals. Large numbers of *LULIM* are included in lists of animals. In two particular texts, apparently of animals held (?) or passing through a depot at Puzrih-Degen, 404 *LULIM* were counted between the 12th month of Kulgi's 44th year and the 10th month of his 48th year, and 142 during the 5th year of Amar Sin.

Another text, dating to the third year of Šu-Sin is a ledger covering month by month payments of animals by known officials. This includes the *LULIM* and the *DÀRA*. *DÀRA.BAR* is read as *aj(j)alu* in Akkadian and translated as 'stag deer'. It is probable that *DÀRA* in Ur III also referred to a type of deer. *Aj(j)alu* appears at Chagar Bazar where one receives 1 *SîLA* per day at the fattening shed (byt mat). 500 *DÀRA.BAR* are provided for the banquet of Amûrânasîrpal. It thus appears that deer played at least a secondary role as a food source throughout the history of Mesopotamia. If *LULIM* is the red deer, this animal appears to have dropped out of
use by the end of the third millennium. DARA.BAR may be the fallow deer continuing in use into the first millennium.

Hare: KA.EDIN.NA, A.GAR.EDIN.NA/arnabu The hare is a common feature on cylinder seals, frequently used as a filler motif. A particularly nice example of a hare being carried by a hunter (who also carries a gazelle across his shoulders) away from a wood appears on a Neo-Assyrian relief from the Palace of Sargon II, at Khorsabad. (Fig. 33) In another Neo-Assyrian relief, this time from the Southwest Palace of Sennacherib in Nineveh, hares are carried in, by the feet, with plants, fruit, birds etc, as provisions for a feast. (Fig. 34)

Other animals

Some other animals, which do not readily fit into other sections, appear in economic texts and reliefs, and formed some type of food source for the diet.

These include the bear (AZ/asu). This animal is frequently listed in Ur III texts, and although one text specifically mentions that the bears were provided for the jester and therefore presumably not for food, others are included in lists which give details about food animals such as cattle, sheep, gazelles and deer, as well as types of donkeys. Bears are also mentioned at Mari, as a delivery from the King of Susa - in this case they may have been for pleasure.

Another unusual creature is the locust (Buru, erbu) and references from Mari and other Old Babylonian texts mention their use as food. Locusts are eaten today in the desert whenever available, but they may have been looked on as a delicacy in Old Babylonian times. This is suggested by the tone of some of the letters: 'Send me a hundred locusts and (some) food... and do not forget ... the locusts'. 'Forward as many locusts as possible'.

The most famous representation of the locust is on an Assyrian relief in the South West Palace of Sennacherib at Nineveh, where locusts fastened on a stick are carried, together with fruit, game,
birds and flowers as part of the provisions for a feast. This also suggests that locusts were considered a delicacy.

3.2.4 Fish

Fish formed an important source of food in Mesopotamia, both in the diet of the ordinary people and in the meals given to the kings and their households. And fish were also included in offerings to the gods.

Fish bones have been found in many excavated sites: at Eridu in Temple VII and VI (Ubaid 4), debris of fish bones and small animal bones were found mixed with ashes. To the excavators there seemed to be 'ubiquitous traces' of fish offerings and the deep deposits of ashes suggested that fires had been lit to 'dispose of repeated votive material'. Later, dated to the Uruk period, in Plan-Square H-5, Room 8 is said to be full of ashes, bones and scales of fish. Room 8 was a three-sided enclosure in a 'non-secular' building rather than a true room within the temple.

Fish deposits were also found at Tello. Behind the 'Maison des Fruits' at levels of 1.30 m, and 0.80 m successive layers of yellow slabs, 4 or 5 cm thick were found. These were fish, compressed so compactly that the skeletons, skin and scales could be distinguished. Further to the west of this spot more layers of compressed fish were found, one below the other, at 1.10 m, 2.30 m and 3.35 m. The lowest deposit was found with Reimchen bricks and therefore probably dated to the Jemdet Nasr period. The other deposits were associated with plano-convex bricks and therefore date to the Early Dynastic period. Van Buren suggests that the 2.30 m may date to Early Dynastic I or II while the higher levels date to Early Dynastic III. At Warka, in Level IIIb (Jemdet Nasr), fish skeletons were found pressed into the clay coating of the floor. A later deposit of fish was found in a room or court made of plano-convex bricks (Level I 1-4 Early Dynastic). The floor was covered with a thick layer of fish remains and the whole enclosure was tinged a golden-yellow. The weight of the fish deposit had apparently caused the oil to be pressed out of the lower ones.
At Ur a bowl containing 21 pottery cups, ashes, fish bones, some unidentified animal bones and the shoulder blade of a sheep/goat was found under the foundations of a plano-convex wall (Square P), possibly representing foundation deposits and dating to the mid-third millennium.\(^{408}\) The bone of a perch-like fish (possibly some form of local cichlid fish rather than an actual perch)\(^{409}\) was found in PG/610, and the vertebra of a shark was found in PG/1232.\(^{410}\) Cockle shells were also found in the Royal Graves. These were used for paint and cosmetics etc, but the cockles may well have been used as part of the diet.\(^{411}\)

Field records the discovery of a thick deposit of fish bones in a room forming part of the Flood stratum at Kish: the bones were found to belong to small fishes (under 10 inches long) and some could be identified as coming from the Cyprinidae family to which the carp belongs. Field considered that these fishes had been carried from the Euphrates by floods and that when the waters receded the fish were left behind, trapped in this room, in fine silt.\(^{412}\) Oyster and cockle shells were found in several graves at Kish, again containing pigments and cosmetics. And mussel shells were found scattered about the site.\(^{413}\) At Tell Asmar, dating to the Early Dynastic III and Proto-Imperiod periods, Hilzheimer records, but cannot identify, fish bones. These were found in the Single Shrine temple (D.16:10 and D.12:1) and in a room in House VI, Level Va (H20:3).\(^{414}\)

Moving to the second millennium, at Nippur the imprint of a complete fish skeleton was found on the floor of Room 142 of House D, Level II (TB houses), dating to the Isin/Larsa period; a saucer or flat dish (Type 21/22) had been placed upside down over it.\(^{415}\) In Site WB, in an Old Babylonian house, a few fish bones have been found, together with remains of water-turtles.\(^{416}\) A few fish bones of the Cyprinidae and Siluridae families were found during excavations at Isin, but no closer identification can be made because of the lack of sufficient comparative material.\(^{417}\) In the first millennium at Ur, the vertebrae of a tunny (Thunnus) fish were found in association with some Neo-Babylonian Type 72a pottery (U.2839).\(^{418}\)
The existence of fish-hooks at sites suggests the activity of fishing and the use of fish in the diet. A copper fish-hook, probably from the Early Dynastic period, was found in the 'Maison des Fruits' at Tello. It has a small barb and a slight knob at the end of the shank, presumably for fastening the line. A possible harpoon point also comes from the 'Maison': at present it has one prong with a thickening at the end of the shaft but when it was complete it was probably Y-shaped. A fish-hook was found at Kish, on Mound 'A', 50 cm below the surface of the mound summit. It was 4.15 cm long and had a barbed point but no thickening at the end of the shank. A copper object, 9.50 cm long, was found 105 cm below Mound 'A' surface and above the courtyard of the Palace. It had a barb, c. 7 mm long, projecting from just below one end. It was found broken and had been bent. It may have been a fish-spear. The excavator, Mackay, suggests that both these objects could have come from the same period as the graves, that is c. late Early Dynastic III.

The possible remains of a fishing-net were found at Khafajeh, House D, Room VI, where a series of clay weights which may have acted as net-sinkers were found. Two rings had twine still attached, pulled double through the ring and knotted. In the Gimilsin Temple at Tell Asmar, a barbed fish-hook was found in N34:5, top layer, possibly dating from Ur III or later. Fish hooks were found at Ur, dating to the Jemdet Nasr period, the third millennium and the Kassite period. Both barbed and unbarbed fish-hooks were found in the Jemdet Nasr levels. A barbed fish-hook was found in PG/491, dating to the mid-third millennium. This hook was copper with a flattened straight tang (U.8967) and was 4.5 cm long. Another copper hook with a flat tang (U.8672) was found against the side of a grave shaft and probably belongs to the cemetery period. It was 4.37 long. The length of these fish-hooks suggests that they were used to catch quite large fishes. Copper tridents which may have been used as fish-spears were found in the graves. The prongs of one (U.17926) were about 18 cm long with the overall width of the three prongs over 11 cm. Again this could spear quite a large fish. Four copper 'harpoons' were found in PG/755 (Mes-kalamdug's grave) - one example was about 18 cm long with the end rounded and the prong shallow. The haft is hollow.
at the bottom as if for a shaft to be inserted. The point of a harpoon is that when it has been thrown the head, which is secured by twine, remains in the body of the fish while the fisherman holds the other end of the twine and can therefore play the fish until it exhausts itself and can be hauled back. It is useful hunting fish from a distance and for big fish which would be difficult to catch with a hook or a spear. It is therefore essential that a harpoon head should have a hole, or at the very least a thickened end, for the secure attachment of the twine. These four 'harpoons' from Mes-kalamdug's grave do not have either holes or thickenings, and it is possible that they were single pronged fish-spears rather than true harpoons.

The Kassite fish-hooks at Ur have slanted barbs, with a small bulb at the end of the shaft to assist attachment. Three copper fish-hooks were found together, low in the fill of the Amar-Sin mausoleum and have been dated to the early part of the Kassite period. Examples of fish-hooks were found in the Old Babylonian levels at Nippur, made of bronze (sic). One from TB E₁, House C₁, Room 6, had a barb and a straight shaft which narrowed at the end, another (from TB 48 C or B) was larger in size; its shaft was slightly curved and swelled out at the end. It had a slightly flattened barb at an angle of about 45°.

Fish are a common feature on cylinder seals and on reliefs etc. A cylinder seal from Warka, dated to the Jemdet Nasr period, shows what may be a fishing expedition: three men are seated in a boat which is propelled by one of them. One of the other men holds two fish, while a man on shore waves a pole or spear. The boat is sailing through reed. From Susa, contemporary with Uruk V/IV, comes a seal impression which shows what may be the unloading of fish after a fishing trip: a high-proved boat is poled ashore and a man is walking away from it with a basket on his head, while a second man walks away carrying a large fish from a loop in his hand. Men spearing fish from a high-proved boat appear on a cylinder seal dated to Early Dynastic II/III. Sadly the end of the spear cannot be seen. Again the boat is sailing among reeds, with birds standing against them. From Tello in the Early Dynastic period comes an alabaster plaque of a man carrying
fish. They are suspended upon loops threaded through their mouths and he holds three fish in one hand and two in the other. The man is naked except for a belt. The fish may represent two different species: the pair of fish have markings on their tails which are almost straight across the end, while the trio have no marking and have more V-shaped tails. A frit figurine of a fish, probably dating to the Ur III period, was also found at Tello. This has markings on its tail which is convex rather than a concave V. Men carrying pairs of fish are depicted at Ur, on cylinder seals, and on the 'Peace' side of the Royal Standard. (Early Dynastic.) Fish-shaped amulets of lapis and gold were found in Pu-abî's grave. The markings on the amulets differ, suggesting that an attempt had been made to copy different fishes. However, the fishes are so small that they are difficult to identify.

An Akkadian seal depicts a man carrying two fish from his left hand, with a staff on his right shoulder from which a crab is suspended - also on this seal is a god with a flowing vase which has fish swimming in the streams of water. Another Akkadian seal, whose main theme is a series of 'heroes' on one knee holding ringstaffs, has a large fat fish in the field. This fish has a continuous fin along its back and a thin deep-V-shaped tail.

The Neo-Assyrian reliefs include many examples of fish in their designs. In a relief dated to Tiglath-Pileser III, a man can be seen perched on a bank, fishing with a line in a river or canal. A parrot-nosed fish has taken the line. (Fig. 35) Another scene shows a man fishing with a short line (at which a fish is biting) in a pond which may have been deliberately made as a fish breeding pond, although there is a canal leading from it, down which swims a fish. The fisherman has a basket on his back which contains fish already caught. The rivers in the reliefs are nearly always full of fish - even when the main theme is a battle and bodies of slain enemies and their weapons are also in the water. Different types of fish are depicted. The differences are subtle and consist of changes in the position of the mouth, the placing and number of the fins and the angle of the head and shape of the eye. Eels, lizards, water-turtles and crabs are also shown in the rivers.
The textual evidence shows that many different types of fish were known and utilized. Texts from Lagaš (Early Dynastic III) mention at least 20 sorts, some of the fish are also described as being salted or dried. In the Ur III period, a text from Ur records more than 12 fish-names. And later, in the Old Babylonian period, a text, dating to the reign of Šamši-Ilumma, gives over 10 types of fish with the amount which could be bought for a shekel. At Mari where references to fish are fairly rare, a fish is mentioned in a letter from Samsi-Adad to Yasmah-Adad. This fish is for Yasmah-Adad's cook and it is to go to Šamši-Adad himself. In another letter, Išme-Dagan refers to girištu-fish which are in a pool at Lahat, and asks his brother Yasmah-Adad to catch one and send it to him. In the reign of Zimri-Lim, four sorts of fish are mentioned in one text and in another, a letter from Kibri-Dagan to the king, fish are mentioned which seem to be kept in a canal or reservoir. At Rimah (Old Babylonian) reference is made simply to little fish (KU₆.TUR.TUR) and big fish (KU₆.GAL).

Identification of fish

Some species of fish can be identified in the texts. Identification on reliefs etc is more uncertain because of the lack of specific features in most of the representations.

Barbel (Barbus): This genus, which is a member of the Cyprinidae family to which the carp also belongs, is known from Europe to India and Burma, and Africa, but certain forms are peculiar to the Mesopotamian rivers. These forms include the Barbus (Puntius) sharpeyi Gunther (Arabic binni) which is found in the Shatt-al-Arab, hars, marshes and lakes, and the more southerly parts of the rivers. It can be over 45 cm long and has no barbels. Barbus esocinus (Heckel) (Arabic Bizz) - this species is found in rivers, mainly upstream. It is large and can reach a weight of 300 lbs and be over 1.5 metres long. It has two pairs of barbels.

The Barbus (Puntius) sharpeyi Gunther has been identified by Salonen as the ESTUB.KU₆ (GUD)/arsuppu. This fish was found in the canals round fields at Lagaš (Early Dynastic III) and was caught and
delivered in large numbers. In the Ur III period it was caught (or kept) in reservoirs, and it may have been used at Mari (Old Babylonian).

The *Barbus esocinus* (Heckel) has been identified as the ȘUHUR.KU₆/purādu which has been described as the 'most commonly mentioned fish' in Sumerian literary texts. This fish is said to have 'nice beards', which mean the barbels. It was delivered from canals, round fields at Lagas (Early Dynastic III) but usually in smaller numbers than the ESṬUB.KU₆. In the Ur III period ȘUHUR.KU₆ are recorded at Ur and at Umma (?), amounts of 1800 fish are mentioned in the reservoirs. It is also listed at Mari and during the reign of Samu-iluna 360 Sīla ȘUHUR.KU₆ could be bought for 1 shekel.

Identifying the species of fish portrayed on reliefs, cylinder seals etc is difficult but it is probable that the barbel is one of the species depicted. The *Barbus (Puntius) sharpeyi* has a short head with the mouth opening underneath, an all-over scale pattern, greenish in colour on the back and whiteish on the belly, and it has a lateral line running along the middle of the body (as do most barbels). The *Barbus esocinus* (Heckel) has a long head, with jaws of nearly equal length. The mouth-opening is at the end of the head giving a blunt-ended profile. Its scale pattern is similar to that of the *Barbus (Puntius) sharpeyi*, as are the positions of its dorsal and ventral fins. The main visual differences are the size, the shape of the head, and the lack of barbels in the *Barbus (Puntius) sharpeyi*.

The size of the fish carried by a fisherman in a wall-painting at Mari suggests that a barbel - possibly the *Barbus esocinus* - was intended but no characteristics are visible. Depictions of the fish-robens worn by priests in Neo-Assyrian times are very like the *Barbus esocinus*. There are however some 10 different species of barbels found in Iraq today and identification from representations below a general level is virtually impossible.

*Caranx sexfasciatus*: This is a marine fish and has been identified as GīR.KU₆/Nahṣ. The *Caranx sexfasciatus* has an arched dorsal
profile, two dorsal fins which run for two-thirds of its length. It can be up to a metre long and lives in the sea and brackish water, entering rivers. When captured it is said to grunt 'like a young pig'. GIR.KU are common at Lagas where they are delivered in large quantities.

**Pampus argenteus** (Arabic zubeidi): This is a marine fish which is almost rhomboidal in shape, the tail is deeply forked and the dorsal and anal fins are of similar shape, the 'anterior part developed into a deep lobe, the posterior part low, consisting of rays of equal length'. It is found in the Gulf and the Shatt-el-Arab, entering fresh water. It is at least 30 cm in length and is described as an excellent food fish. This fish as been identified with ki.KaSAR. KU₆ - a fish mentioned often at Lagas where it is delivered by men described as sea-fishermen (SU.KU₆.AB.BA) and coastal-fishermen (A.DUN.A) and brackish-water fishermen (SU.KU₆.A.SES).

**Polydactylus tetradactylus** (Arabic daghūk): This is a sea-fish; its head is covered in scales to the tip of the snout. It can reach a length of 2 m and is found in the Gulf and the Shatt-el-Arab. It is an excellent food fish. This fish has been identified as SE+SUHUR a fish which was common in the Early Dynastic period - large quantities were delivered at Lagas. From the Old Babylonian period on the SE+SUHUR seems to have been written UBI - the last occurrence of SE+SUHUR probably being in 'The Home of the Fish'. There does however seem to have been two types of UBI/abUtum. One is UBI.A.AB.BA.KU₆(abūt)tu₄t - sea-water UBI, and UBI.ID.DA.KU₆/(abūt)na₄ri - river UBI. It is the sea-water UBI which is equated with SE+SUHUR and has been identified with the Polydactylus tetra-
dactylus. The fresh-water version, which may have been written HI+SUHUR in pre-Old Babylonian periods, is probably a type of barbel common in marsh and ponds. This is probably the fish, written a.ba.tum.ku₆ (to be read abUtum) which is found at Mari; sea-fish would be unlikely to be found so far inland unless preserved in some way.
Hilsa ilisha (shad): This fish which is famous for its roe has been identified with the AGARGARA, NUN.KU₆/agargar. It can reach 40 cm in length and has a deeply forked tail. It is found in the Gulf and in the Hor-el-Hammar, but travels up the Tigris and Euphrates (and other rivers entering the Gulf) to spawn, being known to reach Amara and Baghdad, Samawa and Habaniya. Both it and its roe are excellent food sources until the eggs have been deposited. This fish was common at Lagān in both the Early Dynastic and Ur III periods; it was delivered by sea-fishermen, which may mean that it was caught in the Gulf or the Hor in the early stages of its journey up the rivers to spawn. It also appears at Ur, in the Ur III period.

Other water-animals

Mastacembelus halepensis: This is a spiny eel which can reach a length of 50 cm. It has minute scales and dorsal and anal fins which are semi-continuous with the caudal (tail) fin. It is found in the Tigris and Euphrates and in lakes. It is good as food. It is probably this type of eel which is usually depicted without scales on the Neo-Assyrian reliefs, although individual fins are shown. Another possibility is the Muraenesox cinereus (silver conger eel) which has no scales but does have continuous dorsal, caudal and anal fins. It is found in the sea and in brackish waters.

Possible identifications for this eel are (a) the GU.BI.KU₆/kuppu which has been translated as 'eel' because it is included without the determination for fish, among the section for snakes in a lexical list. However, another translation of kuppu is 'goby', which if correct means that kuppu cannot be identified with the eel on the Neo-Assyrian reliefs. The kuppu - the determination KU₆ - is listed at Mari, suggesting the fresh-water spiny eel rather than the silver conger; (b) HA.MU₅ - snakelike fish. References to this creature appear at Lagān in the Early Dynastic and Ur III periods but it does not seem to have been an important food fish.

Freshwater tortoise and/or marine turtle (Order Chelonia): The phrase 'fresh-water tortoise' covers all the species who live all or part of their lives in fresh water; they have a shell, webbed feet
with strong claws, and are found all over the world in the tropics
and sub-tropics. The marine turtle only comes to land to lay its
eggs, which they lay on sandy beaches in tropical waters. They have
‘paddle-like limbs without distinct digits. Creatures which can
be identified as either of these species are illustrated through the
third to the first millennia. Schematic representations are found on
a cylinder seal from the Early Dynastic period and on a jar from
Larsa. On a cylinder seal impression from Elam naked men carry
the creatures across land, suggesting the fresh-water tortoise because
(a) the men are on land, (b) the marine turtle is fierce — although
of course the animals could be dead, and (c) some digits are shown at
the end of the creatures’ legs. The tortoise/turtle also appears on
Neo-Assyrian reliefs but again it cannot be certain whether a fresh-
water tortoise or a marine turtle is intended.

The BAL.GI.KU_{6}/raqqu and BAL.GI.KU_{6}/UH.KU, NIG.BUN.NA.KU_{6}/Nelepp{6} have been identified with the tortoise/turtle. The BA (probably a
short writing of BAL.GI.KU_{6}) is mentioned with fish at Laga{6} but
does not appear to have been a major food item. Crabs are also
depicted on cylinder seals and on Neo-Assyrian reliefs. (Fig.16)

Preservation of fish

There are three main traditional ways of preserving fish: drying,
salting and smoking. These can be done separately or in combination
with each other.

**Drying:** This can be done by simply laying out the fish in the
sun and the wind, or the fish can be dried over wood fires. In Africa,
fish is preserved by first being sun-dried on the ground, laid in single
layers. They are then piled in stacks to add pressure for the removal
of moisture and after this they are piled on a wooden platform — and
finally placed under a framework shelter which is covered with leaves,
and in which the fish are smoked. The whole process takes 10–14 days.

**Salting:** The two main ways of using salt to preserve fish are as
brine and in dry form. When the fish is pickled in brine, the fish are
first partly cleaned to remove the intestine. The fish are then packed
in a container with solid salt so that moisture is drawn out and a saturated solution is formed which eventually covers the fish. As the fish shrink the containers have to be repacked and 'topped-up' after about a week. For dry-salting the fish are usually cleaned and split, and packed in layers with solid salt to form stacks. The brine solution which is formed is allowed to drain away. Eventually the fish become saturated. During the process the fish are removed from the stack, washed, drained and hung up to dry for a few days, and then returned to the stack for further pressure to bring more moisture to the surface before the next drying stage.

**Smoking:** In the process, fish are usually split, cleaned and brined, and then hung in smoke from smouldering fires. Smoking flavours the fish, and coarsens and toughens the flesh. Cold-smoked fish (that is, done with mild smoking - such as finnan haddock) require further cooking before eating, although the high salt content of some cold smoked fish (such as smoked salmon) makes it possible to eat them raw. Hot-smoked fish (such as smoked eels, buckling herring) are allowed to cook in the smoke so they do not require further cooking. Smoked fish do not keep for more than about a week unless refrigerated and a sign of spoilage is the formation of visible moulds.

Dried (DAR.RA) and salted (MUN) fish were included in deliveries of fish at Lagash in the Early Dynastic III period. Smoked fish (SU.SU) are mentioned more rarely. The same fish might be delivered dried or salted and even specifically described as 'fresh' (A.DE). At Lagash in the Agade period, a text records salt and different groups of dried fish, perhaps representing issues of fish and salt for the process of combined salting and drying.

Another term which may refer to processed fish is KU₆.NE. This has sometimes been read as KU₆.BIL 'fresh fish' but it has also been read as KU₆.ZI - 'fish cooked with fire' - possibly roasted fish (perhaps similar to masgoof, an Iraqi speciality, fish cooked before an open fire) or smoked fish. This description (KU₆.NE) occurs at Ur and at Umma in the Ur III period. Drying and salting appear to be the most frequent methods of processing used in Early Dynastic
III and Agade periods but if $\text{KU}_6\cdot\text{NE}$ can be translated as 'smoked fish' this may mean that there was a greater use of smoking as a means of preservation during the Ur III period.

The textual evidence for dried, salted or smoked fish in later periods is slight but fish deteriorate quickly in hot climates if they are not preserved in some way, so that any fish not consumed within a couple of days of catching would become contaminated. This means that any fish transported from one area to another would have to be preserved in some way. Merchants at Early Dynastic Lagash traded fish, some of which is specifically described as dried and smoked. Consignments for Nippur included GIR-fish said to be good ($\text{SAG}_5$). This has been taken to mean that fresh fish were sent from Lagash to Nippur, a journey of about 130 kms, but this is not conclusive and the term $\text{SAG}_5$ may refer to the quality of the fish rather than its condition. At Rimah, in the Old Babylonian period, Iltani is asked why she is not drying the GIR-fish, which may have been already soaking in salt water. Little fish ($\text{KU}_6\cdot\text{TUR}.\text{TUR}$) and big fish ($\text{KU}_6\cdot\text{GAL}$) are also mentioned in a letter to Iltani. The $\text{KU}_6\cdot\text{GAL}$ are known from Subat-Enlil, Ekallatum, Mari and Babylon, while the $\text{KU}_6\cdot\text{TUR}.\text{TUR}$ are known from Qatara and Karuna - in other words these are fish local to Rimah. If Subat-Enlil (?Chagar Bazar), Ekallatum, Mari and Babylon are the centres where some of the fish are caught their consumption at Rimah involves their being transported for a considerable distance. In addition Iltani sent the little fish to the writer of the letter. It seems likely that some sort of preserving was necessary. In the Neo-Assyrian times taxes and tribute lists include fish, which, unless they were records of projected catches rather than payments of actual fish, would require processing to keep them until they were required for eating.

There are few 'artistic representations' of fish processing. Some cylinder seal impressions from Susa (dated as contemporary with Uruk IV/V) have been interpreted as the facade of buildings, beside which fish have been suspended from a horizontal bar or gallery to dry. The fish deposits found at Eridu, Tello and Warka (see above p.165) may be the remains of fish-processing rather than fish offerings as
has been suggested. The three-sided enclosure in the 'non-secular building' dated to the Uruk period at Eridu, where fish remains and ashes were found, may have been a smoking-area not a place for offerings; the fish-bones found may have been thrown into the ashes by the operators when they prepared the fish to be smoked. At Tello and Warka the fish appear to have been laid in layers on top of each other. These may be the bottom layers of stocks of fish which had been piled up for drying or salting. The salt solution which drains away during dry salting could have caused the staining of the floor in Level I 1-4 at Warka.518

The bulk of the evidence for fish in the diet comes from the third millennium when large quantities of fish are recorded.519 There may have been an element of 'over-fishing' which caused the numbers of fish available to drop, making the role of fish as a food source less important during the second millennium. However, the discovery of fish-hooks from this time indicates that fish continued to be caught. The Neo-Assyrian reliefs depict the rivers and canals being full of different sorts of fish, which suggests that the fish-population may have become plentiful again, but, although the texts show that taxes and tribute are being paid in fish, the numbers recorded are not quite as large as those in the third millennium, and the fish are nearly always called 'fish' (KU₆) without the species being given.520 However, the latter may only reflect a difference in attitude between an area dominated by rivers, canals, lakes and marshes where fishing was a main industry (i.e. the cities of third millennium Sumer) and an area (Assyria) which drew its supplies from an empire and in which fishing played only a minor part.

3.2.5 Birds

Birds, and their eggs, played only a secondary role as a food source in Mesopotamia and textual references to their provision are infrequent. However, these combined with evidence from sites and representations on cylinder seals, reliefs etc, indicate that birds were eaten from the third to the first millennium.
As bird-bones are small and fragile they have not always been recovered from excavated sites, and when they are found identification is difficult. Bird-bones, which could not be identified, were found in the cellar of the Single-shrine Temple II/III and in a room of the Northern Palace (both dated to the early Agade period) at Tell Asmar. Bones from water-birds were identified from Old Babylonian house levels at Nippur; species which could be identified include the cormorant (Phalacrocorax carbo), the goose (Anser anser) and the Mallard duck (Anas platyrhynchos). An egg said to be a goose-egg was found in the Ziggurat at Nippur (?Ur III) during excavations last century.

Use of birds in food

A Scarlet Ware vessel found at Khafajeh (dated to Jemdet Nasr) showed a bird apparently being prepared as food. A large pig is also included in the scene, and nearby people are taking part in a meal. Eggs (NUNUZ.UZ.MUšEN) were included in lots of 10 among other food-stuffs in a list of offerings at Lagaš in the Early Dynastic III period, and what may be a baked egg (NUNUZ.DUG.A) is also recorded there—in lots of one at a time only. Eggs and birds are among the items provided for the New Year Feast by Gudea at Lagaš. During the Ur III period different types of birds (including geese and ducks) were given in a list of provisions for the king's household at Ur. And 'white ducks' (UZ.BABBAR) and ordinary ducks (UZ.TUR) are also recorded as being paid into the account of Šulgi-sintim, in the reign of Šulgi (Ur III). In the Old Babylonian period at Mari birds and fish are listed on a damaged tablet which records provisions for an evening meal, while at Chagar Bazar birds (MUšEN.GAL) are listed as receiving 1/3 SILA per day presumably for fattening. In Neo-Assyrian times, birds and eggs (including MUšEN.MEŠ GAL.MEŠ, UZ.MUšEN.MUšEN, KUR.GI.MUšEN.MEŠ, qa-ri-bi MUšEN.MEŠ, TU.MUšEN.MEŠ, TU.KIL.MUšEN.MEŠ and MUšEN.MEŠ.TUR.MEŠ and NUNUZ) are included in the provisions for Aššurnaṣīrpal's feast.

On cylinder seals from the end of the third millennium, at Susa, birds are depicted on tables before seated 'personages' as if presented as part of a meal. This scene of a bird forming part of a meal is seen from later cylinder seals also, for instance from Aššur.
from other Neo-Assyrian cylinder seals. Birds are shown on Neo-Assyrian reliefs being shot by bow and arrow by hunters in parks, (Fig.33) and being carried by their wings (still alive) with other food items, presumably for a meal for the king. (Fig.34)

The textual references, together with the cylinder seals and reliefs, suggest that birds formed part of feasts and meals for important personages. But although birds did not form a regular part of supplied rations for the ordinary people it is likely that they caught birds for food when required, as the village people do nowadays in both Iraq and Iran.

Identification of birds

Most of the small birds depicted on cylinder seals etc are too generalised to be named, but various species can be identified both in artistic representations and in the texts.

KUR.GI.MUSÉN/kurkû: This has been identified with the goose (Anser anser) and it is one of the most frequently mentioned birds in the texts. Birds with long necks which are almost certainly meant to be geese are common on cylinder seals and plaques. A calcite relief from Ur, dated to the Early Dynastic period, is in the shape of a marsh boat. On one side of the relief a man is shown at the prow while a sow is in the boat's cabin and on the other side, two fishes are slung from a loop on the prow while a goose is in the cabin. Geese are often shown as the companions of the goddess Bau; for example a plaque found at Tello and probably dating to the Ur III period, shows the goddess seated on the back of a long-necked bird with a small head and pointed beak. Her feet are on a seated bird. Other terms read as 'goose' include §E.MUSÉN (mainly in the Early Dynastic period) and UZ.MUSÉN.

UZ.TUR.MUSÉN/paspasu: This has been identified with the duck (Anatidae family) of which there are many sorts. Ducks are not easily identifiable on cylinder seals and reliefs. The duck weights which show birds with their heads turned over their shoulders, resting on their backs, as if in a sleeping position, have been found from
Sumer and to Neo-Assyrian times. It has been suggested that the length of the bird's neck represents a goose, but the beak is duck-shaped.

TU.MUŠEN/summatu and TU.KIL.(GUR₄)/sukkaninnu. These have been identified as the dove or pigeon (family Columbidae) and are frequently mentioned in texts. Doves and pigeons are very common in Iraq today. This type of bird is represented on a limestone frieze from al'Ubaid where the rounded breast and small head are carefully depicted. The birds flying and being shot in the Neo-Assyrian reliefs may also be pigeons but other possibilities are that they represent one of the types of sandgrouse or partridge. The sandgrouse (Pterocles alchate) has been identified with the URU.HUL.A.MUŠEN, MUŠEN.HUL.A.MUŠEN/qadd (Arabic qata). However, as this bird is common in the desert and steppe it is unlikely to be the one in the hunting relief. The frankolin or black partridge (Francolinus vulgaris, Francolinus francolinus) was common in the thick scrub and cultivation in the early part of this century, while the See-See-partridge (Ammopardix griseogularis) was found in the Jebel Hamrin and in the Mosul area at that time. The size and plumage of the See-See-partridge, together with its distribution, suggest that it is this bird which is shown being shot on the Neo-Assyrian hunting relief. (Fig.33)

DAR.LUGAL.MUŠEN/tarlugallu: This has been identified as the cock (family Gallus). If this is correct it is possible that the DAR.MUŠEN/tarru (identified by Von Soden as a wild pigeon and by Salonen as the See-See partridge or the Franklin, or the hen in the Ur III period), is in fact the hen, or at least the female of the tarlugallu-bird. The DAR.ME.LUH.HA.MUŠEN/gulamu, sallamdu (etc) has also been identified as the domestic hen. The association with Meluhha suggests that the bird was brought from the Indus valley area, probably as a novelty, but the scarcity of references in economic texts and the lack of representation suggests that it was not domesticated until late. One of the earliest representations of a cock with its distinctive head and tail comes from Alūbur in the Middle Assyrian period. The design on an ivory pyxis shows a palm tree in which two crows are sitting, at the foot of the tree is a gazelle and in another tree sit two cocks. Other
Sure representations of cocks are much later: in the Neo-Assyrian period a cock appears on a cylinder seal whose main design includes winged genies, griffin and a bull, and from the Neo-Babylonian period at Babylon comes a seal whose design consists of a hen and a cock with a star between them.

There is some evidence for the hen in Near Eastern areas outside Mesopotamia. In Egypt a possible reference to the hen appears in accounts of tribute given to Tutmosis III (c. 1504-1450 BC). Unfortunately part of the inscription is doubtful. A clear representation of a hen appears on a limestone fragment dated to the New Kingdom (between 1425 and 1123), but it cannot be dated nearer. Hen bones (Gallus domesticus) were identified at Koructep in Anatolia, in levels I-J, dating between 1500 and 1200 BC. One bone was found in a mixed dating context (D/I-J 2600-2300/1500-1200) but it is probably unsafe to accept the third millennium date. A humerus was found in level H (1800-1600).

At the present time eggs form an important part of the diet in the countryside of Iraq, but they are rarely mentioned in ancient texts. This may be partly because the hen was not kept as a domestic fowl, at least until the end of the second millennium. Eggs would have to be collected from wild birds, so that the supply was unpredictable. Eggs could not be stored easily and would have to be eaten shortly after collection. It seems likely that they were eaten when possible by countryfolk but did not form a regular part of the diet in the towns.

3.3 Dairy Produce

Milk is a balanced source of most of the nutrients required by man. Many adult communities, such as the Rwala Bedouin, rely on milk as their main source of food. The main animals whose milk is used by man are the cow, sheep and goat, but the buffalo, camel, mare, ass, yak and llama are also used in various parts of the world. Milk can either be drunk as soon as it has been obtained or it can be treated to increase its keeping capacity. Some forms of treatment
involve the removal of the milk fat to form a butter, or the clotting of the milk to form cheese. Cheese-making is one way in which any surplus milk can be preserved.

Before examining the evidence for the use of dairy products in Mesopotamia a brief description will be given of the main forms of treating milk and the manufacture of butter and cheese. 560

3.3.1 Sour milk

Fresh milk will turn sour if kept, but if this souring is controlled the milk will continue to be palatable and will not be harmful when eaten. The milk can be soured simply by leaving it in open vessels for a few days at room temperature; acid-producing bacteria enter the milk and sour it spontaneously. The traditional way of producing sour milk in the Near East is to boil it until it has reduced slightly in volume. It is then cooled and some of the previous day's sour milk is added to act as a starter. The mixture is then kept warm until it has thickened. The whole process takes about twenty-four hours. An advantage in this method of souring is that the boiling will sterilise the milk and the later souring will make further pathogenic contamination (such as the growth of tuberculosis organisms) less likely. (However, the milk must be heated for 10 minutes at 145°F for the sterilisation to be effective.) The souring of the milk while warm may cause fermentation but the percentage of alcohol produced is low.

The soured milk will keep for about a week but the longer it is kept the sourer it becomes. New batches are generally made every few days. The mixture can be used as a drink, when it is usually diluted, or it can form the basis of other dishes. For example butter and cheese can be made from it or it can be added to soups or stews. The name varies from country to country: it is called 'mast' or 'yoghurt' in Iran, 'dahi' in India and 'laban' in Iraq. There are some minor differences in preparation mainly regarding the length of boiling time and the temperature of the milk when the sour is added.
3.3.2 Butter

Butter is made by agitating the milk until the fat separates from the liquid and coalesces in globules of butterfat. The liquid, called buttermilk, is then drained off. Butter can be made from fresh whole milk, from cream or from soured milk. If all the water is expelled from the butter the product will keep for longer. This is done by heating the butter slowly over a fire until the water begins to evaporate. The fat is then cooled until it solidifies and the remaining liquid which collects below the fat is run off. This product (sometimes called 'clarified butter') is 'ghee' in India and nearby countries.

3.3.3 Cheese

True cheese is made by the clotting of milk with rennet. The clot, which contains most of the protein in the milk plus the fat and other nutrients, is then separated from the remaining liquid (whey), usually salted and pressed to remove any further moisture. It is then left to ripen, during which bacterial fermentation takes place. There are many variations of cheese, different bacteria and moulds are used to give the cheese distinctive flavours or the milk may be soured, or skimmed, before clotting. Rennet usually comes from the lining of a sheep's or cow's stomach. Cheese from soured milk is obtained by putting the sour milk in a cloth bag and draining it so that all the liquid runs away leaving only the solid curds. Curd-cheese keeps well if it is kneaded into small balls and dried in the sun (jamid). It can be eaten dried or grated and mixed with water. It is mainly used in cooking in this reconstituted form. The whey from the curd-cheese and the rennet-cheese can also be used in cooking or as a drink.

3.3.4 Dairy products in Mesopotamia

When considering the use of dairy products in Mesopotamia, a reasonable assumption can be made that the presence of large herds of potential domesticated milk animals means that milk and other dairy produce was used as a source of food. Evidence to confirm this assumption can be found on cylinder seals and reliefs and in texts.
Milk

The main milk animals in Mesopotamia were the sheep, goat and cow. Scenes showing these animals being milked appear on several cylinder seals and on reliefs. The milking position in all these cases is between the back legs, and the tail of the animal is usually raised. In some cases, notably the limestone relief from al'Ubaid, the young animal is brought to the mother's head to stimulate the production of milk.

Processing the milk: As has been seen, milk can be made into soured milk, butter and into cheese. Some scenes shown on Jemdet Nasr cylinder seals may depict women making butter: these women are seated and are holding vessels which they seem to be shaking. Sometimes the vessel is held by one woman and at other times two women hold one vessel. However, the style and designs are so schematic that the scenes could represent many other activities.

Dairying scenes are depicted on the limestone relief from al'Ubaid and on several Akkadian cylinder seals. (The main theme on the latter is the story of Etana.) It is however difficult to interpret the activities being performed. A feature which occurs in all the scenes is a man seated beside a large vessel which he is holding at a slight angle and appears to be agitating. This may represent butter-making. But it could also show the vessel being cleaned or it could be the vessel in which the warmed milk was kept for souring. On the al'Ubaid relief one man is shown pouring liquid into a vessel held by a second man. The vessel is a funnel or strainer through which the liquid is poured into another vessel set on the ground. This scene could simply represent the transfer of liquid from one container to another, through a funnel for safety in pouring, the liquid could be the buttermilk poured off after the butter is made, or the separating of the cream from milk, or it could represent soured milk being poured into a vessel in order that the liquid may drain away leaving the curds behind for cheese. The draining vessel used would either be a pottery vessel with some sort of fabric lining or a fabric bag. Although there is no 'pouring' sequence shown on the Etana cylinder seals, rows of circles or balls are laid out near the man with the inclined vessel. These have been interpreted as cheese laid out to dry.
Textual evidence

Dairy products formed part of offerings for many rituals and they are included in lists of food items from the third to the first millennia, emphasising their continued use as food.

The three main categories of dairy products mentioned in texts are: 1. NUN/biāzu, GA.ḪAR and GA/šizbu.

1. NUN/biāzu: This is the dairy product most frequently mentioned in economic texts. It is usually translated as 'butter' or 'ghee', but some scholars have preferred not to commit themselves, either leaving it as 1. NUN or calling it 'princely' or 'noble' oil. References associating it with cows confirm it as a dairy product. 1. NUN is not only used as a food item, but it is also issued as an ointment. It must therefore be a maleable and probably greasy substance made from milk, which can also be eaten. Butter answers these requirements. The expelling of water from butter to form ghee would increase the length of time the product could be kept and, as it was sometimes issued for a year at a time, it is likely that this was done. In the early part of this century ghee formed an important export product from Saudi Arabia and it is possible that this may have been the case in ancient Mesopotamia.

GA/šizbu and GA.ḪAR: GA is translated as milk and as cheese. It is used as an adjective for very young animals — that is, animals which are still suckling — which suggests it can mean fresh whole milk. 'Pure milk' (GA.KUG) is included in offerings at Lagāš in the Early Dynastic period but the use of 'pure' probably refers to a cultically pure offering. What has been translated as sour milk (GA.TU.G.A — milk with a skin) is included in offerings also at Early Dynastic Lagāš. Also included in issues at Lagāš are two dishes in which milk formed a major part. These are Zl.GA, a 'porridge' of emmer-wheat and milk, and Zl.UTU, a gruel-like mixture of flour and milk, or another dairy product. It is possible that the Zl.GA was similar to the modern Iraqi milk-wheat product kushuk which is made by mixing dried parboiled wheat grits with yoghurt and fermenting it for about a week.
Kushuk can be sun-dried and ground into powder for storing. It is then re-constituted with water or milk when required for use. Returns of dairy products at Ur, in the Ur III period, include both GA and GA.SIG7.A. The GA.SIG7.A appears to have both 'ghee' and GA or GA.HAR associated with it. The proportions are steady, 1 part of GA.SIG7.A contains .1 GA or GA.HAR and between .15 and .06 ḫ.NUN.

Either GA.SIG7.A is a type of dairy product to which ghee and milk or curd cheese is added, or else it is the skim milk left after the production of ghee or cheese. In the temple offerings to the Ningal temple in the Old Babylonian period at Ur the quantities of GA.SIG7.A exceed the amounts of GA (3 BAN to ½ SÍLA) but both these products are exceeded by the amounts of 'ghee' and GA.HAR (100 BÁN 2 2/3 SÍLA and 100 BÁN 1 SÍLA 10 GIN).

GA.HAR is translated as 'cheese'. The association of the element ḫAR/ARA with milling suggests a product which is crushed or ground in some way. It is possible that this is similar to the curd cheese which is sun-dried and later grated into a powder before use. GA.HAR-cheese is included in issues (with 'ghee') to priests and officials at Tello in the Ur III period. It is also listed in returns of dairy products from cows at Ur, also in the Ur III period. GA.HAR-cheese was a regular offering in the Ningal Temple at Ur in the Old Babylonian period when it was offered (with a few small exceptions) in the same quantities as 'ghee'. Spices may have been occasionally used to flavour the GA.HAR-cheese. An account of receipts from Umma in the Ur III period includes GA.HAR KAS X(GAZI) - ?spiced cheese - and GA.ŠE.A - ?perhaps a cheese mixed with barley (or a barley and milk dish). 'Ghee', (sour) milk and curd-cheese were provided by Aššurnaṣîrpal for his feast. Here the cheese is written e-qi-di but Neo-Assyrian vocabularies show that this is equated with GA.HAR.

There is little evidence for making cheese by clotting the milk with rennet, and it is more likely that the cheese was made by draining the whey from the curds of soured milk. Therefore GA.HAR would be curd cheese and GA would seem to refer to both soured milk and fresh whole milk. The amounts of milk (either fresh or sour) which are included in temple offerings and in lists of returns from milk herds are in
general much smaller than the quantities of 'ghee' and 'curd-cheese'. So it appears that a considerable proportion of the milk obtained from the milk animals was processed for storing - and indeed the dairying scenes on the Akkadian seals suggest that the curd-cheese was prepared and dried by the shepherds before sending to the temples or other destinations.

3.4 'Vegetables'

This section deals with those plants which are eaten by man but which are not popularly considered cereals, fruits or nuts and whose main economic use is not one of flavouring nor of producing oil. This is not a botanical division, as it includes parts of plants which are botanically described as fruits, such as cucumbers or the pods containing the chick-pea seeds.

It is proposed to summarise the palaeobotanical evidence (after 3000 BC) and then to consider the evidence for the use of the main kinds of vegetables.

3.4.1 Palaeobotanical evidence

(see Presence Chart on p.188, Table 10)

Examination of the sizes of the lentils found show that there was an increase in diameter from the late third millennium sample at Tell Qurtass (average 3.34mm) to the mid-second millennium samples found at Tell Bazmosian and the mid-first millennium ones at Nimrud (nearly 5mm). The size of the chick peas found seems to be more uniform: those found at Bazmosian vary (in their greatest dimensions) between 4.03mm and 4.60mm, while those at Nimrud vary from 3.67 to 5.44mm. However, it was noted at Nuzi that 'the chick pea from the transition period ... is considerably smaller than that of Nuzi'. At Ur, the chick peas were impressions found in fine dust inside a silver water-pot in Pu-abi's tomb (P/G 800, U.10855, Type 44). The conditions of preservation meant that no dimensions could be taken. Some field peas were found together
<table>
<thead>
<tr>
<th>SITE</th>
<th>Lens esculenta</th>
<th>Cicer arietum</th>
<th>Vicia ervilia</th>
<th>Vicia sativum</th>
<th>Pisum sativum v. arvense</th>
<th>Grass pea</th>
<th>Field pea</th>
<th>Broad bean</th>
<th>Cucumber</th>
<th>PERIOD</th>
</tr>
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<tbody>
<tr>
<td>Ur</td>
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<td>?x</td>
<td>Akkadian</td>
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<tr>
<td>Bazmosian</td>
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<td>Ur III/I-L</td>
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<td>Tell Qurtass</td>
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<td>Ur III/I-L</td>
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<td>Bazmosian</td>
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<td>I/L</td>
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<td>Tell Taya</td>
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<td></td>
<td></td>
<td>Early second millennium</td>
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<tr>
<td>Khafajeh</td>
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<td>x</td>
<td></td>
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<td>c.17th century</td>
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<tr>
<td>Nuzi</td>
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<td>x</td>
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<td>trans. GA.SUR</td>
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<tr>
<td>Nuzi</td>
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<td>c.15th century</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>c.15th century</td>
</tr>
<tr>
<td>Nimrud</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>c.7th century</td>
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</table>
with barley and wheat grains, in PG/208, a deep trench grave. Their maximum dimensions varied between 2.4 and 3.5mm with an average of 2.9.

The quantities found of each vegetable varies. At Tell Taya, in the Early Dynastic Level IX, one seed each of grass pea and field pea were found on a floor (in the same deposit) while one seed of each was found in what was possibly a cess-pit. In ovens from the Akkadian Level VII, a few seeds of grass pea, field pea and lentils and one of broad bean, were found mixed with barley and some wheat and emmer-wheat. Also from the Akkadian Level VII ten seeds of an unknown Cucurbit species were found with six grains of wheat on a floor. The early second millennium deposit, in an oven in Level IV, was made up of grass pea seeds with barley, wheat and emmer-wheat. At Bazmosian some 59 seeds of lentils (in 3 different samples) were found in the Isin/Larsa level as compared with 5 (in two samples) specimens of chick peas; in the 15th-century level some 49 lentils (in 3 samples) compare with 8 chick peas (in three samples). In the Ur III/Isin-Larsa level at Bazmosian, 227 ccm of seeds were found, of these four-fifths were grass pea and one-fifth was lentils. In the sample from Tell Qurtass 250 lentils were found with 40 seeds of bitter vetch. Figures are not given for the Nuzi remains but the chick peas are said to be found throughout the private houses. At Nimrud the lentils found far exceed the quantity of chick peas; for example in two samples 7 cc of lentils (Sample IV) and 1 chick pea were found and 85 cc of lentils (Sample IX) and 36 chick peas were found. Only 2 seeds of cucumber were found at Nimrud (Sample XI) and the broad bean sample found at Khafajah (c.17th century) consists of only one or two carbonised seeds. The evidence suggests that the two most common pulses were lentils and chick peas, with lentils being of the greater importance.593

3.4.2 Evidence for the use of vegetables

This section will be subdivided into the main types of vegetables and the evidence for their occurrence in different areas and at different periods and their preparation as foodstuffs will be discussed.
Allium group

The genus Allium contains around 500 species, but the majority of these are wild plants. The main food-Alliums include the onion (A. cepa), garlic (A. sativum) and leek (A. ampeloprasum var. porrum). And each of these species contains different varieties. The probable area of origin for A. cepa and the others is India and south-western Asia.

The onion, garlic and leek have been identified in the cuneiform texts. SUM.SIKIL/šašaškillum is usually translated as onion, SUM/šumu as garlic and GA.RAŠ(SAR)/karaḫu as leek. One of the reasons for taking SUM.SAR to be 'garlic' is the similarity of SUM with the Hebrew sum, Syriac and biblical Aramaic tuma and Arabic tumun, all of which are usually translated as 'garlic'. However, SUM appears more frequently in the texts than SUM.SIKIL, and it has been suggested that it might be better to take SUM as 'onion' and SUM.SIKIL as 'garlic'. Various types of both SUM and SUM.SIKIL are recorded, including SUM.GAZ, SUM.GUD, SUM.ZA.ḪA.ṬI, SUM.DILMUM, SUM.TUD..DAO, SUM.SIKIL.GAL.GAL, TUD.SUM.SIKIL. Other words which have been translated as types of onion or garlic include ḥazannu, zimsimmu and kunipbu. In view of the problem in distinguishing between garlic and onion, both species will be referred to as 'onion'.

In the late Early Dynastic period at Lagâš, different types of 'onions' together with spices and pulses, were planted in fields, parts of which were ploughed and parts left fallow. One text gives precise details about the numbers of furrows to be used for each type of crop. First, there are 21 SAR of ploughed land belonging (?) to the estate of dNinti: within this area there are 7+ furrows of ŠE.LŪ, 11 of GŰ.GŬ.GUD, and 85 of TUD.SUM.SIKIL, 15 of SUM.SIKIL.GAL.GAL, 10 of SUM.SAC₅ and 1 of SUM.GUD = 129+ furrows in all. In an area of 22 SAR of ploughed land 4 furrows of ŠE.LŪ and 11 furrows of TUD.SUM.SAC₅ are planted, and a third group of furrows (also belonging to dNinti) consists of 4 furrows of ŠE.LŪ and 5 of TUD.SUM.SIKIL. These two later areas may include areas set aside for cattle pasture (Ȃ(kv). There does not seem to be any particular order in which the furrows are laid out and the different crops are apparently planted in any order. In these fields the most important vegetable crop is the 'onion', with the
varieties of TUD.SUM.SIKIL (96 furrows) and SUM.SIKIL.GAL.GAL (15) far exceeding the SUM.SAC₅ (10) and SUM.GUD (1) in the numbers of planted furrows. Other types of 'onions' recorded as being planted in furrows in fields at Lagaš are the SUM.DILMUN (the Dilmun 'onion') and SUM.ZA.ḪA.TI.⁵⁹⁹

Some information about the cultivation of ḫaṣannu can be found in a letter from Napsuna-Addu to Iltani at Rimah (Old Babylonian period).⁶⁰⁰ Napsuna-Addu requests Iltani to send him ḫaṣannu dried to eat, and undried for seed. ḫaṣannu is translated as garlic.⁶⁰¹ But garlic is cultivated by planting the individual cloves making up the whole garlic-bulb rather than by planting seeds, and it is the onion which is grown from seed.⁶⁰² So the fact that seed is used to grow ḫaṣannu suggests that 'onion' may be a better translation than garlic. However, the phrase a-na NUMUN may not mean 'for seed' but 'for cultivation'.

Onions used as food

'Onions' are recorded in texts from the Early Dynastic period although they did not form part of the standard rations like barley, oil and wool. In the Agade period 'onions' were issued to free individuals at Nippur in amounts varying from a few ŚILA to several hundred ŚILA. Some of the individuals receiving 'onions' are called 'LŪ.EN'.⁶⁰³ In the Ur III period 'onions' (SUM) were supplied with beer, bread, oil, NAGA and usually fish to the 'messengers' (SU.KKAL) and other individuals. The 'onions' were usually issued by weight in shekels (GĪN) or in bundles (SA).⁶⁰⁴

In the Old Babylonian period, ḫaṣannu and Namaškillus and ḫubatinnu -onions are included in lists of spices and fruits at Mari.⁶⁰⁵ They were issued for the work of the AGRIG/sabarakkātim and the cook (female). Some of the ḫaṣannu is specifically said to be for nersu. The quantities given for Namaškillus are greater than those for ḫaṣannu. Both Namaškillus and ḫaṣannu were also issued for the king's meals.⁶⁰⁶ At Rimah ḫaṣannu was dried for eating. It seems to have also been used as a flavouring agent here as when ḫaṣannu is unobtainable coriander and cumin are sent. It seems to have been a popular item as the king is said to be complaining about its lack.⁶⁰⁷ In the Neo-Assyrian
period SUM is mentioned as food in an illness and various types of ‘onions’ are listed in the provisions for Anûnûnashirpal’s feast. These include ū.šûmu, ū.īmaškilu.SAR, kunipḫu and ū.zînmîmu.

Pulses

This section includes legumes such as the lentil, chickpea, broad bean, grass pea etc. ĠU (when connected with plants) is usually translated as a pulse of some sort. There are several types of ĠU recorded in the texts and it is not always possible to identify which pulse is meant.

The two most frequently mentioned pulses are ĠU.GAL and ĠU.TUR. ĠU.GAL/hallûru (hallûru in Nuzi) has been translated as ‘chick pea’ and ‘chick pea plant’ based on the etymology of Hebrew hurul, Aramaic hurî and Arabic hullar. ĠU.TUR/kakkû is translated as lentil or small bean. The writings ĠU.GAL.GAL and ĠU.TUR.TUR can probably be equated with ĠU.GAL and ĠU.TUR and the determinative ġE (grain) is sometimes used with them. Another series of terms used are ĠU.ĠU.GUD, ĠU.ĠU.UR, ĠU.ĠU.GAL, ĠU.ĠU.GAL.GAL and ĠU.ĠU.TUR: it is not possible to say whether these are all different pulses or whether they are different sizes or sorts of the same pulse, i.e. the ĠU.ĠU. A tentative identification for ĠU.ĠU.GUD might be chick pea. The Latin name for this pulse is Cicer arietinum – the use of arietinum (from Latin aries, ram) as the specific name is due to a supposed likeness of the young seeds to a ram’s head. But the cultivator in the Early Dynastic Mesopotamia may have seen a likeness to an ox. The ĠU.ĠU.GAL could be the broad bean (Vicia faba).

Cultivation of pulses

In the Early Dynastic period at Lagaš ĠU.ĠU.GUD and ĠU.ĠU.UR are grown (together with various types of ‘onion’ and spices) in fields in which areas have been specifically set aside for vegetables. The ‘onions’ appear to be the most important of the vegetables, as the number of furrows allocated to their growing in one text total 127 compared with 11 for ĠU.ĠU.GUD and 15+ for coriander. In the Old Babylonian period at Ur, chick peas (ĠU.GAL) and lentils (ĠU.TUR) are listed with barley, emmer-wheat, and ū.nap-bi as crops from districts. In at least six of the areas emmer-wheat, chick peas and lentils are
all grown, and in four of these ū.nap-hi is grown as well. The total quantities for all the districts are barley 2324 (CUR) 4 (PI) 2 (BÁN), emmer-wheat 200+ (CUR) 5 (BÁN), ū.nap-hi 27 (CUR) 5 (BÁN), chick peas 7 (CUR) 3 (PI) 5 (BÁN) and lentils 1 (CUR) 2 (PI) 2 (BÁN) 5 (SIŁA).

Chick peas and lentils are also listed as field-crops with cereals including barley, emmer-wheat (ZÍZ.AN.NA), bread-wheat (GIG), and cress (ZAG.ḪI.LI) in the Kassite period at Nippur. Here the quantities from all the districts are 1 (PI) bread-wheat (grown in only one district), 102 (CUR) 2 (PI) 4 (BÁN) emmer-wheat, 4 (BÁN) 2 (SIŁA) lentils (grown in only three districts), 1 (CUR) 3 (PI) 2 (BÁN) 8 (SIŁA) chick peas, 4 (CUR) 3 (PI) 2 (BÁN) 1½ (SIŁA) cress and 65 (CUR) 2 (PI) 5 (BÁN) barley. Discounting the barley, in the Old Babylonian period at Ur and the Kassite period at Nippur, greater quantities of chick peas are grown than lentils and both are exceeded by emmer-wheat and by the fourth-named crop (ū.nap-hi and cress respectively). There is roughly 3 times as much ū.nap-hi as pulses and 2.5 times as much cress as pulses.

Pulses used as food

In Ur III Lagāš different types of chick peas and lentils are included in a list of foodstuffs. These are whole (or large?) chick peas (GŪ.GAL.GAL), chick pea flour (ZI.GU.GAL) and crushed (?) chick peas, possibly chick pea semolina, (GŪ.GAL.HAR.RA) second grade (?) lentils (GŪ.TUR.UŠ.SA) and roasted chick peas and lentils (ŠE.SA.GŪ.GAL and ŠE.SA.GŪ.TUR). This suggests that these pulses were consumed in a variety of forms. Chick pea flour can be added to bread, and it can be used to make hummus and couscous.

In Old Babylonian Mari, chick peas and lentils formed part of the provisions for the king's meal. The fact that GŪ.GAL/hallūrum was issued in almost every month suggests that it was dried and stored rather than eaten fresh. There are several references to chick peas for drying (na-ga-bi). Issues for the king's meals tend to be small - averaging less than 2 SIŁA per day of issue in the 'Year Zimri Lim counted the people'. NINDA hallūri and ground (?) chick peas
(balluru sa-am-du) are mentioned at Mari suggesting that chick-pea flour and chick-pea 'semolina' were used. Issues of lentils for the king's meals are also made in nearly every month of the year, again suggesting that they were dried and stored for use. The average tends to be about 2 SÌLA per day of issue. Another legume which is issued for the king's meals at Mari is the Gû sp-pa-nu possibly a type of chick pea, grown only at Mari. Chick peas were used at Rimah: they are given to servant-women for a journey to Andarik, and ground chick peas (GûqAL pa-ah-sa-tum) were handed over to Iltani, together with a further issue for drying (na-ga-pi/bi). Small amounts of lentils (1 SÌLA) were occasionally issued for the king's meals at Chagar Bazar. 'White' beans (Gû.BABBAR) and 'lentils' (d-ezinnu) were included as offerings for temples at Ur in the Old Babylonian period.

Other vegetables
This section will include those vegetables which cannot be considered either Allium or pulses.

'Cress'
Garden cress (Lecidium sativum) is an annual herb, which is native to western Asia and Europe. Its leaves are rich in Vitamin A and Vitamin C. It is therefore a valuable food plant. The leaves can be eaten raw and the seeds can be added to sauces, stews or breads.

Cress has been identified with ZAG.ḪI.LI.SAR/sahû. One of the earliest mentions of this is at Lagaš in the Ur III period, when it is in a list of foodstuffs which also includes chick peas, lentils, salt and spices. Its cultivation alongside chick peas, lentils and cereals at Kassite Nippur has already been mentioned. At Nuzi it is recorded as an alternative to both chick peas and 'lentils', and it continues to be cultivated in the Neo-Assyrian period, when it is also amongst the provisions for Aššurnāṣirpal's feast. It would thus appear that although it was already grown in the late third millennium it became more important during the second, even replacing the pulses to an extent.
Cucumber

Cucumber (Cucumis sativus) is native to southern Asia or Africa. It can be eaten raw, or it can be stuffed and cooked. As mentioned (3.4.1), palaeobotanical remains of cucumber were found at Nimrud in the Neo-Assyrian period, and an unknown species of Cucurbit was found at Tell Taya in the Akkadian levels. UKUS is translated as cucumber and many varieties are given. One type, UKUS.DUR, was included with other foodstuffs for men during the reigns of Lugalanda and Urukagina at Lagaš. But apart from this, references to the issue of cucumber are rare. No word has yet been identified for melon or water-melon (although UKUS.TI.GI.LI/tigilu has been identified with the Colocynth which is a member of the same family as water-melon - the Colocynthis citrullus, formerly Citrullus vulgaris). (Fig.41)

Turnip

The turnip (Brassica rapa) has been identified with LU.UB.SAR/lapatu because of its white colour and its similarity with Aramaic laphta. It is grown in the Old Babylonian period and it appears among the provisions for Aššurnaširpal's feast and in the plants at Merodach-Baladan's garden.

'Artichoke'

The Globe artichoke (Cynara scolymus) is thought to be native to the Mediterranean and North Africa. It was known to the ancient Greeks and Romans who apparently considered it a delicacy. In a Neo-Assyrian relief of fruits and various delicacies being carried into a feast, some attendants are shown holding one unusual plant in their hands. The plant is held by a long stalk and is depicted as consisting of layers of small semi-circular leaves. A long 'leaf' curls out from the centre. This has been identified as a pineapple and a fingered citron. But the pineapple is native to South America. Another possible identification may be the artichoke: this has a long stalk and layers of small leaves and has a certain resemblance to the object carried in the relief. The depiction on the relief however is rather stylised so that the original of the vegetable may not have been a frequent part of the king's provisions - possibly the artist may never have seen it but have relied on descriptions. Another possible
identification is that this plant may be the cardoon (*Cynara cardunculus*) from which the artichoke is thought to derive. It is native to the Mediterranean and North Africa, is cone-shaped and has a crest of leaves on the top. A suggested translation of *nasabu*, which appears in the list of plants in Merodach-Baladan's garden is artichoke, although this word has also been tentatively translated as a type of gourd or cucumber.\(^649\) GIS *nasabu* also occurs as part of the provisions for Aššurnaširpal's feast.\(^650\)

'Lettuce'

Among many other words believed to mean a vegetable of one sort or another is H:\i:\s:\i:\sAR/hassû - translated as lettuce, *Lactuca sativa* because of its similarity with the Syriac hassûtha and Aramaic hassa - lettuce. It seldom appears in texts, except for lexical lists.\(^652\)

3.2.3 Importance of 'vegetables' in the diet\(^653\)

When considering the nutritive value of 'vegetables' a distinction must be made between pulses, and non-pulses such as the onion, turnip, leafy green vegetables etc. The pulses have a higher protein content than cereals, and when combined with cereals, may provide as good nutritive value as animal proteins. They are good sources of the Vitamin B group (except for riboflavin) and sprouted pulses (after germination that is) can be a good source for Vitamin C. In addition, most of the vitamins present in the pulse are actually consumed, and losses in cooking are small. Pulses can be prepared for consumption in several ways. Fresh pulses, such as peas or broad beans, can be eaten without cooking or may be boiled, added to stews etc. Dry whole pulses have a skin which may be indigestible. If the skin is not removed, the pulses require soaking and cooking for longer periods so that they are soft enough to eat. Soaking also makes the skin easier to remove: it can be rubbed off the seeds while they are still damp, or they can be dried, then pounded, and the skins removed by winnowing. Pounding and winnowing can also be used on seeds dried in the sun, without any soaking. There is some danger that the removal of the skin also causes the loss of some nutrients, but on the other hand it
increases digestibility and lessens the time required for cooking. Whole dried pulses can be parched or roasted for eating. They can also be germinated by soaking, and then spread in the sun until they have sprouted. The sprouted grains can then either be eaten raw or fried or boiled. Pulses can also be added to stews or soups, usually after the skins have been removed. And skinless pulses can be cooked until soft enough to mash to a paste. This can then be flavoured with oils and spices. This type of dish is known as hummus in the Near East and is very popular throughout the area. Dried pulses can also be ground into flour and added to cereal flour to make bread. Coarse pulse semolina, especially that made from the chick pea, may be made into couscous or similar dishes.

Some pulses possess toxic substances. The two most important pulses involved are grass pea (Lathyrus sativus) and broad bean (Vicia faba). If grass pea is allowed to form the major part of the diet (c.300 gm per day) a paralysis, lathyrism, may occur. It is more common in boys and young men than in women. Eating broad beans or inhaling the pollen of the flower may cause favism - a disease which causes blood disorders. This disease seems to be mainly confined to people living in the Mediterranean basin or of Mediterranean origin.

Vegetables such as the onion, turnip, aubergine, cucumber etc are of little value as sources of energy. Most vegetables do provide a source of iron and calcium. But their main nutritive value is in supplying Vitamin A equivalents and ascorbic acid. There is a rough relationship between the colour of the vegetable and its value as a source for Vitamin A. Green leafy vegetables, and others such as carrots, are good sources while pale vegetables such as cucumber are poor. Most vegetables can be eaten raw. They may also be boiled, added to stew etc. Much of their Vitamin A equivalent and Vitamin C content may be lost in washing and boiling, unless the water used for cooking is either drunk or added to soups or stews. However, even with such preparation and cooking losses a daily consumption of vegetables (of about 90 g) may provide sufficient Vitamin C to prevent scurvy.
Oils and fats play an important part in the diet as they provide a concentrated source of energy, and increase the palatability of food when used for cooking. Oils and fats are also used for other purposes such as ointments, perfumes and lighting. And they also play an important role in textile manufacture, especially in the processing of wool. However, these non-dietary uses will not be dealt with in any detail. The main animal fats (apart from dairy produce discussed in Section 3.3 above) used in Mesopotamia from c.3000 to 600 BC are mutton and pig fat, although beef fat and fish oil may also have been used. The main vegetable oils are linseed or sesame, and the olive.

3.5.1 Animal fats

The most common animal fat would seem to be pig-fat (šaḫu) although mutton-fat (ludū) is also used consistently. Their comparative value is difficult to assess. At Umma in the Agade period a text giving the value in silver of various commodities states that a pasture-reared pig (šaḫu) equals 1 shekel of silver while a sheep (ganamu) is only worth .5 shekel, which suggests that the fat from the pig would also be worth more than that from a sheep. Only pig-fat is listed and 20 šēla šaḫu equal 6 šēla šaḫu (unspecified but possibly vegetable oil). In the Old Babylonian period, the Laws of Ešnunna give 12 šēla šaḫu and 15 šēla šaḫu as being worth 1 shekel of silver each. If, for the sake of comparisons, šaḫu and šiṣu are taken to be the same type of oil, the ratio between 'vegetable' oil and pig fat in the Agade period, at Umma, is 1:3 and in the Old Babylonian period at Ešnunna, is 1:8, suggesting a slight increase in the value of pig-fat as compared with vegetable oil.

A reference to šaḫu appears in the Early Dynastic period at Lagasš. This is mentioned in conjunction with LAK 490, which is probably cheese, as the property of Baragnamtara brought by various individuals at a count of cows. Thus it is probably not beef-fat but cream or curds, as there is no suggestion of the cows being slaughtered. Fish oil (šušu) also occurs in texts at Early Dynastic Lagasš,
listed in deliveries with different types of fish. However, there is a species of fish, the GA.MAR.KU₆ (also GAMAR/ꜜKU₆/ kašaru, mentioned for example at Ur in the Ur III and Old Babylonian periods. This fish is thought to be a fresh-water fish with a very high oil content so that the I.KU₆ at Lagas may simply be a type of fish. However, both I.MES.GUD.MES and I.MES.KU₆.MES are listed with other types of oil in a Neo-Assyrian vocabulary list indicating that beef-fat and fish oil were prepared.

3.5.2 Vegetable oils

The main vegetable oil in Mesopotamia had been identified until recently as sesame (Sesamum indicum), mainly due to the philological connections between the Akkadian šamaššamunu (Sumerian ŠE.GIS.₁) and the Arabic simsim (meaning sesame). However, it was suggested in 1965 by Helbeak that šamaššamunu should rather be identified with linseed as this is found on many excavated sites in Mesopotamia, whereas no sesame-seeds at all have been found there, and there is no word translated as 'linseed'. This assumes that when sesame replaced linseed as the main vegetable oil, apparently in Islamic times, the word šamaššamunu was applied to the 'new' oilseed. This philological change is complicated by the use in both Mycenaean and Classical Greek of words deriving from šamaššamunu, which have also traditionally been translated as sesame. It is proposed to consider the cultivation, preparation and nutritional value of both linseed and sesame, as well as looking at the evidence for them in the Palaeobotanical record and in the texts.

Occurrences of linseed, I.GIS and ŠE.GIS.₁

Two main terms are used in the texts to refer to vegetable oils: I.GIS/šlu, or Šamaššamunu and ŠE.GIS.₁/šamaššamunu. That these are two different oils is suggested by the fact that both are referred to in the same text at Lagas (Ur III period) both are provided for the king's meals at Mari for the same days, at Rimah when ŠE.GIS.₁ is requested as there is no I.GIS, and both appear in the provisions for Aššurnāṣirpal's feast in the Neo-Assyrian period. However, on
occasions \( \text{I.G} \) is used to express the quantity of oil produced by an amount of \( \text{SE.\text{G}6.1} \) and it is apparently used indiscriminately with \( \text{I} \) (alone) to describe the oil issued as rations in the 'messenger' texts in the Ur III period. This suggests that \( \text{I.G} \) may have been used to describe vegetable oil in general and that \( \text{SE.\text{G}6.1} \) was employed when that particular oil was referred to.

Linseed appears in the Palaeobotanical record at Arpachiya, Brak and Ur between about 5000 and 3000 BC, at Khafajah B (Old Babylonian period) and Nimrud (Neo-Assyrian). The finds of linseed at Nimrud were substantial and exceeded in quantity the amount of pulses (and even bread wheat and emmer-wheat) found.

Cultivation

Linseed is an erect annual which can stand between 46 cm and 60 cm high. The stems rise some distance from the ground before branching. The fruit is a capsule, divided into ten segments each of which has one seed. The seeds are a flattened oval, mainly brown, but occasionally white, in colour. Time of sowing can vary, but it is important to avoid drought during early development, and high temperatures during flowering and the early stages of seed formation can reduce the final oil content. Frost is not a problem as the young seedlings have been known to withstand temperatures as low as 20°F without permanent injury. In Iraq (Diyala area) the sowing is done in November and the crop is harvested in May/June. It is reaped before it is completely ripe, and the crop can be stacked and dried on the field. The plants are threshed after they are completely dry. This can be done by beating with a stick and the seeds are separated by winnowing. One method of reaping is to pull up the plant by the root and not to cut the stalks.

Sesame is also an annual plant, rising to 110-140 cm. The fruit is a capsule, divided into four, which opens at the top when ripe. The capsules contain many seeds which are flat and oval, and can be white, grey, reddish brown, dark brown or black. The crop can be sown in September and harvested in January or in May/August, and harvested in August/December. The Diyala area of Iraq sows in June and harvests
in September. Heavy rain in the early stages can destroy the seedlings. Handweeding and hoeing are desirable for a good crop. The best way to harvest the plants is to uproot them. The seeds can be collected from the opened capsules by shaking the plants over a cloth. The rest of the crop is then tied into bundles to be stacked until the remainder of the capsules have opened. The bundles are then upended and beaten gently with sticks to remove the seeds. Both crops require a well-prepared smooth seed-bed and they can be sown in rows or broadcast.

A study of the cultivation and harvesting of *SE.GIŠ.✶* 674 found that fields were prepared carefully before the sowing, that the crop was harvested by uprooting or tearing out (nash*mum*) the plants. The seeds were removed by hitting with a stick (nap*sum*) 675 and winnowing was then carried out.

**Preparation**

Linseed oil 676 is obtained from the seeds by means of pressure. A non-mechanised way of doing this is by packing the linseed in bags and using a hand-press to squeeze out the oil. Before the pressing the seeds can be crushed and ground into meal. Heat can also be used to obtain more oil, but cold-pressing provides a better quality oil which can be consumed without refining. Present-day methods include hot-pressing with hydraulic presses, or the use of solvents. The seeds have up to 37% oil content, but some 10% will be left behind in the 'oil-cake' after pressing. This oilcake provides good fodder. Another method may be to crush the seeds and boil them in water to release the oil. 677

Oil can be extracted from the sesame seeds 678 by pounding the seeds in a mortar; they are then soaked in hot water until the oil floats to the top. Cold pressing can also be used but the oil requires filtering. The oil content is about 50%.

The oil from *ŠE.GIŠ.✶* and 1.GIŠ appears to have been obtained by pressure. The adjective 'pressed' (ḄA.MA.GA/halsu) is used to describe 1.GIŠ and *ŠE.GIŠ.✶* in lexical lists. 679 The verb satstu - to press - is also used to describe the process of obtaining the oil from *ŠE.GIŠ.✶*. 680
The 'hilsu-pressing' would appear to be the first pressing while the 'sahetu-pressing' refers both to the second pressing and to the whole process of obtaining the oil. The oil obtained from oil plants by the first pressing is usually considered to be superior to that obtained by later pressings. In the Ur III period ŠE.GIŠ.₁ is recorded as being sent to a mill (E.ARA) – together with dates – although it is not clear whether this is for grinding or rations. At Lagaš, in the Ur III period, ₂CUR ŠE.GIŠ.₁ produced 120 ŠILA ₁.GIŠ and in the Old Babylonian period at Ur, ₂(P1) ŠE.GIŠ.₁ produced 2 (BAN) 9 ŠILA ₁.GIŠ; 20% and 24% respectively.

Uses in food

Linseed is a drying oil – that is, a thin film of it will form a solid elastic substance when exposed to the air. Its main present-day use is as an industrial oil, but it is used for human consumption in parts of Eastern Europe, Hungary and the Soviet Republic. Linseed oil contains unsaturated fatty acids, mainly linolenic acid (45–50%), with more than 2 double or triple bonds in their chain of carbon and hydrogen acids. This means it is less stable and resistant to deterioration than oils such as olive oil or the saturated fatty acids such as pig-fat. There is also a rapid flavour deterioration and a risk of the oil breaking down when heated. If it is kept in a tightly closed container, at a temperature of around 15 and 16°C, linseed will keep over a year, and possibly up to five, although it may darken in colour and acquire a smell of drying-oil. It can be used for salads, frying fish and preparations made from dough, but it is less acceptable in confectionary. In Egypt today linseed is used as a dressing on the bean dish ful medammes.

Sesame oil is a non-drying oil which stays liquid at room temperature for an indefinite period. It is more stable than linseed oil and will deteriorate more slowly. It is a more commonly acceptable edible oil than linseed oil, but experiments on rats have shown that linseed oil is as nutritious as other edible oils in promoting growth. As well as providing a cooking and salad oil, sesame seeds can be roasted and ground in a flour and added to cakes, porridge etc, or they can be used as garnishes on cakes and bread.
ŠE.GIS.İ and İ.GI appear on lists of provisions, which suggests their use as foodstuffs, and they were sometimes sweetened but their precise use in the diet—that is whether they were used in cooking or whether they were added to dishes after cooking—is seldom indicated. The Bedouin pour melted butter over dishes of milk and bread, burghul or rice and a vegetable oil could be used in the same way. Confections such as NINDA.İ.DE.A/Ninda mersu were made with oil: it is not always clear whether vegetable or animal fat. Both categories are included as ingredients in lexical lists.

Conclusions

It is difficult to make a final identification between linseed and sesame as ŠE.GIS.İ. What is known about the cultivation and harvesting of ŠE.GIS.İ could apply both to linseed or sesame—for example both plants can be harvested by uprooting. In favour of sesame is the philological similarity between šama’sammi, simsim and sesame, and the fact that sesame-oil is a more palatable oil than linseed. In favour of linseed is its discovery in the paleobotanical record and the fact that the main way of obtaining oil from linseed is by pressure while sesame is more usually obtained by boiling the seeds and skimming off the oil. Thus the verbs šalīsu and šahītu can be used in their specific translations 'press' without any extensions of their meanings. On the whole it would seem that the points in favour of linseed outweigh those for sesame: the word šama’sammi could, as suggested by Helbæk, have been transferred to sesame when this became the main oil-plant. In India from where Sesamum indicum is believed to have spread, the plant is known as til and gingelly, simsim being the Arabic name. Marco Polo recorded how the sesame seed resembled the seed of flax, except that it was lighter coloured and the oil it yielded was better, emphasising the similarity between the two seeds, which could make such a name change easier. The fact that sesame is more palatable than linseed would not apply unless people had been in a position to make a choice between the two.

It is possible that the term ŠE.GIS.İ is mainly used when the seeds are meant, that is, before the oil has been obtained from them,
and that I.G1S is used to refer to the actual oil. In this case, seeds of linseed (SEM.G1S.) may have been used at Mari (Old Babylonian period); perhaps as garnishes or in the various types of bread.

3.5.3 Olive oil

The olive (Olea europea) has been identified as sirdu, olive oil as I.G1S. sirdi. The oil is obtained by soaking the olives in hot water, and the oil which floats to the top is skimmed off or the water drained out through the bottom of the vessel. The fruits and stones are then pressed. Olive stones have been found at Tell Tayy in the late third millennium (Akkadian period), at Lachish (Palestine) in the third and first millennia, and at Nimrud in the Neo-Assyrian period. The occurrence of sirdu in the economic texts is rare; it is listed at Mari (Old Babylonian) together with deliveries of 'honey', wine, tunics and metal tools (?), where it is associated with important personages such as Iarim-Lim of Iamhad and Aplahanda of Carcemish, suggesting that the items came from areas to the north and north-west of Mari. Olives, not necessarily olive oil, appear in the provisions for Ashurnasirpal's feast at Nimrud. These references and the palaeobotanical record correspond with the likely area of olive cultivation, that is, in the north of Mesopotamia and in the hilly areas west towards the Mediterranean. It is unlikely that olive trees could be cultivated in the south of Mesopotamia, probably not below Tuz Khurmatli.

3.6 Fruits and nuts

In societies which can draw on a wide range of food sources, the main value of fruit in the diet is their Vitamin C content, and the variety of flavours which the different fruits can add to food-dishes, wines, and other drinks or simply when eaten raw. However, in societies with a more restricted range of food sources, fruits such as the date are used as a major part of the diet. Dried dates and dried figs have a calorific value similar to that of bread and they can therefore be used as a source of energy. But their protein value is low and they have lost their Vitamin C content in the drying process,
so that other food stuffs must be used to supplement the diet (see Chapter 4). Nuts also have a high calorific value and are rich in protein but they are seldom consumed in sufficient quantities to be classed as a major food source.

3.6.2 Fruits

The main fruits which appear in the palaeobotanical record in the economic texts and in the artistic representations in Mesopotamia between 3000 and 600 BC are the date (211.LUM/sulupp), the fig (GIŠ.MA/tittu), the pomegranate (GIŠ.NU.UR.MA/nurmû) and the GIŠ.HAIšUR/hasiru and GIŠ.HAIšUR.KUR.RA/armannu which have been identified as the apple and/or the apricot. It is proposed to survey the general cultivation characteristics for these fruits in terms of modern practices and then to discuss each in relation to its appearance and use in Mesopotamia. It is not intended to cover every type of fruit listed in the texts, although some other fruits, such as the pear and plum, will be mentioned.

Dates

At the present day, dates are one of the main agricultural exports of Iraq where the main date-growing areas are the groves on the banks of the Shatt al'Arab, along the Euphrates to Ana, and along the Tigris to Samarra (especially in the Baghdad area), and the Mandali region. Further north the winters tend to be too cold for the dates to mature, but in the Middle Ages dates were recorded as far north as Sinjar, Tell Afar and the Mosul area.

The date-palm grows well in areas of intense summer heat, provided its roots have access to a plentiful water supply. It does not like prolonged cold winters and severe frosts have been known to destroy whole plantations. Usually irrigation is essential for date-growing and various methods can be employed. In the Basra area, the flow of the tide backs the fresh water of the Shatt al'Arab into the canals so that the plantations in this area are irrigated twice a day. The ebb of the tide causes the canals to empty back into the river, so that they act as drainage channels and prevent the ground from becoming
waterlogged. In other areas the amount of irrigation is limited by the amount of water available. The Arab ideal is daily watering, but this is not always possible. The date-palm can grow on almost any type of soil and is remarkably resistant to saline soil, although both waterlogged soil and soil that is very dry are unsuitable.

Date-palm seedlings can be grown from seed, but it is more usual to propagate by transplanting offshoots. Preferred offshoots are about four to eight years old and are taken from the parent palm in late winter or early spring before the season of maximum growth. The tree begins to bear fruit about five years after planting, but its most productive period is after it has ceased to bear offshoots, at about 12-15 years. It can then have about 50 years of high yield and is said to have seen its best days when it is between 60 and 80 years old.

For the best results date-plantations should be well-tilled: this will help to conserve soil moisture, kill weeds and harmful pests and keep the soil temperature more even. In the Shatt al'Arab area it is usual to dig the land to a depth of four feet every four years, but in other areas digging may not be so deep and plantations may even be left several years without any tilling. Manure, such as sheep dung and fowl droppings, may be added to the soil, but commercial fertilizers are rarely used as the chemicals tend to be washed out of the soil during irrigations before they can be any use. Other types of fruit trees may be grown in the shade of the date palm and sometimes vegetables and even cereals are sown. It is held to be best to grow only shallow rooted vegetables among the palms until the palms have ceased to produce offshoots and have sent their roots deep into the earth. The growing of vegetables and cereals ensures that the plantations will receive adequate tilling.

The date palm grows either male or female flowers and it is customary to pollinate the female flowers with the pollen from the male tree, by hand, as wind pollination, although possible, is not fully reliable. The male spathe is usually cut off a few days before it opens, the spathe is then taken indoors, split open and the flowers removed and allowed to dry so that no pollen is lost. The male
inflorescences are then placed in a can or basket and taken to the
top of the palm, the pollinator climbs the tree with the aid of a
rope-sling which he uses to support his body while pollinating the
flowers. Flowering can start in late February, and March and April
are the main months for pollination. A male palm can produce
sufficient pollen to pollinate 100, 200 or even 300 females, but a
safe margin is held to be two or three males for every 100 females.
(This ratio varies from country to country and in some areas round
Basra only female trees are grown, the pollen being brought from other
plantations.) The superfluous males can be cut down as soon as their
sex has been firmly established - that is at about five years old.

The main harvest month is September, although this can vary
according to area and the stage of maturity desired. The date passes
through four main stages in ripening: the first, chimri, denotes a
hard green fruit which is unfit to eat, the second, khalal, is yellow
or red in colour, sweet and juicy and considered to be a delicacy.
The next stage is ratab. In this, the skin becomes translucent and
wrinkled and the fruit is soft. The fourth stage, tamar, is dark and
the flesh is 'toffee-like'. The dates are picked from the second stage
onwards. Khalal-dates can mature into ratab, and ratab into tamar,
after picking, but the flavour of the dates which have been allowed to
ripen naturally on the palm is superior. For the picking, the harvester
climbs the palm, again using the rope-sling, and cuts off the bunch.
If the dates are at the khalal or ratab stages, the bunches are lowered
to the ground, as they would be damaged if dropped. Tamar-dates can
be dropped onto a mat spread out round the base of the palm. Ratab-
dates are sometimes spread out on the ground and left to ripen into
tamar. An average yield of about 20 kg per palm was found in Iraq in
the early part of this century. Dates keep very well, but soft
dates should be dried slightly to remove excess moisture or else there
is a risk of fermentation. This can be done by spreading the dates
out in the sun, covering them at night, either on the ground or on
a roof.

Figs

The fig **(Ficus carica L)** is native to the more arid regions
of Western Asia. The plant can withstand winter temperatures as low
as 15°F in a state of dormancy, but young plants must be protected
from frost. High summer temperatures may cause the fruit to be tough
but have no other detrimental effect provided the soil is kept moist.
An annual rainfall between 82 and 122mm is required. The plant is
also tolerant of poor drainage, but well-drained soil will improve
both growth and yield. The fig-tree can attain a height of about 9 m
or even more, although it is also found in bush form. The branches
tend to curve upwards and then inwards, like a sickle. The tree is
deciduous and has large almost oval leaves which are usually divided
into five lobes or segments.

Wild figs are propagated from seed spread by birds and fruit-bats,
but most cultivated varieties are propagated by cuttings. The tree
requires very specialised pollination. The wild fig produces male
and female plants. The male tree, the caprifig, produces male flowers
and short-styled gallflowers in which develop the larvae of a small
symbiotic wasp, the **Blastophaga psenes L**. The wasps, as they emerge
from the caprifig, become dusted with pollen, and when they enter the
female flowers they transfer this pollen, bringing about pollination.
Some cultivated edible figs, such as the Smyrna fig, produce only
female flowers and must be pollinated by the caprifig wasp. Other
varieties, known as common figs, no longer need pollination, as seedless
fruits develop parthenocarpically. The wild caprifig may either be
planted alongside the cultivated fig-tree, or branches of the
caprifig may be attached to the tree to be pollinated.

The fig-tree bears fruit from the eighth to about the fiftieth
year, although some may begin to bear at four years old. The harvest
starts towards the end of September. The fruit is usually picked by
twisting its neck. Sometimes the fruit is left on the tree until it
has started to dry naturally. Those picked before this stage can be
eaten fresh or sun-dried. Dried figs may be pressed and threaded on a string. The main areas for cultivation of the fig in Iraq are the Jebel Sinjar, Baghdad and the Diyala areas.\textsuperscript{706}

Pomegranates

The pomegranate (\textit{Punica Granatum L})\textsuperscript{707} probably originated in southern Asia and spread west through Iran into south-west Asia and Turkey and the Mediterranean region. It can grow in most tropical and sub-tropical countries. Like the date, it prefers a hot climate with plenty of water, although it can withstand drought well. The best pomegranates are grown on deep soil, and alluvial soil suits this fruit particularly.

The plant can develop into a tree of between 4 and 6 metres, but if pruned it will remain as a bush of about 2 to 4 metres. It is deciduous in colder areas. The leaves are about 7 cm long, and taper at both ends. The fruits are red or yellow and globular in shape. Their most characteristic feature is the notched tubular persistent calyx which looks rather like a crown. Propagation is mainly carried out by seeds or cuttings. The plant bears fruit in its fourth year and continues until about the twentieth. The ripening season for the fruit lasts from midsummer to late autumn. The fruit can be eaten fresh and the juice can be used to flavour drinks.

Apples

The apple\textsuperscript{708} (\textit{Pyrus malus L}, sometimes \textit{Malus pumila} etc) has many cultivated varieties; there appear to be two sources for the original wild tree producing crab apples - one found in the northern parts of Europe and western Asia (\textit{Malus pumila var. sylvestris sylvestris}) and the other found in southern Europe and western Asia (\textit{Malus p.mitis})\textsuperscript{709}. The apple can grow on most soils but badly drained sites should be avoided. Spring frosts are also harmful. The fruits ripen from August. The best cultivated apples are grown in temperate zones. In Iraq it is grown in the mountain valleys and sometimes in orchards on the plain, but here neither trees nor fruit reach great size. Philby saw crab-apples grown among palm groves at Riyadh in Saudi Arabia.\textsuperscript{710}
Apricots

The apricot (Prunus armeniaca) is thought to be native to China. It prefers a warm climate and a limestone soil. A limestone soil gives good yields, sweeter fruit and ensures a good soil drainage. The tree can be between 3 and 10 metres high and is deciduous. It is widely cultivated in Iraq, where it flowers between February and March and fruits between May and June. The fruit can be eaten fresh or cooked. It can also be dried and will hold its flavour indefinitely. The dried fruit can be soaked in water before eating or cooking, or it can be eaten dry. In this form it is particularly useful for travellers.

3.6.2 Palaeoethnobotanical evidence

The palaeoethnobotanical remains of fruit found on Mesopotamian sites from 4/3000 BC to 600 BC are few. Date stones are said to have been found in the Ubaid levels (fourth millennium) at Eridu which suggests that the date-palm was being cultivated by this period. Carbonised date stones were found in graves in the Royal Cemetery at Ur (PG/296 and PG/1054). Date stones have also been found at Nippur, in an Ur-Nammu foundation deposition in the north corner of the E-Kur enclosure wall, from the Ur III period, and at Warka, inside a flask-shaped vessel, in the so-called Old Babylonian 'offering-places'. They were also occasionally found in the private houses at Nuzi (mid-second millennium) and in the Neo-Assyrian period at Nimrud. Two specimens of pomegranates are recorded from Nuzi but unfortunately no mention is made of the exact find places. And uncarbonised fig seeds and pomegranates were found at 7th-century Nimrud. Small crab apples, which had been cut into rings and threaded on a string and dried, were found at Ur (Early Dynastic period) in the Royal Cemetery (PG/1054). These were carbonised but it is not clear whether this carbonisation was the result of placing the saucers on which the apples were found in the ashes of fires, or whether they were burnt for some ritual reason.
3.6.3 Evidence for the cultivation and use of fruit from texts, artistic representations etc.

Cultivation

Although the texts and cylinder seals etc do not give exact details of the cultivation of fruit-trees in Mesopotamia for every period, an overall picture which has many similarities with the modern situation can be gained.

Plantations of fruit trees, mainly date-palms, occur frequently in texts. In the Early Dynastic texts from Lagash dates are listed with 'apples', figs and sometimes 'grapes', suggesting that mixed orchards were kept. The dates and 'grapes' are measured in capacity measures while the other fruits come in NIG.DU.A-measures. As the size of this latter measure is not known, the relative importance of the fruit-trees cannot be assessed from these texts on the basis of the quantities of fruit delivered. It may be relevant that the fruits which come in bunches are in capacity measures while the single fruit are not. In another text, from the Agade period, numbers of palm-trees are listed in plantations together with the owner and/or gardener. A possible reference to 'linseed' (ŠE.GIG.X) at the end suggests that this crop may have been cultivated in some of these plantations.

Some information about likely yields of date-palms can be found on an Ur III text from Nippur which lists numbers of date-palms together with the amount of dates from each tree. The productivity varies considerably: one group of seven trees bears 300 SÌLA each, while a group of 14 trees only bears 10 SÌLA a tree. The average per tree is about 85 SÌLAS. It is not clear whether the different groups of trees represent different ages or varieties, but the variation in yields are so great that it is unlikely that the groups are divided only by owner or gardener. 40 trees appear to bear no dates. These are described as SIR/kasšu.

In Hammurapi's Laws (Old Babylonian period), a gardener employed to cultivate and set-out a field as a plantation tended it
for the first four years. In the fifth year - that is, when the trees began to bear dates - the produce was divided in equal parts between owner and gardener. On occasions the gardener might be hired only to pollinate the date-palm and in this case he took only one-third of the produce, giving the remaining two-thirds to the owner. Penalties were imposed for neglecting to carry out the artificial pollination, and thereby causing the yield of dates to drop. Cutting a palm-tree without the owner's permission incurred a fine of 30 shekels of silver.

Two texts from Lagaba may illustrate the harvesting of the dates at the half-ripe state and allowing them to ripen fully afterwards. At first sight the quantities suggest that a given amount of half-ripe or green dates (uḫḫu-in) will drop by one-third when allowed to develop into fully-ripe dates (ZLUM). Although some reduction in the quantity of the dates is to be expected because of moisture loss during ripening and drying, a loss of one-third seems excessive. It is possible that the figures in the texts mean that of the harvested green dates, two-thirds should be set aside for ripening, and the remaining one-third used in their harvested state. The half-ripe dates are probably the best of the crop, as the texts indicate that two-thirds are second quality and one-third is the best quality. Alternatively, the two-thirds to be set aside may be the yield for the grove owner while the one-third is for the pollinator. The owner would then take one-third of his share from the top quality dates and the remaining two-thirds from dates of lower quality.

The actual harvesting of the dates is shown in a wall-painting at Mari. The main theme of this painting is the investiture of Zimri-Lim, but flanking the central scenes are two palm-trees with bunches of grapes, which are scaled by men, exactly in the way date-pickers still climb the palms at harvest. Dated contracts from the reign of Ammišaduqa suggest that the date harvest in the Old Babylonian period, or at least in that reign, took place in August and September as the term of delivery in the contracts ends mainly in September. This is roughly about two or three weeks earlier than today, suggesting that the dates may have been ripening slightly earlier.
There is some evidence from Aššur (Middle Assyrian period) that the regular removal of shoots and suckers was not considered necessary. The incised design on an ivory comb includes a palm-tree from which two offshoots are growing. However, it is possible that these represent offshoots which are being kept for propagating, or the artist's view of how a palm should be shown.

Date-palms, fig-trees and pomegranate-trees are all depicted on the Neo-Assyrian reliefs. Palm-trees bearing bunches of dates are common features of the countryside on reliefs showing scenes from campaigns in southern Mesopotamia. The regularity with which the lines of palms are usually drawn suggests that they have been planted in groves. Scenes of winged genii pointing 'cones' at stylised date-palms are held to represent the pollination of the female palm-tree with the main inflorescence. The presence of bunches of dates on palm-trees in the Royal Park at Nineveh, on the occasion of Aššurbanpal's meal with his queen suggest the possibility that dates ripened as far north as Nineveh in the Neo-Assyrian period. (Fig. 7)

Pomegranate trees, bearing fruit, appear in scenes of the park at Nineveh, where they are apparently cultivated, as bushes, amongst other trees. They also appear in the countryside, with vine-trees bearing grapes, and fig-trees, in the relief in which a site is being prepared for Sennacherib's palace at Nineveh. Apparently similar trees - that is with similarly depicted leaves, but with longer trunks - without any fruit appear on many of the Assyrian reliefs. If these are all pomegranate-trees, this would suggest that the pomegranate was the commonest tree, after the date-palm, in Mesopotamia at this time. The tree appears both in flat countryside near rivers and in mountainous countryside. The flat land beside the rivers would presumably give the pomegranate its preferred alluvial soil, but the less deep soil of the mountains would also support this tree. However, it is possible that many of these depictions represent other types of trees.

The fig-tree is easily identified by its leaf, and it appears on the relief showing the preparation of the site for Sennacherib's
palace and in the scene in which Sennacherib accepts the surrender of Lachish. A stylised representation of the fig-tree is included in the frieze found on the front of the Sin, Šamaš, Nabu and Ningal temples at Khorsabad. The rest of the frieze consists of stylised figures of a lion, an eagle, a bull and a seeder-plough.

3.6.4 Fruit as a food

In the Early Dynastic period at Lagaš, dates (ZU.LUM) were issued as rations both in the reigns of Lugalanda and Urukagina. The usual amount of dates was 2 SILA and the rations included cereals and cucumbers. GL.AŠŠUR, together with different types of fats and oils, were sometimes included as rations with dates and cereals. Dates were also issued as part of rations in the Ur III period, especially at Ur. And both dates and figs (GIŠ.PES/MA/tittu) are included in a list of foodstuffs, given to a named individual. Fruit was also added to 'cakes' (GL.RAM): date-cakes of different sizes were included in a list of foodstuffs for Ibbi-Sin and his queen at Ur, date cakes and 'apple'-cakes are listed as offerings for the temple of Šara at Umma in Šu-sin's third year and bunches of dates and pomegranate cakes are recorded for a variety of deities, also at Umma in Sulgi's 45th year. Pomegranate (GL.NU.UR.MA/nurmu) does not seem to occur in administrative texts before the Ur III period although it might be expected to appear in the Early Dynastic III period as the fruit occurs in the jewellery of that period. It is reasonable to suppose that it was eaten, but it may have been a particularly prized delicacy until the Ur III period.

Dried figs (GIŠ.PES HAD) and dried apples/apricots (GIŠ.AŠŠUR HAD) are listed with dates, as receipts during the months I-IV at Lagaš, probably in Amur-Sin's 6th year. As these months are roughly equivalent to our March/April–June/July, only dried fruit could be delivered and this text is good evidence for the use of drying to preserve foodstuffs.

The identification of GIŠ.AŠŠUR/pahhuru is a problem. It was translated as 'apple' partly because of its similarity to Syriac
hazzura - apple, and GIL.Ḫ ḪAN.UR.KUR.RA/armannu was translated as 'apricot' because of its similarity to the Syriac hazzura armenana. It is sometimes felt, however, that apple is an unlikely fruit to find growing in abundance in southern Mesopotamia, and that GIL.Ḫ ḪAN.UR should be read as 'apricot'. At first sight the occurrence of the fruit of the GIL.Ḫ ḪAN.UR in a dried form suggests that it should indeed be taken as the apricot, as dried apricots are common both in the Near East and Europe. However, dried crab apple rings were found in the grave PG/1054 at Ur in the Early Dynastic period. In addition small crab apples are grown and eaten in Saudi Arabia and these are sometimes dried, pierced and strung on strings. The identification of GIL.Ḫ ḪAN.UR as 'apple' would thus seem to be possible.

The translation of GIL.Ḫ ḪAN.UR.KUR.RA as apricot is complicated by its listing in a lexical list as the equivalent of kamīḫaru - pear. Kamīḫaru (usual Sumerian GIL.ŠENNUR.KUR.RA) is identified as pear on the basis of the Arabic kummatra. GIL.ŠENNUR/kalluru has been translated as 'medlar' but another suggestion is 'plum'. The translation of 'plum' is also suggested for GIL.ŠENNUR.GAL/habbu. It would be somewhat surprising if some varieties of plums were unknown in Mesopotamia - these fruits are widely cultivated in the alluvial plains of Iraq today - and it is possible that GIL.ŠENNUR/kalluru and GIL.ŠENNUR.GAL/habbu refer to two varieties of plums. The terms GIL.Ḫ ḪAN.UR.KUR.RA and GIL.ŠENNUR.KUR.RA suggest that these two fruits were not local to southern Mesopotamia (Sumer); the listing of GIL.Ḫ ḪAN.UR.KUR.RA as an equivalent of kamīḫaru may be due to some sort of scribal confusion. For now GIL.Ḫ ḪAN.UR.KUR.RA/armannu will be translated as 'apricot', GIL.ŠENNUR.KUR.RA/kamīḫaru as 'pear' and GIL.ŠENNUR/kalluru as 'plum'.

In the Old Babylonian period dates were issued as rations, included in offerings to temples and even used as fodder. They also formed part of the provisions for the king's meals at Mari, being issued throughout the year. They were sometimes issued to the AGRIG/abarakkatum to be used in the making of NINDA mersu - together with pistachio-nuts - for the king's meal. Many other types of fruit were used at Mari, mainly by the abarakkatum; these include 'apples',
'pears' (kamašru), 763 'plums', 764 figs, 765 and 'apricots', 766. These fruits appear to have come from a number of different places. The dates were probably local (as suggested by the wall-painting mentioned above - p.212) and this is probably also the case with the figs - 'figs of Mari' are listed in a lexical list. 767 In the Iltani archives from Rimah, 'apricots of Mari' (arwānī ẖa Mari) (although it is not clear whether the fruits or trees are meant) are said to have been put in a box and sent to Iltani, 768 which suggests that this fruit may either have been grown at, or traded through, Mari. However, it seems that the 'pears' and 'plums' were not local: Išme-Dagan, in a letter to Yasmah-Adad, 769 says he will bring pears from the country of Nāwala, which are delicious, and 'plums' are said to have been brought from Supri. 770 Pomegranates do not seem to have been used much at Mari but they are recorded at Ur, in a list of foodstuffs, 771 suggesting that they continued to be eaten in the south.

At Nuzi in the mid-second millennium, figs, pomegranates, and green dates (uhinnu) are recorded. It is not clear whether all these fruits were grown locally. The figs and pomegranates certainly could have been, and the fact that the dates were green suggests that they were local. But if so, the climate in the area must have been hotter than it is at present. The use of the wood of the 'pear' and 'plum' trees makes it likely that these fruits were also eaten. 772

In the Neo-Assyrian period, pomegranates, figs and 'plums' were grown: in the area of Kalhu, 350 pomegranate saplings (ziqpu), 400 fig saplings and 450 'plum' saplings are recorded, presumably for planting. Pomegranates, dates and figs were included in offerings which may have been issued to such temple staff as the cook and steward. 774 And fig-cakes are included in what is probably a list of tribute. 774 Pomegranates, dates and figs are also among the fruit provided by Ašurnāgīrpal for his feast. 775 Among the other fruits mentioned is the jujube (Zizyphus jujuba, samru) 776. A relief dating to the reign of Sennacherib shows servants carrying trays of pomegranates, figs and other foodstuffs as provisions for a feast. Pomegranates fastened onto sticks are also shown in these reliefs. 777 (Figs. 34, 40 and 41)
3.6.5 Nuts

The evidence for the use of nuts in the diet of Mesopotamia is slim; most of the evidence comes from text and refers to the GILS.LAM.GAL/butumtu, identified as the pistachio. This nut can be eaten raw, or toasted, and is considered a delicacy today throughout the Near East and Europe. It can also be used to decorate pastries etc, or added to the fillings of pies, cakes or even used in stuffing for fowl. The Bedu sometimes collect nuts of the butum-tree (probably Pistacia Khinjuk) dry and grind them and add them to flour.

The pistachio-nut (butumätum) was used at Mari, with dates, to make mersu - the amounts are 1 GUR dates and 10 SILA pistachios. These pistachios may have been imported into Mari; in a letter to Yasmah-Adad, says he will bring pistachios from the country of DHAR (possibly Subartu). Pistachio nuts were also included in the provisions for Ašurnaṣirpal’s feast. Two different sorts of pistachio-nuts may be referred to as there are two separate entries referring to GILS.bu-ur-na-te. One entry records 100 pistachio nuts while the second notes 10 homers of shelled (kukku) pistachio-nuts.

Other nuts listed in texts include the pine-nut (GILS.(ŠIM.)LI/burāšu) and walnut (GILS.KU). Small quantities of pine-nuts are included in offerings at the Ningal Temple at Ur in the Old Babylonian period, and they are also (probably) listed in a text recording a range of products such as boxes of dates, pig-fat, leeks and ‘honey’ at Rimah. Broken walnuts are included in a list of foodstuffs brought to the temple of Aššur and possibly used for the meal of the cook and steward.

Nuts appear rarely in the palaeobotanical record. At Nuzi (mid-second millennium), quantities of acorns were found in the palace and in the private houses. Although the precise identification could not be made because the cups and leaves were missing, it was suggested that Quercus Haas was the probable species. These acorns may have been used as fodder but they can also be eaten by humans, but usually only in times of scarcity. The uncarbonised shells of hazel nuts were
found in a well in the North-West Palace at Nimrud (6th century). Wood identified as coming from the Aleppo pine (Pinus halepensis var. brutii) was used in the roof beams of the Nabu temple and the skal māṣarti, and walnut-wood was used for writing boards. It is possible that the use of these trees as wood may also mean that their nuts were consumed. Some shells and fragments of shells of pistachio-nuts, thought to belong to the Pistacia atlantica, were found in Early Bronze Age Lachish.

3.7 Spices, salt and sweeteners

This section deals with those substances which are used to flavour food and includes the main spices, salt and sweetening agents associated with cookery in Mesopotamia between c.3000 and 600 BC.

3.7.1 Spices and herbs

An important aspect of preparing food is to ensure that it has an attractive and appetising flavour. Herbs and spices are used throughout the world to vary the taste of dishes which would otherwise be monotonously the same. In general terms, herbs are fragrant plants whose leaves, stems, flowers and seed and roots, can be used to flavour dishes. They are normally used fresh. Spices are the dried parts of plants (mainly the leaves, stems, flowers, seeds, bark, roots etc) which are also used for flavouring. Herbs tend to have a mild flavour while spices are stronger and can be used to disguise the taste of food which may have been imperfectly preserved or which is deteriorating. Spices and herbs can also stimulate the digestion, and some possess bactericidal and disinfectant qualities. However, although most herbs and spices contain vitamins of the B group and are rich in calcium and iron, the quantities consumed are far too small to have a nutritional value. The main value of spices and herbs in the diet is their use as flavouring agents.

Spices and herbs played a large part in medicine, in perfumery and in the cosmetic industry in Mesopotamia, but these roles will not
be considered here - only their use in food will be discussed. The main sources of evidence for the use of spices and herbs are the administrative texts and the palaeobotanical record. The latter is very slight and will be included with the discussion on the textual evidence. It is proposed to consider the most common herbs and spices separately and then to mention some of those which are used occasionally.

Coriander.

Coriander (Coriandrum sativum): (Ú) ŠE.LÚ.(SAR)/kisibirru
is an annual herb of which the fruit forms the spice. These must be dried before use as the fresh fruits have an unpleasant smell. The leaves of coriander can be eaten raw. The identification of kisibirru as coriander is based on the Aramaic kusbarta, Arabic kus/zbura etc. Coriander seeds (as the fruits are called) can be used whole or ground; they can be added to curries, soups, stews etc, and they can also be added to cakes and pastries or with fruit. In Roman times coriander was ground with cumin and vinegar and used as a preservative with meat.

Coriander (ŠE.LÚ) was grown in Early Dynastic III Lagaš in the same fields as onions and other vegetables, but it is not clear here whether its main use was for flavouring food, for eating raw or for some other purpose such as medicine. It is recorded at Umma in the Agade period, and in the Ur II period when it is included with various other foodstuffs for night and evening offerings. At Lagash, in the Ur III period, it is included in a list of spices and herbs, vegetables and flour etc. At Old Babylonian Ur coriander formed part of the food-offerings to a number of temples. At Rimah, a letter records that coriander and cumin were sent to Iltani, while another letter requests that she should prepare and send coriander, cumin, onions etc, according to their availability. Coriander is also one of the spices used at Nuzi where it was apparently brought in from villages and gardens outside the city. It is also listed among the plants in Merodach-Baladan's garden. It is not in the list of provisions for Ashurnasirpal's feast, in the Neo-Assyrian period (unless it is included under the heading 'fine spices').
It is the texts at Mari (Old Babylonian period) which give the clearest evidence for the use of coriander in food. Here coriander and other spices were issued to the cook (MU) and abarakkatim. It is used in mersu and for the king’s meal. These references show that this spice was included in bread or cake dishes, and possibly in more savoury concoctions with wheat and chick peas. (The abarakkatim was issued burrum-wheat and chick peas for use in the king’s meal.)

Coriander is rare in the palaeobotanical record, but it may appear in a 13th-century sample from Nimrud.

Cumin

Cumin (Cuminum cyminum) 𒌙.𒈺.𒈼.𒈺.𒈻 (GA.MUN)/kaanû 809 is a plant whose dried fruits are used as a strong aromatic spice, in curries, chili powders and as a condiment, especially in India. It is useful as a seasoning for stews, soups, fish dishes, and vegetables.

Cumin (written GU.MUN) was grown at Lagaš in the late Early Dynastic period in the same field as different types of onions, flax and vegetables. It is probably included in a list of foodstuffs, such as chick peas, lentils, 'cress' and coriander at Ur in the Ur III period. In the Old Babylonian period at Rimah cumin is used. At Mari, cumin is used by the cooks and in the making of mersu. And it is included in the lists of spices brought to Nuzi in the middle of the second millennium. In the Neo-Assyrian period cumin was part of the provisions for Ashurnasirpal’s feast at Nimrud.

The phrase 𒌙.𒈺.𒈼.𒈺.𒈻/zibû appears in a number of lists of spices, often with cumin. This spice has been identified as the seed of Nigella sativa, so-called 'black cumin'. Nigella sativa is habb es-soda, kamûnum aswad, sunûs etc in Arabic and is sold in bazaars in Iraq. The seeds are used to sprinkle on or in bread. Zibû is one of the spices used at Mari by the cooks, and is used both for the preparing of mersu and in the king’s meals.
Cassia or mustard?

GAZI/\textit{kas} has been identified as cassia\textsuperscript{819} and as mustard\textsuperscript{820}. Cassia (\textit{Cinnamomum cassia}): both the unripe buds and the bark of this plant can be used for flavouring. The smell is similar to that of true cinnamon (\textit{C. zeylanicum}). Cassia bark is thicker and coarser than the true cinnamon and has a reddish colour when ground. It can be used to flavour breads, cakes etc, in pickles and in drinks. \textit{C. cassia} is native to South Vietnam and most of the species of \textit{Cinnamomum} are native to south-east Asia. \textit{C. cassia} was in use in China about 2500 BC.\textsuperscript{821}

\textbf{Mustard} (\textit{Brassica nigra} and \textit{B. alba}): this can be used as a spice or as a vegetable. The condiment mustard is made from a mixture of the ground black and white seeds plus other spices - vinegar and salt may be added to the prepared 'ready-to-use' mustard paste. Whole mustard seeds are used in pickling, in salads, in stews, as a garnish; dry mustard powder is added to similar dishes, and the young green leaves of \textit{B. alba} (white mustard) can be eaten as a vegetable or used as a garnish. In the Middle Ages in Europe mustard was used in the preservation of food, as if it is mixed with other food it helps to halt the detrimental action of bacteria.\textsuperscript{822} Both cassia and mustard have been used in medicines.

GAZI/\textit{kas} is listed with types of peas or beans, and cress at Umma, in the Agade period,\textsuperscript{823} and with similar vegetables, plus salt, coriander, and flour at Ur III Lagaš.\textsuperscript{824} Also in the Ur III period it was used to flavour cheeses (GA.BAR GAZI)\textsuperscript{825} and GAZI by itself was also included in the same list of foodstuffs, for offerings. In the Old Babylonian period GAZI was included with coriander, dates, vegetables and dairy products in temple offerings at Ur,\textsuperscript{826} and it is listed with black cumin, coriander and vegetables at Mari.\textsuperscript{827} It is in a list of spices at Nuzi\textsuperscript{828} and in lexical lists, dated to the mid-second millennium\textsuperscript{829} reference is made to soup flavoured(?) with \textit{kas}, and fish preserved in it. In the Neo-Babylonian period \textit{kas} was used to flavour date-beer.\textsuperscript{830}
The large quantities of GAZI/kas\(^\text{a}\) mentioned in some texts and its association with locally grown crops\(^\text{831}\) suggest that it was a plant cultivated in Mesopotamia, rather than imported. This would seem to rule out the identification with cassia, which would almost certainly have to be imported. Mustard could be grown locally, and this, together with its use in preservation, makes its identification with GAZI/kas\(^\text{a}\) a possibility. However, this identification can only be tentative, and future evidence may contradict it.\(^\text{832}\)

Miscellaneous spices and herbs

The following are a selection of those spices and herbs which were used in Mesopotamia.

**U.KUR/In\(\text{\textsuperscript{\text{2}}}n\)**: This has been identified as *Ammi Visnaga* - 'Bishop's weed',\(^\text{833}\) a spice similar in use to cumin. Reference to it occurs in the third, second and first millennia.\(^\text{834}\) At Mari (Old Babylonian) it is specifically said to be issued for the work of the abarakkatum.\(^\text{835}\)

**U.HUR.SAG/azup\(\text{\textsuperscript{\text{3}}}\)ru**: This was identified as *safron* (*Crocus sativa*)\(^\text{836}\). However, in the Medieval period in Europe safron was used as a medicine - to deaden pain, as a laxative, to settle the stomach and for measles, among other uses,\(^\text{838}\) so that this does not appear to be a valid objection. As far as food is concerned the main uses of safron are to give colour and to flavour. It can be used to flavour butter, cheeses and rice dishes. It was used by the abarakkatum at Mari\(^\text{839}\) and it is among other spices at Nuzi.\(^\text{840}\) It is also listed among the plants for Mardak-Baladan's garden.\(^\text{841}\)

**U.SULLIM.SAR/\(\text{\textsuperscript{\text{4}}}\)mbaliltu**: This has been identified as *fenugreek* (*Trigonella foenum-graecum*).\(^\text{842}\) The shoots of this herb can be used whole, and the dried seeds can be used either whole or ground. Both the shoots and the seeds are very nutritious, as they are rich in protein. Seeds of fenugreek (*NUMUN umberlittim*) are mentioned at Rimah\(^\text{843}\) in a letter from Napsuna-Addu to Iltani, requesting some
seeds. Actual seeds of fenugreek were reported from Tell Halaf dated to about 4000 BC while others have been found at Meadi in Egypt (3000 BC) and at Lachish in the first millennium, suggesting that this herb was in use in the Near East throughout this period. Fenugreek is also an important fodder plant.

Ú.HA/Kimru: This has been identified as fennel (Foeniculum vulgare). The dried seeds of this herb can be used to flavour soups, breads, drinks etc. It is especially good with fish. The shoots can be eaten as a vegetable, either raw or cooked. Fennel appears in a list of herbs and spices at Nuzi.

Ú.HAR.HAR/habû: This has been identified as a variety of thyme (Thymbus vulgaris) mainly on etymological grounds. The sprigs are dried and used in stews, vegetable dishes, stuffings etc.

3.7.2 Salt

Salt (Sodium Chloride - NaCl) is essential for the human body. It is needed for proper muscle and nerve function and to control the acid base balance of the body. However, it is probable that the salt already present in food is sufficient for these needs and that a separate source of salt is unnecessary. But salt is not only an essential mineral in the make-up of the body, it is the best natural food preservative, and because of this it has always been sought after. In Iraq salt is not a scarce commodity, as the salinity of the soils is one of the major problems facing agriculture. The salt found on the surface of the soil, due to the evaporation of irrigation water and ground water, is mainly sodium chloride, although other salts such as calcium chloride, potassium chloride and magnesium chloride also occur. This salt can be used as a preservative and in cooking, as most impurities can be washed away and the salt dried in the sun.

The salinity of the soil in the alluvial plain (discussed above 1.3.2 pp.33-35) has probably meant that salt was always available in Mesopotamia. It may have become more easily obtainable from the second half of the third millennium with the increasing soil salinity.
Salt (MUN/ḥabtu) is recorded throughout the period, in the texts. At Parsa, there was a profession MUN.UR₄ salt gatherer ⁸⁵⁰ - suggesting that people were employed in collecting salt from salt pans, such as those at Hit ⁸⁵¹ or from the surface of saline fields. At Lagaš, it was used to preserve fish, both in the Early Dynastic III and Agade periods. ⁸⁵² At Nippur in the reign of Naram Sin salt was distributed by the ¹⁄₂ SILA with dried fish and large quantities of barley. The recipients were apparently quite wealthy people. ⁸⁵³ In the Ur III period it formed part of offerings at Lagaš. ⁸⁵⁴ It was apparently used loose and in bricks (SIG₄ MUN) and was measured in capacity measures and by weight (MA.NA) respectively. ⁸⁵⁵

In the Old Babylonian period salt formed part of the offering to temples at Ur ⁸⁵⁶ and it is recorded at Larsa in a tabulated account with beer-bread (RAPPIR). ⁸⁵⁷ Salt also was part of the list of items in a price list at Ešnunna. ⁸⁵⁸ In the Neo-Assyrian period salt is included in a list of commodities supplied to the palace overseer for chariot troops. ⁸⁵⁹ In the provisions for Ašurnasirpal's feast mention is made of salted beef (G₄ ma-ad-lu-te) as well as MUN.KAT.NI (? a kind of salt). ⁸⁶⁰ Salt seems to have been used with or to preserve mutton during the Neo-Assyrian period. ⁸⁶¹

These references to the use of salt, especially as a preservative of fish and meat, indicate its importance throughout the period.

NAGA

This has been variously identified as uhulu, an alkali plant used in making soap etc, and as qṣqullu, 'carduomīt' (?), ⁸⁶² and as ṣamēdu which has been translated as a plant whose ashes could be used as a salt-replacement. ⁸⁶³

The occurrences of NAGA in the texts include its provision, along with foodstuffs such as bread, beer, onions and fish, as rations for 'messengers'. ⁸⁶⁴ The amounts are usually small - around 2 shekels. It is also listed in a price list with barley, oils and fats and salt at Ešnunna. ⁸⁶⁵ (It was of low value: 1 GUR = 1 shekel silver.) Although the Ešnunna price list includes commodities other than
foodstuffs, such as bitumen(?), the inclusion of NAGA in the 'messenger' ration lists in the Ur III period suggests it was considered a standard foodstuff. It is difficult to accept either an alkali plant used for washing or cardamom-seeds in this role, although cardamom (*Elletaria cardamomum*) is a popular spice which can be used to flavour sweet and savoury dishes and drinks. It is a plant native to southern India and therefore would presumably have to be imported. The low value of NAGA at Ešnunna would seem to suggest a local substance rather than an imported one. The most likely reading of NAGA when associated with food is *samēdu*. The use of plant ashes as a salt substitute is a common one among poor people in many countries.

The use of a plant to produce a salt or alkali is recorded in the Neo-Assyrian period. This material (*kuddimmu*) was used by Shalmaneser I to scatter over the site of a conquered city. It was included in the provisions for Ashurnasirpal's feast at Nimrud and it was among the commodities given to the palace overseer for the chariot troops.

3.7.3 Sweetening agents

The main sweetening agents in Mesopotamia between c.3000 and 600 BC must have been syrups made from fruit, especially from dates, and honey. There is no evidence that sugar cane was used in the Near East at this period.

*Lîl*/*dîšpu* is usually translated as honey but this has been challenged on the grounds (a) that bees were not brought into Mesopotamia until the Neo-Assyrian period, when the Governor of Suhi and Mari, Šama‘-reš-šur, boasts of bringing bees from the north, and (b) that the similarity between *dîšpu* and *dibis* (the Arabic for date-syrup) is so great that they must have the same meaning.

There is evidence to suggest that *Lîl* can be used to mean both honey and any fruit syrup.

For its use as honey: In the Ur III period *Lîl* was imported by merchants and it was very dear — for example 19 Sîla *Lîl* was worth
7.5 shekels of silver.\(^{874}\) It was kept for gods and royal meals. Date syrup would have been a local preparation which would not have to be imported, and it would not have been expensive. At Mari, in the Old Babylonian period, \(\text{LAL/dinpu}\) was included in deliveries from Yamhad and Carcemish to the north of Mari.\(^{875}\) This northern origin makes the identification of \(\text{dinpu}\) with honey more likely than with date-syrup.

On the other hand, lexical lists record date-syrup \((\text{LAL.ZU.LUM.MA} = \text{di-nip sur-lu-pi})\)^{876} and grape-syrup \((\text{LAL.CEŠIN.MA} = \text{ina di-im-pi ka-ra-a-a-ni})\)^{877} From the Old Babylonian period 10 SILAS of \(\text{LAL}\) appear to be equated with 60 SILAS of dates,\(^{878}\) suggesting that in this reference \(\text{LAL}\) means date-syrup.

\(\text{LAL/dinpu}\) as a food

\(\text{LAL/dinpu}\) was provided regularly at Mari for the king's meals,\(^{879}\) although the quantities were usually small. It also occurs at Rimah.\(^{880}\) There it is included in a list of commodities such as dates, palm-trees, fats and vegetables. These products could have originated in many areas so that their sources cannot be used to identify \(\text{LAL}\).\(^{881}\) \(\text{LAL}\) was included in the temple offerings at Ur in the Old Babylonian period. A number of different varieties of \(\text{LAL}\) are given in lexical lists, such as \(\text{LAL.MES.KUR-e UD-u} - \) possibly white (or dry?) mountain \(\text{LAL}\).\(^{882}\) The following entry in this list is \(\text{GAB.LAL/kišbi dinbi} - \) beeswax,\(^{883}\) which suggests that the product \(\text{LAL}\) was taken as honey. Beeswax was in fact found on writing-boards at Nimrud confirming the existence of bees, at least in northern Mesopotamia, at this period.\(^{884}\)

As honey and date-syrup can both be used as sweeteners\(^{885}\) their use in cooking cannot be a guide to the identification of \(\text{LAL}\). However, the trade in \(\text{LAL}\) in the Ur III period, and its import into Mari from the north, the fact that varieties of \(\text{LAL}\) come from the mountains and the use of the word to describe beeswax, all suggest that \(\text{LAL/dinpu}\) means honey. However, it is possible, especially before the Neo-Assyrian period, that \(\text{LAL}\) was used simply to mean a 'sweetening syrup' whose specific origin was not considered important.

From the point of view of food, neither fruit-syrups nor honey provide
much more than carbohydrates to the diet. Their main use, apart from providing energy, is to add to the flavour and attractiveness of certain foods.

3.8 Wine

Wine is the fermented juice of the grape (Vitis vinifera) although types can be made from the fermented juices of other fruits.

Grapes can be made into wine can be grown all over the world between the latitudes of 50°N and 40°S. They require a hot summer, and rain falling mainly in winter and spring. The vine is very sensitive and excessive moisture or hot dry summer winds can destroy it. It will grow on many varieties of soil, preferring those which are heavy and retain moisture. Some of the best wines come from vineyards that have stony or gravelly soil. It is unlikely that the grapes grown in Mesopotamia would have produced wine of the quality of the great French wines, but there is no reason (given a climate similar to today's) why grapes should not have been grown there. In Iraq at the present day grapes are grown for wine in the Baghdad area and the vine is one of the main crops in Kurdistan where it is grown without irrigation. On the Assyrian plains grapes are grown with irrigation and vines are cultivated in all the southern regions. Grapes both for eating and for wine production are grown in Syria, Jordan, Israel, the Lebanon and Iran.

The vine itself is a bush or tree. The traditional shape of horizontal climbing branches associated with it is achieved by pruning. In commercial vineyards, in cooler and wetter areas, an acre can support 24,000 vines, while in the hotter and drier parts only 1700 vines are grown to an acre.

Briefly, wine is produced in the following manner: when the grapes are gathered they are placed in a vat, which normally possesses apertures through which the juice can flow. The grapes are then pressed - traditionally this is done by people 'treading' them. If
the wine is to be red, the stalks will be removed from the bunches and the grapeskins will be added to the juice. If white wine is wanted, then the stalks will be left on so that both the stalks and the skins can be separated from the juice before fermenting. Grape juice (the must) will ferment naturally. The wine yeast (Saccharomyces ellipsoideus) is present on the skin of the grape and acts on the sugar in the grape juice to turn it into alcohol. Fermenting will continue until a liquid containing 14% alcohol is produced. At this stage most if not all the sugar will be used up. However, the juice will still stop fermenting when the 14% alcohol is reached, even if more sugar is present. Differing colours and degrees of sweetness can be produced by controlling the amount of time the skins are left with the juice, by adding sugars or more alcohol, or by using special yeasts. The 'must' starts to ferment within forty-eight hours and the process is usually completed within five days. Depending on the type of wine required, it may be left to stand for a further period or it may be run off into containers. The kind of cask and the length of time which the wine is kept in it before bottling varies according to the quality of wine which has been produced. Several pressings may be made from the grapes and the grapeskins, and hydraulic presses are often used in the final pressings. The wine produced from the early pressings is superior in quality to that which comes from the final ones.

There is little evidence from Mesopotamia on the methods used to produce the wine, but there are various illustrations from Egypt which show some of the stages. From these it can be seen that the grapes were pressed by treading, and, as might be expected, this was an occasion of festivity. In one illustration the grapes are on a raised vat so that the juice falls into it and then runs out through funnels into lower vats. Another method of pressing the grapes was to place them in a cloth and then 'wring' it. This was done by attaching sticks to the ends of the cloth bag and turning them in opposite directions. Various types of these bag-presses were used. The bag-presses were used for the later pressings rather than the first. After fermentation which was apparently carried out in large pointed-bottom storage jars, the wine was filtered through cloth to remove the lees. The wine was stored in jars and different types of wine might be mixed together before drinking.
It seems likely that wine-making in Mesopotamia followed the same pattern which, as can be seen, is similar to that still used today.

3.8.2 Wine in Mesopotamia c. 3000 – 600 BC

The evidence for wine and grapes in Mesopotamia is mainly pictorial and textual. The word usually translated as wine, grapevine and grapes is (G1š) _TXTIN/karānu. 891

There are references to _TXTIN at Lagaš in the late Early Dynastic period. 892 In these, quantities of dates, 'apples', figs and _TXTIN are brought into Lagaš by different men. The 'apples' and figs are measured in NIG.DU.A and the dates and _TXTIN in SILLAS and GURS. These are probably the fruit grown in mixed orchards, and it is likely that in this context _TXTIN means grape. As can be seen, the fruit which is picked singly is measured in NIG.DU.A while the fruit which is counted in bunches is in capacity measures. It is not known whether these grapes were eaten, dried, or turned into wine. _TXTIN is included in a list of provisions for gods at Lagaš. 893 The other foodstuffs are flour, different sorts of beer, oil, fish, sheep and dates. _TXTIN are measured in KUR (= 2 SILLA) 894 as are the dates, so that it is probable that here too it should be read as grapes rather than wine.

Vineyards (G1š.SAR _TXTIN) are mentioned in Ur III Lagaš. 895 The text records the amounts of rations required for the workers labouring on different plantations and orchards. One of the vineyards is described as G1š.SAR _TXTIN (?); GU ipherals.GAL – vineyard on the bank (of the canal) 4BAUegra. 896 This suggests the possibility that the vineyard was deliberately planted on the levee, which, although it would add to the work of irrigation, would mean that the soil was well drained. Another suggestion that vineyards were planted on raised ground comes from the period of Gudea. 897 A connection between KUR (probably mountain) and _TXTIN suggests that vines were planted on raised areas, perhaps deliberately raised for this purpose, although the levees of the canals could also have been used as terraces. Again, there is no evidence for how the grapes were used.
Banquet scenes depicted on cylinder seals and plaques during the Early Dynastic III period show two ways of consuming liquid. In one, the liquid is sucked up through tubes, while in the other, the banqueter drinks from small cups which usually have wide mouths and straight flaring sides. While this may be the method used in drinking two different sorts of beer (see above, 3.1.4, 145-46), there is also the possibility that beer is taken through the tubes while it is another type of drink, perhaps wine, that is drunk from the cups. However, in view of the uncertainty of textual evidence for wine, this can only be a tentative suggestion.

By the Old Babylonian period, the presence of wine is clearly attested, especially at Mari. GŠTIN is described as being counted and transported in jars, and can therefore be safely taken to mean wine in this context. It was given or traded by Iarim-Lim of Iambil (Aleppo) and Alalahanda of Carcemesh. Wine was often brought down by boat through Mari possibly on its way to be re-exported to the south. The wine trade between Mari and the areas to the north may have been carried out by the Tur(Šš) Si-im-a-lu-um a nomadic group to the north of Mari. Jars of wine (karpat karšum) possibly representing the tax payable on this trade, were delivered to the cellar (ka-en-im) at Mari by these people. This wine-tax was also paid by individuals. As well as importing wine, however, it seems that it was also made locally as deliveries of wine from an estate at Terqa were made to the cellar. The wine industry was sufficiently advanced to make different types and grades of wine by this time. At least three are mentioned at Mari. Red wine (karšum si-mi-im), good wine (GŠTIN DUG.DA) and second-quality wine (GŠTIN US). Red wine was often mixed with the ordinary wine. For example one text states that a jar of red wine was to be mixed with 6 of ordinary wine, while another says that 40 jars of red wine were to be "emptied" into 52 jars of good wine. Wine from Terqa was sometimes described as second-quality wine. Wine at Mari may have formed part of the gifts made to important individuals: a text records the issue of wine, honey, turbans and clothing to such individuals as Supram of Susa — the clothing and turbans in particular were often given as presents to envoys. A reference to a delivery of GŠSTIN.FI.A together with leeks (karšu)
and reeds (qanu) at Larsa\(^9\) suggests that grapes continued to be
grown in the south, but again it is not clear whether they were
made into wine.

At Nippur, in the Kassite period, wine (GE\^TIN GAL) may have formed
part of rations issued to one of the king's servants, who was described
as 'not in residence' (a-rad LUGAL ù la a-Na-bu) - the issues were
probably either for his household while he was absent from Nippur or
for the servants and/or troops accompanying him while he was away.
The rations included barley, flour, beer and meat.\(^1\) GE\^TIN.GAL is
here identified tentatively as 'wine' as the list of foodstuffs does
not include other fruits.

The pictorial evidence for wine-drinking during the second millennium
is slight. A common theme of the cylinder seals during the Isin/Larsa
and Old Babylonian periods is the presentation scene of worshippers to
a personage. In many of these the personage is shown holding a cup in
one hand.\(^1\) These are mainly wide-mouthed with sides sloping down to
narrower bases, but they can also be shallow round-bottomed bowls. It
is not clear however whether these are intended to be 'wine-glasses'.
Vessels of these shapes are difficult to identify among the pottery
calved, but possible examples have been found at Nuzi.\(^3\) At Nuzi
can also be found the famous 'Nuzi-ware' chalices, which often have a
small pedestal foot and are finely decorated.\(^4\) These are almost
certainly drinking vessels and may well have been used for wine.

Wine had become a regular part of the diet by the Neo-Assyrian
period. Different varieties are listed in lexical lists\(^5\) - including
strong wine (GE\^STIN.ME\$ dan-nu), sweet wine (GE\^STIN.KU,KU) and
vinegar (GE\^STIN.ME\$ ka/hailu and GE\^STIN.ME\$ BIL.LA/mesu), and those
coming from different countries - such as Izalli, Hublunu, Haburum
etc.\(^6\) Skins of wine (KU\$ zi-qu \$a GE\^STIN.ME\$) as well as bunches
of grapes (GE\^STIN.KIN.GE\^STIN.ME\$) were included in the provisions for
Assurnasirpal's feast.\(^7\) Issues of wine were made as part of the
regular rations for personnel at the citadel,\(^8\) and it formed part
of the provisions for the army.\(^9\) Wine was used also as part of the
king's meals,\(^10\) as tribute,\(^11\) and in rituals,\(^12\) and grapes by
themselves were used as offerings.
The vine is frequently represented on reliefs in the Neo-Assyrian period. A relief of Sennacherib's shows his army advancing towards a city along a canal or river, and through neat rows of vine-trees and (probably) pistachio-trees. Another relief of Sennacherib's shows the army marching along and in a stream flowing through hilly countryside. Vines grow on the hills and along tributary streams. And vines and fig-trees grow on the hillside where Sennacherib receives the surrender of Lachish. The vine was also grown near Nineveh. It appears in the scenes showing the building of Sennacherib's palace and Assurbanipal's royal garden. (Fig.7) Tribute-bearers are often shown carrying skins, almost certainly containing wine, suggesting that wine was brought into Assyria proper from subject areas. Some of the tribute-bearers which are on ivory decorations for furniture, are thought to come from Syria or Media. However, not all skins carried by prisoners or attendants need necessarily have held wine. In a relief of Sennacherib's, prisoners led out from a southern city carry skins over their shoulders, and one gives a child something to drink from a skin. Elamite prisoners, captured during a campaign of Assurbanipal's, also hold skins, and a child is drinking from one. It is more likely that these skins held water, perhaps each prisoner's water-allowance for his journey.

Banquet scenes in Neo-Assyrian art show the participants drinking from shallow wide-mouthed bowls held in one hand. More elaborate drinking vessels include the bowl held by Assurbanipal's queen (Fig.7) and the famous 'lion-beakers' held by revellers at a banquet in a relief at Khorsabad. Pottery dishes which could have been used as the wide-mouthed drinking bowls have been found at Nimrud. More common vessels found at Nimrud are the istikans. Footed goblets (particularly in the 7th century) and fine Palace Ware beakers were also common. The quantities of liquid which could be held by these vessels varies. The wide-mouthed bowls hold around .2 of a litre, the istikans and goblets are very small; the istikans hold between .03 and .1 of a litre (average .06), the goblets between .06 and .15 (average .1). The beakers can hold between .22 and .78 (average .5). It is difficult to imagine the small istikans and goblets being used as vessels for quenching the thirst. They seem more suitable to be used
in the manner of tea-glasses or coffee-glasses in Iraq today, that is, to be sipped at gently at the end of a meal. They are unlikely 'wine-glasses'. The shallow wide-mouthed bowls, such as are shown in the pictorial representations, and the beakers, may have been used for this or for beer.

The remains of 4 grapes (Vitis vinifera) were found at Tell Taya, together with other carbonized material including barley grains, olive stones, a broad bean, a lentil, two grains of emmer-wheat and grass and weed seeds, in an oven dating to the Akkadian level VII. This indicates that grapes were eaten at this time, but not whether they were made into wine.

A grape pip was found at Nimrud dating to the 13th century while many uncarbonized grape pips were found in a well in the 'Burnt Palace' also at Nimrud (dating to the end of the 5th century - c.617-600 BC) with barley and green vegetables, underlining the textual and pictorial evidence that grapes were known and eaten during that time.

It can be seen from the above discussion that the evidence for the manufacture of wine and its consumption during the third millennium is slight, although it was apparently used in Egypt during this period. Grapes were grown in the south, especially around Lagaš, but were probably eaten raw as fruit or dried as raisins. During the second millennium wine was imported and produced at Mari and the Nuzi-ware chalices suggest that they were made for the drinking of wine - although this is only a supposition. By the first millennium wine was a common drink, rivalling if not overtaking, beer. This is particularly so under the Assyrians, and the reliefs show that the vine was grown on the hillsides and at Nineveh. Sargon II was impressed by the quality of the vines during his Eighth campaign, in Urartu, and grapes are shown among the fruits being carried to Sennacherib's feast. (Fig. 40)

The evidence for wine during the Neo-Babylonian period suggests that it was also a common drink in the south of Mesopotamia by this time. A kudurru dating to the reign of Nabonidus, commemorates the importation of wine, the drink of the mountains, into Babylonia, after a drought which may have destroyed the local vines.
3.8.2 Distillation

There is little evidence for the use of distillation in the manufacture of alcoholic drinks in Mesopotamia 3000 - 600 BC. Pottery, tentatively identified as distillation and extraction vessels, was found at Tepe Gawra dating to the mid-fourth millennium. These vessels have a channel running round the rim of the outside of the rim. In some cases the outer channel is connected with the body of the pot by one or more pierced hole. In these examples it is thought that the material to be treated was placed in the channel while water or a volatile oil was boiled in the vessel, over which a lid would be placed. The steam would condense against the cooler lid, run into the trough and extract the desired ingredient from the raw material, which would then drip through the holes into the body of the pot. In those vessels which did not have a connecting hole, the condensed steam would collect in the channel and would be removed (by scraping or with a spoon or ladle) when the channel filled up. Later vessels with channels round the rims are rare. One was found at Rimah, from the mid-second millennium. This was decorated with a ram's head, and had a spout from the channel inwards to the body of the pot. It has been suggested that this could have been used for oil-ovens, with the body of the pot filled with water, and oil running in the channel. The oil would drip through the spout onto the water and the configurations would then be interpreted. But it could also be used as an extraction vessel in the way described for the Tepe Gawra vessel. Fragments of another channelled double ram bowl were also found at Rimah, dating to level I. The textual evidence indicates that extraction, and distillation techniques were used for the making of perfumes but it does not seem that this technique was utilised in the preparation of alcoholic drinks. In view of this it is probably best to assume that only fermented alcoholic drinks were consumed.
When considering diet it is necessary to know more than what range of foods are available for consumption. It is necessary to know what is actually eaten and by whom and, if possible, in what quantities. When this has been established the qualitative and quantitative nutritional value of the diet can be assessed. In this chapter it is proposed first to consider what constitutes an adequate diet - and then to discuss the food eaten in different levels of society and the nutritional value of the diet. The levels of society for this purpose have been divided into two: the 'aristocracy' as represented by the kings and gods (including their households and functionaries), and the ordinary men and women represented by those receiving rations and maintenance from religious and secular employers, either as wages or as total maintenance. There is little evidence for the food of those levels of society which lie between the 'aristocrat' and the ration-receiver, and they have had to be largely ignored. It may be supposed that they were a little better off than the ration-receiver and worse off than the 'aristocrat'.

4.1 The nutritional value of the diet: general considerations

An adequate diet is one which enables the individual concerned to live a healthy, active life. The human body is composed of varying amounts of protein, fat, carbohydrates, water and minerals which not only form the essential structure of the body and its reserves, but provide the energy required for its functioning, including the mechanical action of the internal organs (such as the heart, lungs, digestive tract) and the maintenance of body temperature. The energy turnover of vital body functions is called the 'Basal Metabolic Rate' but over and above this, energy is required for all activities performed. Many studies have been carried out to determine man's energy requirement and it has been found that this varies according to age, sex, height and weight, climate and environment, and physical activity.
Tables have been drawn up expressing the recommended daily intake of energy. The Food and Agriculture Organisation (FAO) of the United Nations produced a set of tables based on a 'Reference Man' weighing 65 kg, whose activities were those of a normal Western worker engaged in fairly active employment.\(^2\) His energy requirements were given as 3200 Calories a day. Adjustments have been made for different types of communities according to body weight and temperature,\(^3\) for instance the FAO adjustment to African conditions gives a requirement of 2707 Calories per day. At present it is not possible to calculate the height and weight of individuals in ancient Mesopotamia, although the texts often give details about the sex and approximate age and type of occupation in which the individual is engaged.\(^4\) The United States Department of Agriculture, in a study on food balances in foreign countries, gave 2255 Calories per day as the average energy intake in Iraq,\(^4\) which may form a standard with which to compare the intake in ancient Mesopotamia.

The main sources of energy are carbohydrates, fats and proteins. Carbohydrates provide most of the energy in all human diets - this can amount to 90% of the diet of the poor in the tropics.\(^5\) The main sources of carbohydrates are cereal grains, although in many societies nowadays sugar provides an important source. It is difficult to say what the minimum requirements for carbohydrates are. The store of carbohydrate in the human body (1 kg) can be replenished by synthesis from the reserve of protein, and it is possible that carbohydrate is not an essential part of diet if other sources can provide the energy requirements.\(^6\)

Fats\(^7\) can provide 35-45% of the total energy in a prosperous country but only 15% in a poor one. However, although no precise recommendations can be made about the amount of fat necessary, it has been considered that at least 20% of the energy requirements should be supplied by fats.\(^8\) From the point of view of diet the term 'fats' includes dairy products such as butter and ghee, and fats rendered from pigs, sheep and cattle as well as oils from fish and plants. There is also a percentage of fat in the meat from animals.

Fats are made up of a number of fatty acids which differ from each other chemically. They can be divided into three types: saturated
fatty acids and unsaturated fatty acids and polyunsaturated fatty acids with two or more double bonds. Fats consisting mainly of saturated fatty acids are solid at room temperatures - these are mainly the animal fats, whereas those consisting mainly of unsaturated fatty acids are usually liquid - these are the vegetable and fish oils. The polyethenoid acids have been referred to as 'essential fatty acids' and are important for growth. The most important polyethenoid acids are linoleic, linolenic and arachidonic, the first two of which occur in vegetable oils. Arachidonic acid can be synthesised direct from linoleic and linolenic acids. At the present time much research has gone into the amount of cholesterol, a substance present in all foods of animal origin, consumed by people because of its association with atherosclerosis and heart disease. A correlation between the consumption of fats, and the incidence of heart disease has been found particularly in prosperous countries with a high intake of fat, especially of animal origin. It is probable that the level of fat consumption in Mesopotamia was insufficiently high to be a dietary concern.

Protein (a gram of which provides about 4 kcal of energy) provides between 10 and 15% of the energy value of a well-balanced and prosperous diet. Every cell in the body is partly composed of proteins which have to be constantly replaced, and protein in the body, unlike the carbohydrates and fats, can only be replaced by protein in the food. The minimum requirements for an adult as given by FAO are 48 gms per day or 6% of the energy intake. However, this has been reckoned a very low figure and not one which can be considered as a 'recommended intake' and it is better to assume that protein should provide about 10% of the energy intake. The figure of 10% covers the protein required for growth, tissue synthesis etc, as well as the production of energy. If the energy requirements are being met from other sources a smaller amount of daily protein would be required.

Proteins are made up of about 20 amino acids which are arranged in a varying number of sequences and proportions, so that thousands of different proteins are formed. The human body can convert some amino acids into others but this ability is restricted and there are eight which the body cannot make and which are essential to maintain its
equilibrium. These are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Histidine is also required for growth in infants. Certain proteins are deficient in one or more essential amino acids and such amino acids are referred to as the 'limiting' amino acids. Lysine is the limiting amino acid in wheat, methionine and cysteine (which contain sulphur) in beef and tryptophan in maize. The limiting amino acid must be obtained from another source. Proteins from animal sources are sometimes referred to as first-class proteins while those from vegetable sources are called second-class. This is because animal proteins contain more of the essential amino acids and usually have a higher nutritive value, and the vegetable proteins are less biologically complete. However, a mixed vegetable diet - for instance wheat and legumes, which are rich in lysine - can provide all the amino acids in adequate amounts.

An adequate diet must also include specified amounts of vitamins, minerals and some trace elements. Vitamins are organic substances which the body must have in small amounts for its metabolism but which it apparently cannot make for itself in sufficient quantities. They are referred to both by a letter, and by a specific name, but the latter is really only correct when the vitamin consists of a single chemical substance. There are two main groups of vitamins: the fat-soluble vitamins including Vitamins A and D, and the water-soluble vitamins such as Vitamin C, and the Vitamin B complex including Nicotinic Acid, Riboflavin and Thiamin. Only those vitamins whose main sources are dietary will be discussed in any detail.

Vitamin A (Retinol) 16

This vitamin is particularly important for the eyesight and its deficiency is the cause of most of the total and partial blindness in the Near East. Children under five are particularly affected. The main dietary sources of Retinol are milk, butter, cheese, egg yolk, liver and some fatty fish. Carotenes, which can be converted (albeit not completely) into the vitamin in the body, are found in green vegetables and yellow and red fruits and vegetables such as apricots and carrots. It should be noted that when ghee is made from butter some of the Vitamin A is destroyed, but this is still a good source. The body stores retinol in
the liver and in a healthy individual this may be sufficient to meet requirements for a number of months or even years with no further intake. Because of this the recommended intakes are difficult to establish; but 750 micrograms of retinol equivalents per day for adult men and women are recommended.

**Vitamin D (Cholecalciferol)**

This vitamin is necessary for bone formation. It promotes the absorption of calcium and phosphorus from the gut and has a direct effect on bones and kidneys. Deficiency in children leads to rickets, epiphyses of the long-bones and ribs fail to calcify, while in adults the bones may start to decalcify. There are few foods rich in this vitamin and these include fish-liver oils, eggs and butter. The main source for Vitamin D is the action of ultra-violet on the skin. The recommended daily intake is 10 micrograms for young children and 2.5 micrograms for adult men and women. In tropical communities rickets are mainly caused by covering children and keeping them from the sunlight.

**Vitamin C - Ascorbic Acid**

This vitamin is necessary for the proper formation of intercellular substances which binds the cells together in the capillaries, bones, teeth and connective cell tissues. It is also necessary for proper wound healing. Deficiency can lead to scurvy, the symptoms of which include haemorrhaging of the joints, muscles and gums, and anaemia. Vitamin C has a limited distribution and it is also easily oxidised and lost during cooking, especially if the food is cooked in water which is thrown away. The main sources are citrus fruits, currants, fully grown green vegetables, fresh liver, kidneys and offal. Dried cereals and pulses contain no Vitamin C but they form the vitamin on germination, so that sprouted grains and pulses are a valuable source of ascorbic acid. The FAO has recommended that 20 milligrams per day for children and 30 per day for adults are necessary.

**Thiamin (Vitamin B₁)**

This vitamin is concerned in the metabolic breakdown of carbohydrates and is stored in the heart, brain, liver, kidneys and skeletal
muscles. Deficiency can lead to beri-beri, a disease which takes two main forms: dry beri-beri leading to a wasting of the muscles, emaciation and neurological symptoms, and wet beri-beri which causes oedema (swelling) of the legs, face, body etc, cardiac problems, anorexia etc. Beri-beri is particularly associated with the rice-growing cultures of the Far East. The richest food sources for thiamin are the germ of the cereals, nuts, pulses and yeast while all green vegetables, roots, fruits, flesh and dairy produce (except butter) contain the vitamin. It is not found in butter, animal fat or vegetable oil, as it is not a fat-soluble vitamin. Milling of cereal grains reduces the thiamin content, but high extract flour loses less thiamin than the whiter low-extract flours. Native beers are a good source and if cereals are parboiled or steamed before milling the thiamin is more tightly held. Thiamin is water-soluble, so cooking losses are severe and about 25% may disappear in the cooking of an ordinary mixed diet. The recommended intake is 1.2 milligrams per day for an adult man, .9 milligrams for an adult woman.

Nicotinic Acid (Niacin) and Nicotinamide

The disease caused by the deficiency of Nicotinic Acid is pellegra. This is associated with people whose main staple is maize. Nicotinic acid is present in maize and some other cereals such as sorghum, but in a bound form which cannot be released by the human body.

Other wholemeal cereals such as wheat are good sources of nicotinic acid, as are pulses, meat and fish, nuts, native beers etc. In addition the body can synthesise nicotinic acid from the amino acid tryptophan (60 mg of tryptophan are needed to replace 1 microgram of dietary nicotinic acid). Thus eggs and milk, which although poor in nicotinic acid are rich in this nicotinic acid equivalent, may be useful supplementary sources. Nicotinic acid can be lost in the cooking water, and about 15–25% of it may be lost in a cooked mixed diet. The recommended intake is 19.8 micrograms per day for an adult man, 14.5 micrograms for a woman.
Riboflavin \((B_2)\) 22

Riboflavin is essential for the functioning of cellular respiration and is involved in tissue oxidation. Surprisingly its deficiency causes only minor problems and does not appear to incapacitate. The best sources are liver, milk, eggs and green vegetables, but cereals are poor sources. Most methods of cooking do not destroy the vitamin, except for the losses in the cooking water. However, if the food is exposed to sunshine large losses do occur. Recommended intakes are 1.8 micrograms per day for an adult man, 1.3 micrograms for a woman.

Some vitamins are important in the prevention of anaemia: these include \(B_{12}\) (Cyanocobalamin) and folic acid. \(B_{12}\) is only found in animal products such as liver, eggs, muscle meat and milk. None occurs in plants unless they have been fermented by micro-organisms. No recommended intake can be made and apparently healthy people may get only .5 micrograms per day. However, it is suggested that a larger daily intake of about 3–4 micrograms is safe. Folic acid is found in green vegetables, liver and beef, wheat flour, and eggs. Milk, fruit, mutton and poultry are poor sources. The intake recommended by the FAO is 200 micrograms per day for adults.

A number of minerals and trace elements are essential for the proper functioning of the body. These include:

Calcium (Ca) 25

This is essential for the functioning of muscles and nerves, for the maintenance of the skeleton and for growth in childhood and youth. Milk and dairy products form a rich source, but it is also present in most foods. The present recommended intake is 500 micrograms per day for an adult, but the body can adapt to much lower calcium intakes.

Iron (Fe) 26

This is an essential component in the processes involved in the transfer of oxygen. A deficiency of iron can lead to anaemia. Anaemia during pregnancy will cause the infant to have a low store of iron and it will develop anaemia during its first year. Anaemia from iron-deficiency causes fatigue, breathlessness etc, and leads to
ill health and weakness. The FAO recommended daily intake for men is 5–9 milligrams while women require 14–28 milligrams as their losses are much higher. Unless the women have a diet which has 10% or more of its energy from animal foods, this recommended intake will not be met without supplementation. Good sources are meat, poultry, fish, whole grain, green and yellow vegetables, peaches, apricots, grapes, prunes and raisins (if eaten often). Normal mixed human diets of good quality contain 12-15 micrograms of iron.

Sodium Chloride (NaCl) 27

This is required for proper muscle and nerve function and to maintain the acid base balance of the body. 90% of the intake of Sodium Chloride is excreted in urine, while some is lost in the faeces and in the sweat. In hot climates more salt is required as the losses during sweating are greater. A loss of 14 grams of salt has been recorded in one day during physical labour in the tropics. 28

Potassium (K) 29

Potassium is required for the acid base regulation, for the synthesis of protein and for muscle and nerve functioning. Almost all foodstuffs contain some potassium, although sugar, fat, refined cereals and eggs and cheese are poor sources. It is thought that in healthy people on a normal diet the intake of potassium is about 60 mEq/24 hours. 30

Iodine 31

Iodine is an essential part of the thyroid hormones which have important roles in metabolism of body cells. If the thyroid secretion is deficient this alters the basal metabolism of the body, circulation is reduced and the pace of the person's life slows down. If the supply of iodine is deficient, the thyroid gland tends to enlarge — a condition known as goitre. If the goitre becomes very large it may interfere with breathing. Although there are other factors effecting the development of goitre the deficiency of iodine is probably the main one and it can be used in the treatment of the condition, at least in the early stages.
Goitre is more prevalent in certain areas: these include isolated regions where the water in common use comes from wells or springs originating in limestone, and areas where there is poverty, poor sanitation and poor water supplies. Mountainous areas may be 'goitre-prone'. Goitre was found to be prevalent in Iraq, after studies made in Northern Iraq and in the Baghdad area in the 1960s. In a study of subjects comprising school children, school teachers, industrial workers etc, it was found that in Mosul 26% of the males had goitre and 49% of the females. In Tell Afar 34% of the males and 50% of the females were affected, and in a number of school children examined in Baghdad, 6.4% of the boys and 18% of the girls had some signs of goitre. The goitre in the northern areas, especially in the Mosul region, is due to iodine deficiency as the iodine in the water supplies is low. The results found in Baghdad were unexpectedly high.

The above list of essential nutrients is not complete: the body also requires small amounts of phosphorus, magnesium, sulphur, copper, manganese, zinc etc. With most of these, deficiency diseases, although found in animals, have not been recorded in humans, and it is believed that the amounts required can be furnished by a diet containing adequate supplies of the main essential nutrients. One exception is zinc; low levels of zinc in the blood were found in parts of Iran in children who suffered from severe anaemia, enlarged livers and spleens, who were failing to grow and were sexually immature. Their diet was found to be poor; they had little protein, and consumed mainly unrefined wheat flour containing a high amount of phytate which reduces the absorption of zinc.

4.2 The qualitative and quantitative nutritional values of the ancient Mesopotamian diet

The main sources of evidence for the food actually eaten are the cuneiform texts which give details of offerings made to the gods, food provided for the kings' meals and rations issued to employees. Some information can also be obtained from cylinder seals (for instance the banquet scenes), plaques and reliefs. There is also some palaeobotanical and palaeozoological evidence for food which formed part of meals.
Before discussing what the different levels of society ate, some consideration has to be given to the number of meals taken a day and the manner in which these meals were eaten, in order to give a full picture of the diet.

4.2.1 How many meals a day?

The evidence for the number of meals a day is somewhat sketchy. In a group of texts from Early Dynastic III Lagash, dealing with food provided for gods at various festivals, there seems to be only one issue of food per day per deity, and in fact each recipient does not receive food on every day. For example, in the ritual connected with EZEM.MINU.KU (Urukagina Year 2) the issues of food continued for four days. Ningirsu received food on days 2 and 3 while Ba’u received something on all four days. However, these discrepancies may be due to differences in ritual or to the fact that the supplies for the other days came from a different establishment and were therefore not recorded in this group of texts. A text from Ur, dating to the Ur III period, records evening drink and meat offerings at Dur and E-Nammar. This very slight evidence suggests only one meal a day, probably in the evening, but this is by no means conclusive.

During the Old Babylonian period at Mari, there is evidence for two meals a day. This can be found in the administrative tablets listing the different foodstuffs provided for the king’s meal (NIG.DU LUGAL/naptan Garrim). These tablets are of two types: one is a sort of daily record giving the details of food issued for one particular day, and the other, a monthly (or periodic) accounting of the same thing — often giving grand totals of each category of food at the end. This 'double book-keeping' often helps to date the tablets as the daily records nearly always have the day, month and year, but the periodic ones often only mention the day and month. Thus when the amounts on a number of daily records correspond with those in a periodic one (provided the dates and month are the same) it is safe to say they are from the same year.
In the majority of cases in the periodic texts there is only one group of foodstuffs issued per day, but occasionally there are two entries for one day. For example, on one tablet there are two entries for the 17th Malkanum and this does not seem to be an error on the part of the scribe as there are entries for the 16th and 18th also. The first entry for the 17th corresponds with a daily record dated to 'The year when Zimri-Lim dedicated the statue of the god Hatta'. The periodic tablet is a record for the month of Malkanum from the 1st to the 18th and states this at the end of the tablet.

On occasions there are two records dated to the same day, month and year, differing only in the amounts and sometimes variety of foodstuffs listed. This suggests that there were two meals on that day. If a monthly record exists for the day involved, generally speaking only one of the daily records is reproduced in it. It seems possible that daily records were made for both the meals a day but that either only one was double-entry recorded in the monthly record or that two separate records were kept a month for each meal. It is probable that one meal was eaten in the morning and the other in the evening. A text which seems to be a list of birds and fish ends with the phrase 'meal of the night' while two other texts list food for the 'morning meal' and the night meal.

The Assyrian kings also appear to have had two meals a day. In a letter Esarhaddon is asked why food has not been served before the king a second time that day as fasting confuses the understanding. And morning and evening meals were offered by Assurbanipal to Marduk on that god's return to Babylon. A ritual text from Warka in the Seleucid era gives detailed instructions about the numbers of meals to be offered the gods every day. The colophon of this text shows it was part of a group of ritual texts which originated in the time of Nabopolassar, king of the Sealand and founder of the Chaldean Dynasty of Babylon. A large and small meal is to be offered the gods every morning and every evening. It is probably better to take this to be one morning and one evening meal, consisting of two courses each - rather in the manner of 17th-
18th-century English dining, when a meal was described by the number of 'courses' each of which had many similar sorts of dishes. The 'courses' of these two meals consisted of the same type of dishes only distinguished by the quantities involved. The morning meal was larger and more varied than the evening one.

By and large the evidence suggests that two main meals were eaten by the rich a day, at least from the Old Babylonian period onwards. The evidence available for the earlier periods is insufficient from which to draw conclusions.

Little can be said about the number of meals eaten by the ordinary people. It is possible that they were similar to the country people of the present time. When in Riyadh in Saudi Arabia, Philby had morning tea with flat bread, a large breakfast with mutton and rice and many subsidiary dishes and a dinner, which was usually a replica of the breakfast. These were of course the meals given to a guest of Ibn Saud. But on his journeys he recounted stops for at least breakfast and an evening meal, and Musil said that the Rwala Bedouin had two meals - a light one before midday and a main one after sunset. It seems likely that the ordinary people of ancient Mesopotamia followed a similar type of pattern and had a morning and an evening meal.

4.2.2 Table manners

The manner in which people eat and the tools they use can provide information about the type of food taken. For example, if there are no vessels in existence it is less likely that people ate soup as there would be nothing to hold the liquid!

A common theme on cylinder seals, plaques and reliefs is the banquet, and an examination of these scenes can reveal changes in the style of eating over the years.

For the purposes of this discussion any religious or symbolic aspect of these scenes will be ignored, nor will any attempt be made to decide whether the figures represent royalty or deities. Only the manner in which the food is served will be examined.
The banquet scene is a common one on cylinder seals and plaques from the Early Dynastic III period. Two cylinder seals from Pu-abi's grave (PG/800) at Ur illustrate this. Both have two registers. One, in its upper register shows two figures seated on low-back chairs, on either side of a large vessel. They are drinking from the vessel through curved tubes. Seated with his back to one of these figures is a third person who is drinking from a triangular cup. He is attended by a servant. In the lower register, a servant attends a figure with a cup while another servant is carrying a spouted jug to another seated figure. In the middle of this register is a large 'side-board' laden with what appears to be food. It is difficult to identify the dishes, but a leg of some animal seems to be included. The second Pu-abi seal has a similar picture. (Fig.42) In the upper register are two figures seated on stools, drinking from small cups. They are each attended by a servant. A third servant waves a flag-shaped fan. In the lower register, a seated figure, with a cup, is attended by one servant while a second one stands behind holding a cup in one hand and a ring-handled vessel in the other. A third servant stands by a side-board which has food on top. The scene is completed by some musicians.

Yet another seal from Ur also illustrates the banquet. The upper register shows two seated figures, drinking from cups, and each with a servant. A third servant stands watching in the background. In the lower register, one servant stands with a spouted vase in one hand and what may be a cup or a piece of food in the other. Two 'overseers' with batons watch while other servants appear to queue at the side-board on which are two cups, four loaves of flat-bread (probably) and the leg of an animal. This method of serving, whereby a servant brings the food to the eaters, can be seen on plaques from the same period. The 'Peace' side of the Royal Standard of Ur shows a number of seated figures. Two, larger and presumably more important than the rest, have a servant each, while one servant waits on six others. (This one may represent more.) Each of the seated figures holds a small cup. The servants appear to be handing pieces of food to the eaters. The middle and lowest registers show cattle, sheep, goats, fish and other items apparently being brought for the feast. A votive
plaque from Khafajeh\textsuperscript{53} has a similar theme. In the top register there are two seated figures. One holds a cup while a servant waits in front, but the second figure is in the act of taking a cup or dish from his servant. A musician plays while a third servant stands at the back holding a vessel and another object. The middle register shows more servants apparently bringing animals and foodstuffs for the feast.

Two other plaques can be cited in illustration. On one, a fragment from Susa,\textsuperscript{54} in what is probably the middle register, one servant is holding two cups, which a second servant is about to fill with a dipper from a larger vessel. A third servant stands behind holding a tall vase (perhaps to add to the large vessel). The other plaque is from Tell Agrab.\textsuperscript{55} In the top and middle registers, seated figures hold cups in their right hands. In their left hands they hold large leaves, possibly as fans. One servant is shown on each register. Also on the middle register is a figure seated before a large vessel. It is not clear whether a tube is coming out of this.

From all this it would seem that during the Early Dynastic III period, those taking part in a banquet were brought the food by the servants. In the second cylinder seal from Pu-abi's grave, the lower register shows a seated figure with two servants. One is holding a cup and a vessel, while the other appears to be holding a dish up towards the eater's mouth. It would seem that the servants collected the food to be eaten, from the side-board, and brought it in a dish to the person he attended. The eater must then have had to scoop up the food with his fingers (or possibly a piece of flat-bread provided by the servant). A servant may have cut up the pieces of food into bits which could be taken up with the fingers, or the eater may have kneaded the food into mouth-sized lumps. Drink was also handed over in cups by the servants or drunk through tubes.

After the Early Dynastic III period, the banquet scene is seldom used to illustrate cylinder seals and plaques so that there is less evidence for eating habits in the Agade period. But some seals do show food offerings to the gods.\textsuperscript{56} In these the god is usually seated, with
a stepped 'altar' or table in front. On the lower step is a small vessel from which smoke or steam arises, and on the top step a sheep's head or other piece of meat is set on a pile of flat bread. (Fig.23) Sometimes a subsidiary deity pours a libation out at the foot of the seated god. If one can take the presentation of the food here as representative of what happens in ordinary life, then it would seem that people sat near the food to be eaten and perhaps at a table, and that it was served, as in Bedouin feasts today, with a pile of bread crowned with joints of meat. In another example (Fig.43) the diner is seated at a true table but is still attended by servants who probably hand him his food. There is nothing on the table so that the food must be served as in the Early Dynastic period.

Another cylinder seal dated to the Agade period, shows a figure and a snake-god seated on either side of a table, on top of which is some flat bread. Both figures have small discs, possibly cups, in their right hands. One servant attends them. Other Agade cylinder seals show a figure and a snake god with a table between them on which is some flat bread (?) and flames, probably from an incense burner.

The use of a table set before the person eating continues in the Ur III and Old Babylonian period. At Nippur two cylinder seals, whose main theme is the presentation to a personage, show a seated figure in front of whom is a small table. What appear to be loaves of flat-bread are set on top of the table. Scenes of this type are a common seal illustration at Susa and continue into the mid-second millennium. The design has a seated figure with a cup, in front of whom is a table with a duck or fish on top. (However, in a Mari wall-painting from the Ur III period a goddess is shown handing a bowl to Ishtar, so that the method of serving whereby servants brought the food to the eater was still in use then.)

At the end of the second millennium, from Susa, comes a fragment of a relief (dated to the 13-11th centuries) which shows a woman holding a spindle, seated at a table on which is set a large fish and fruit or bread. (Fig.44)
Food continued to be served from tables in the first millennium. A Neo-Assyrian relief of Ašurnāṣirpal dedicating his bag of lions to the gods shows the four bodies lying in front of an elaborate table on which two cloths have been laid. On top of the cloths is a pile of what seems to be bread, a bowl with a leg and a jawbone piled inside, and a small box. This method of presenting food also appears on cylinder seals from this period. On these, the table is usually placed before a seated king or deity who is holding a cup or dish. The shape of the table varies but the two cloths seem fairly constant. The food on the table sometimes consists of a bird, or fish, or a bowl, a box and some pieces of bread. Unfortunately in many cases it is not known what is in the bowl or box. Similar scenes appear on Assyrian reliefs of camps.

Two funerary stelae from Zinjirli, dated to the 8th/9th centuries BC, illustrate people eating a meal. In the slightly earlier one, a man and a woman are seated at a table on which there is a curved loaf of bread and a fish. The second stela shows a seated female, with a servant; the table has a curved dish with bread, fruit and a small fish in a dish. The woman is holding a bowl. Some ivory panels from Nimrud also show women eating at tables, apparently set in the trunks of trees. Here the food offered is curved flaps of bread plus a bowl which may contain wine. One female holds a plant of some sort in her hand while on another panel the female holds a lotus (?) fruit.

A relief and an ivory panel show groups of men seated at tables. In the relief four men are seated on stools, two on either side of a table. On the table is a cloth on which is set a curved object and some bread (?). The men are holding very elaborate lion-headed beakers. There does not seem to be any servant, but the background is rather obscure. On the small ivory panel from Nimrud three tables are depicted. At the first, seated on a chair, is the king holding a small dish. He is alone at a table and is attended by a servant who holds a fan in one hand and a long-handled dish in the other. At the next table four men are seated, two at each side. At least two of them are holding dishes. A servant stands at the table with a piece of something in his hand. Not all of the third table remains.
What there is shows two men seated at one side, one holds a tall beaker and the other a long-handled ladle-like bowl. Behind the king’s table is a pot-stand in which three small narrow-necked jars are set. A servant stands fanning them. The contrast between these two scenes is obvious. On the relief, the foodstuffs (unless they are in fact ritual objects as sometimes suggested) are set before the eaters, while on the ivory panel there is nothing but a cloth on the tables, and each table has a servant presumably bringing the food to it as required.

Other scenes connected with feasts are the reliefs showing foodstuffs being brought for a banquet of Sennacherib’s. Here different items are being carried by attendants. They include locusts on sticks, birds and hares, trays of fruit including pomegranate, grapes, figs, ‘melon’ (?) and dates, and sheep etc. (Figs. 34, 40 and 41) The birds and sheep are certainly alive, so that these items are the foodstuffs brought in to be prepared, rather than being those actually served for eating.

But the relief illustrating Ashurbanipal and his wife eating in the Royal Park at Nineveh does show trays of food being brought in for an actual meal. Ashurbanipal is lying on a couch, with one elbow resting on the back, while his wife is seated in a high-backed chair (Fig. 7). A table is set beside the couch. On the table is a pile of bread (?) set on a bowl, a small-footed dish, and a box. Both the king and the queen hold dishes in one hand and what seem to be flowers in the other. The pair are fanned by four servants. Other servants are standing behind the queen with plates which they are fanning (possibly to keep the flies away). One plate has a footed-bowl and a covered dish, while the other has two rounded objects on it. Another relief may be connected with this Royal feast and shows Elamite princes and Assyrian attendants carrying vessels and trays of dishes presumably to Ashurbanipal’s table. Sadly it is impossible to say what is in the dishes. One can only imagine that they are the result of preparing similar foodstuffs as those brought for Sennacherib’s feast, or listed on Ashurnasirpal’s stela. The dishes appear to have been brought forward to a table a few at a time. The footed bowls and boxes may
have contained portions which the king and queen picked up and ate. The servants were available to remove the used dishes, and hand the couple new ones, or their drinking vessels, as desired.

There is little pictorial evidence for the eating manners of the ordinary people. Some reliefs from the Neo-Assyrian period showing Elamite prisoners at a meal may portray this. In these scenes the prisoners are seated on stones or low stools around one main vessel, into which they reach. Many of the prisoners hold a skin or sack which probably contains their water supply. The contents of the vessels cannot be surely identified, but two different items seem to be involved. In one relief the food appears to be divided into individual portions - perhaps measures of bread for each person.\(^7\)\(^5\) (Figs. 48 and 49) While in other reliefs the men are dipping their hands either into rounded piles of food or right into the vessels.\(^7\)\(^6\) (Figs. 50 and 51) These may be food which can be moulded together and conveyed to the mouth by hand. One of the scenes shows a man supping from a bowl.

Other Neo-Assyrian scenes\(^7\)\(^7\) show columns of Elamite prisoners being marched away after capture. Almost all the prisoners carry two sacks or skins. One is usually carried over the shoulder while the other is held in one hand. It seems probable that the sack held on the shoulder contains the prisoner's rations of flour, barley etc, while the other skin holds water. One man can be seen giving a child a drink from such a skin.

The greatest change in the serving of food comes at the end of the Early Dynastic III period. During this period, diners were brought the food by servants from side-boards. But with the Agade period, tables on which the food was set began to be used, and this way of presenting food lasted through into the first millennium. During the Neo-Assyrian period servants are again represented as bringing the food to the diners, but this time it was often set on the tables as well. The evidence from cylinder seals for the late third and second millennia suggests that one main dish was served - for instance meat on top of bread - but the lists of foodstuffs for the king's meals at Mari (see below, pp.259-64) suggest that a variety of side dishes were provided as well. By the Neo-Assyrian period there is a variety of dishes,
especially in the royal feasts. Only one or two dishes are set before the figures on the funerary stele, or ivory plaques, or on the tables for four mentioned above. The lack of any indication of knives or spoons suggests that the servants or cooks must have prepared the food so that it could be either scooped up with the fingers and conveyed to the mouth or torn off in pieces (such as bread or pieces of meat) and dipped in relishes or other side dishes for flavours. The flat-bread could have been used as a spoon. The fact that many diners held a cup in one hand and a 'flower' in the other suggests that only one hand may have been used for eating. But the evidence is slight and too much should not be made of it.

4.2.3 The 'Aristocracy'

The evidence for food provided for kings and gods is presented under the heading 'The Aristocracy' on the assumption that (a) the meals provided for the kings and gods would be much the same as the meals provided for the families of wealthy and leading citizens, and (b) the food given to the gods was shared later among priests and other high functionaries.

Before proceeding with the discussion, it must be stressed again that no religious or symbolic aspects of any of the meals provided for kings or gods will be dealt with, and only the sort of food and the range of dishes will be considered.

There is a certain amount of evidence indicating that the food offered to the gods was later used by the priests etc. In the Old Babylonian period a group of texts gives details of quantities of food-stuffs, including animals brought for slaughter, which were distributed among the functionaries in the temples - certain items were set aside for the gods and the rest were allocated to the temple personnel. Similar allocations of offerings can be seen in the Neo-Assyrian period. In texts dealing with the procedures connected with the cult of Anu/šur there are many references to temple employees. Unfortunately some of the tablets are damaged, but there are specific references to the meal of the cook and the steward (nap-tu-nu Ea LÚ.MU LÚ.ŠE NINDA) and to
the cook and the king's scribe having the use of what would seem to be parts of the offerings. Another text from Nineveh includes instructions made by various kings about the numbers and quantities of offerings for temples. Many of these offerings are specifically allocated to particular priests and some appear to have been destined for the royal households. The text probably dates to Sennacherib and records offerings decreed by some of his predecessors.

A kudurru dated to the reign of Nabu-aplu-iddina shows that the situation was similar in the south of Mesopotamia. The kudurru records the re-endowment of the Šamaš temple at Sippar, the installation of the high priest and the establishment of suitable offerings, and instructions are given about the division of the offerings among the priests and other officials.

From the above it can be seen that the priests and other temple functionaries received the foodstuffs that were offered to the gods, at least from the second millennium, so that it is reasonable to take the meals of the gods as patterns for the meals of mortals.

4.2.4 'To set before the King'

Here will be considered the different types of foodstuffs provided for the kings' meals or included in offerings to the gods, and their qualitative nutritional value. For this, use will also be made of other foodstuffs known to have been available, either from cuneiform sources or from palaeobotanical and palaeozoological sources. The quantitative value of a diet can only be properly assessed when all the types and quantities of food are known so that the intake of each nutrient can be calculated. This is not known for the 'Aristocracy' but will be attempted later for the ration lists of the employees.

Early Dynastic period

At Early Dynastic III Lagān, the gods were offered a wide variety of foods. Milk was given with types of bread (SUR and NINDA GU.KAL) to Nannā and Nannar for their meal. The references to two types of milk - GA and GA.KUG.A - may mean that one (probably GA.KUG.A, pure
milk) was fresh milk while the other was the more normal sour milk. And milk and pure malt (GA.KUG MINU.KUG) are listed as offerings from forty individuals presumably for the gods. Malted grain and milk, or bread and milk, make very nutritious dishes by themselves, and can of course form the basis of other dishes - say with meat added. What would seem to be made-up dishes are provided for the gods at a festival in Urukagina's reign. These are 逖Z.GA - a porridge of emmer-wheat and milk mixed, and 逖UTU - gruel-like mixture of flour and milk or another dairy product. Other texts recording the gods' food at festivals show that they received a sheep or goat (usually only 1 each), fish, flour, emmer-wheat, oil, grapes, dates, ghee, and different types of beer (KAŠ.KAL and KAŠ.GIG). The qualitative nutritional value of the offerings made to Ningirsu, for the first day of such a festival (EZEM.ŠE.KU) can be roughly assessed. The offerings were: 1 sheep, 2(?) fish, emmer-wheat, 3 DUG-measures of strong beer, 4 DUG-measures of dark beer, a type of flour (ZI.MIN. DU) 4 SILA oil, 4 SILA dates, 4 SILA 'grapes' (GEŠTIN), and ghee.

First the preparation of the provisions for what was probably the main meal of the day must be discussed. The carcases of the animals were cut up for eating and all parts of the body were used. The ways in which the sheep might have been prepared include boiling or roasting. Banquet scenes on cylinder seals of this period show what appear to be joints of meat set on top of sideboards while the soundbox of a harp from Ur shows a stand on which are placed the leg and the head of a sheep and the head of a pig, being carried (by a dog!) into a feast (Fig.32)

The presentation of joints by themselves suggested that they were dismembered for roasting rather than boiling in water, as it might be expected that the latter method of cooking would be indicated by showing the meat in a bowl or other vessel. However, this is not necessarily so, as the joints could have been lifted out of the stewing-pot for serving. During either roasting or boiling there is a certain amount of shrinkage in the meat due to loss of water, in which some of the water-soluble vitamins such as Thiamin, Nicotinic Acid, and Riboflavin may be lost. When the meat is cooked in water, although
the loss of vitamins will be great due to the leaching effect of the water, if the water containing the juices is eaten, as a gravy or a soup, then most of these vitamins will be retained. The presentation of the leg-joints and heads without their gravy suggests this loss of vitamins unless the gravy was drunk or used to moisten other dishes. It is likely that the rest of the sheep was also eaten.

Tannour-bread and probably burghul were eaten at this time (see above, 3.1.1, p.105, 3.1.2 p.114) so that it can be assumed that the flour was used to make bread while the emmer-wheat may have been made into burghul. The beer manufactured in the Early Dynastic period had to be drunk through straws to avoid the husks etc, which were not removed. It contained beer-bread and malted grains (Chapter 3, 3.1.4, p.135).

In the feasts given by Bedouins sheikhs a large mound of rice, bread or burghul is served crowned with joints of mutton. Oil and melted ghee is often poured over the meat, with side dishes of soup or gravy, with pieces of meat. dishes of sour-milk, dates, fruits etc. From the banquet scenes on cylinder seals etc, it would appear that the large joints of meat and the heads were served separately, but the cylinder seals sometimes also show small dishes on the sideboards which could contain side dishes of gravy with the rest of the meat, burghul, dates, ghee etc, while the tannour-bread may be stacked at the side.

The energy value of the offerings to Ningirsu cannot be assessed as it is not known how many people were to partake of it. However, certain nutritional points can be made. The protein supply would appear to be adequate - the main sources being the carcase of the sheep, the flour, emmer-wheat and fish. The deficiency of the amino acid lysine available in wheat is compensated by the other sources. The two types of beer provide good sources for Thiamin, Riboflavin and Nicotinic acid; the fermentation of the grain and the production of yeasts increases the amount of B complex vitamins. As these vitamins are also available in meat, and wholegrain cereals (although cereals are a poor source for Riboflavin), any deficiency is unlikely. The sources for Vitamin A and Vitamin C are poor. Of all the items listed, only
'grapes' contain more than a trace of Vitamin C, while only the fish and the ghee are reasonable sources for Vitamin A, though the dates and 'grapes' are minor sources. An additional source for both vitamins may have been the liver of the sheep.

The greatest dangers of deficiency in a diet based on the above foodstuffs are the lack of Vitamin C and Vitamin A. Other sources for Vitamin C may have included onions (especially if eaten while green and immature), garlic, cucumber, and green pulses and 'apples', all of which were recorded at Lagaš in the Early Dynastic III period. Dates eaten while fresh are a good source of the vitamin. Milk too contains Vitamin C and this is often offered to the gods. And although dried grains and pulses do not contain ascorbic acid, the vitamin is formed on germination so that the consumption of malted grains forms a protection against scurvy. It has been found that 30 grams of dried pulse can yield 9–15 micrograms of Vitamin C on germination.

Dairy products and green and dried pulses contain Vitamin A equivalents. One might expect fish to be the main source at Lagaš. But it should be noted that most fresh water fish (without bones) contain only traces of Vitamin A, although sea-fish are richer. An exception is the carp. Dried fish too only contain traces of Vitamin A. So that this source should not be over-emphasised.

At Ur in the middle of the third millennium, food offerings were placed in the graves. The remains of some of these meals were excavated by Sir Leonard Woolley and brought back to London for examination. The actual remains tested probably came from offerings made after the closure of the lower grave PC/1054 and beginning of the upper shaft. A number of saucers contained mixed foodstuffs. One contained dried apple rings, a fish bone and the bone of a caprovid, while others included crab-apple rings and pieces of possible flat bread. Date-stones were found in a few graves and the bones of sheep, caprovids, pigs, and fish were found in many others. Some of the bones - especially when they consist of complete skeletons, may represent the remains of ritual sacrifice, but the discovery of such items on saucers
indicates that they were left as food offerings. The finding of caprovid and fish bones, in the same saucer as crab-apples, gives an idea of the type of foodstuffs which might be eaten together.

Late Agade

In a feast to celebrate the New Year and to honour Bau, Gudes, the ensi of Lagaš, c.2200, provided an ox, sheep and lambs, dates, ghee, figs, birds including a goose (MUŠEN.KUR.GI), carp (KU₆SUHUR) and the ŠA(G).GIŠIMMAR - possibly the heart of the palm. There is however no mention of cereal-grains, flour or bread and beer.

Ur III

A wide variety of foodstuffs was provided for the gods and for the king's household during the Ur III period. One text from Ur lists offerings of grapes (or wine) and (or mixed with) a semolina-cream (GEŠTIN.A.TIR.DA) for various deities. Dates, vegetable oil, ghee and probably cheese were provided for the boats of the deities in the month of Akītu at Ur. Among the animals offered to the Dīur and the temple of Ennannar at Ur was a reed-fed pig.

At Lagaš in Amar-Sin's reign various items were issued for festivals, including malt (ZI.BA.BA), isqūgu-flour (ZI.KUM and ZI.GU), 'semolina' (NI.G.RA), barley flour (ZI.ŠE), semolina-cream (A.TIR), roasted barley (ŠE.SA) and beer (KAS). The temple of Ennannar supplied some provisions for the king's household at Ur during Ibbi-Sin's reign. These included a sheep, pigs, birds (including a good and duck), fish, ghee and cheese, 'apples' (GIŠ.HAŠHUR) and a type of bean or other garden produce (GÚ.SAR). Another fruit, the GIŠ.UR+NA, was also recorded. If this list represents the main ingredients for meals provided for the king's household at Ur, the most surprising omission is a mention of bread, cereal grains or flour. However, the large quantities of GÚ.SAR may represent a dried pulse which formed the basis of the meal. If this was so, then the presentation of the meal may have been similar to that of Bedouin sheikhs, with the dried pulse steamed in the manner of 'couscous' or ground and prepared as a 'bread', and the joints of meat piled on top.
The list of provisions shows that meat and fowl formed a prominent part in the meals for the king's household, suggesting that the supplies of protein would be adequate. The Gū.SAR if either chick pea or lentils would also be a good supplier of protein, calcium, phosphate and iron and the B-Vitamins. Vitamin C supplies appear to be low. If the Gū.SAR are green pulses they would contain some Vitamin C, although if they were dried only negligible traces would be added to the diet. 111 As the provision list is dated to the 10th month, probably the equivalent of December/January, it is likely that the pulses were dried. This also applies to the dates and 'apples' and possibly the pomegranates, so that here too Vitamin C would be low.

Sources of Vitamin A are also low. The cheese and the ghee contain reasonable amounts but the quantities provided (5 ȘILA of each) are small when compared with the quantities of meat, so that only traces would be available for individual portions. Apples contain some Vitamin A. The Gū.SAR–pulse probably provided the main source as, although pulses do not contain large quantities of the vitamin, the amount of the pulses provided (25 GUR) suggests that each individual would have received a reasonable portion. 112 It is difficult to assess the fish as Vitamin A sources.

Old Babylonian period

A group of texts from Ur 113 gives details of offerings to the gods during the Isin/Larsa and Old Babylonian periods. These show that as well as regular offerings of barley, offerings of dairy produce, oil, dates, spices, beans, honey etc, were made to the different gods and temples. These offerings would seem to be ingredients for dishes, with the possible exception of the cheese and dates. One interloper which appears frequently amongst the list of foodstuffs is an issue of oil said to be for the leather door hinges. 114

During the Old Babylonian period, at Mari, Chagar Bazar and Rimah, records were kept of foodstuffs provided for the meals of the king and his household. Although these 'naṭṭan marrim' texts are comparatively few at Chagar Bazar and Rimah, the number found at Mari make it possible to get a picture for a whole year.
As mentioned above it is probable that two meals were served to the king each day at Mari. However, in the monthly records there are occasions when one or more days are missed out. Three reasons have been suggested for this - the scribe may have 'jumped' a day and so put out all his dating, there may have been a religious fast, or the king may have been away from Mari. There are a number of daily records recording provisions for the king in places other than Mari - for example, 'in Hatta', 'in Dīr', 'for the boat when the king (went) to Hanat'. It is therefore possible that the monthly records were only for the meals actually eaten at Mari but that daily records were kept for food consumed by the king at other places.

The large quantities of food involved in these meals, and the frequent use of the phrase 'meal for the king and his "people" in Mari' indicate that the meals were not just for the king and his immediate family but were for the king, his family, the leaders of his court and administration, and possibly a number of the lesser members of the palace staff. It has been suggested that the word šābum covered the court dignitaries, palace staff and soldiers. An unpublished text records a banquet attended by Hanaens and Elamites who were given an individual ration of about 1 3/4 SILA a head, and if this amount is taken as the allowance made for each person attending, then a meal whose total issue of 1 1/2 GUR, 35 SILA would feed 680 people. (However, this calculation may be too simple, as this particular total is divided into different dishes, such as tannour-bread (NINDA KUM), sour bread (NINDA ēmṣu), ıṣqūq, semolina-cream (aṣqūq) and 'sweetened bread' (NINDA mersu) and this division may make a difference to the amount allowed for each person.)

For each meal, each type of foodstuff and its amount is listed separately and then totalled. In the monthly records grand totals are given at the end of the period being recorded. The different sorts of breads, dishes made from cereal-grains, and pulses are almost always lumped together in the daily and periodic totals under NINDA - which is here used with the wide meaning of 'food'. The totals of beer, oil, 'linseed' oil, dates, and honey are kept separate.
The main ingredient of all the king's meals is tannour-bread (NINDA KUM). This is issued at every meal and in the largest quantities. Sour-bread (NINDA emsu) also appears at nearly every meal but in smaller quantities and sometimes the 'sweetened bread' (NINDA mersu), although issued less frequently, is provided in larger amounts. The average amount of NINDA KUM issued per meal in Kiskissum (in the 'Year Zimri-Lim counted the land') was 143.36 ŠILA (33 meals); NINDA emsu: 57.18 ŠILA (33 meals); NINDA mersu: 80.9 ŠILA (11 meals).123

The other made-up dishes issued regularly include those made from prepared cereal grains - arsānu, isqūqu, sasqū, papplsu (see Chapter 3, 3.1.1, 3.1.2). Of these arsānu is only rarely provided. The most usual quantity for these dishes is 2 ŠILA a meal, although isqūqu and sasqū sometimes exceed this. The average amount of isqūqu issued per meal (only 5) during Malkanum (the 'Year Zimri-Lim counted the land') was 13 ŠILA but as the average amount of sour-bread (11.7 ŠILA) issued during that month was also low the unusually high amounts of isqūqu may have been made to compensate.

The vegetable issues at the king's meals include chick peas (ballūru), lentils (kakkū) and another type of bean, probably similar to the chick pea (appānu).124 Again the usual amount is 2 ŠILA per meal. These vegetables are issued in practically every month of the year (though not necessarily in every month in each), so that it is reasonable to suppose they were dried and stored. There appear to be some fluctuations. Lentils are issued in 7 out of 11 recorded months in the 'Year Zimri-Lim counted the Land', but in only 2 out of 12 recorded months in the 'Year Zimri-Lim built Dur-Iahdun-Lim'.125 Possibly the lentil crop failed that year!

The main drink regularly recorded is the beer alappānu. But this occurs only rarely - in Kiskissum in the 'Year Zimri-Lim counted the Land', alappānu appeared at only 4 meals out of 33. The average quantity per meal is 167.5 ŠILA. Alappānu would seem to be a 'special occasion' drink. Although there are times when NINDA mersu appears without alappānu there are few times when this drink occurs without NINDA mersu. Alappānu nearly always occurs when the quantities of the different types of bread are large enough to suggest a 'banquet' rather than a routine meal, and when there are issues of oils, and honey.
Apart from alappānu only two other types of drink are listed in the naptan šarrim texts. Both these are rare. KAS īدادu, a type of beer, occurs two or three times during the 'Year Zimri-Lim built Dur-Iahdum-Lim', but not at all in the 'Year Zimri-Lim counted the Land'.

Vegetable oil, linseed oil and honey are frequently issued for the same meals. They do not appear at every meal. For instance, out of 33 meals during Kiskissum vegetable oil was issued for 8, honey and linseed oil for four. Dates too seldom appear at meals without one of the oils and honey. However, this commodity appears to be an irregular feature. Although it does occur fairly regularly during the 'Year Zimri-Lim counted the Land', it does not appear in any of the recorded tablets for the 'Year Zimri-Lim built Dur-Iahdum-Lim'. (This covers about half the year with a few days from nearly every month.) This suggests that dates may not have been an important crop at Mari, unless the latter year was an exceptionally bad one for dates!

The only dairy product listed in the naptan šarrim texts is ghee (L Também/hamātu). This occurs rarely and in small quantities. The apparent low use of dairy products is surprising in a country where sheep are plentiful. It may mean that cheese, sour milk, ghee etc., were not favoured foodstuffs at Mari. Alternatively it may only mean that dairy products were usually issued by a different department and not the one dealing with NINDA etc.

It seems likely that the naptan šarrim texts are lists of prepared dishes rather than lists of ingredients to be made up for the king's meals. Other texts list types of onions and spices issued for the king's meals and for making mered but these onions and spices do not appear in the naptan šarrim records. These former texts are probably the 'shopping lists' or partial recipes while the naptan šarrim texts are menus, or at least partial menus.

These texts are unlikely to represent the entire food provided for the king at each meal. For example, no regular drink is mentioned (other than the occasional occurrence of alappānu). There is also no mention of meat or fish. It seems unlikely that the king of such a
prosperous country would have dined only from cereal grains and vegetables, however deliciously prepared. An unpublished text does mention cuts of meat and 'legs' (2 ma-la-ku ša alpi (HA) and 2 (UZU) te-ak-bi-su)¹²⁹ destined for the king's meal and another text giving details for the night meal appears to be a list of birds and fish¹³⁰ so that it is probable that the meat supplies were issued by another department.

Naptan ṣarrim texts were also found at Chagar Bazar.¹³¹ There are only a few of these texts and all referring to Yasmah-Addu come from the month of Maqranim in the Išmu of Adad-bani, and are a little earlier than those from Mari.

The small number of these texts may be due to accident of discovery or Yasmah-Addu may only have eaten at Chagar Bazar occasionally. Many dishes provided are similar to those at Mari: isaqqu, ssasqû, aršalu, kakku and NINDA emsu. But there is a greater variety of breads (including NINDA SAG, NINDA ŠE).¹³² There is no record of alappšu, NINDA mersu, oils, honey or dates, but as the texts involved only cover a period of five days, little can be concluded from this.

Two texts from Rinah¹³³ record the food provided for Iltani's meals. Two sorts of bread, NINDA SAG and NINDA US, are issued. These two tablets state that these issues were made when Iltani had particular guests staying.

When assessing the qualitative nutritional value of the king's meals at Mari it must be kept in mind that the naptan ṣarrim texts only list the foodstuffs prepared from cereal grains and vegetables - with the occasional additions of honey, dates and vegetable oils. The basis of the meal is the flat tannour bread (NINDA KUM) and it is possible that this may have been used as plates on which the prepared cereal dishes, such as the semolina-cream (ssasqû) or the vegetable dishes like 'hummus' (GU.GAL/ḫallGru) were piled. Other pieces of bread may have been used as spoons to scoop up the food and convey it to the mouth. The oils and ghee could have been used to pour over the different side-dishes and relishes, or to moisten the various types of bread. One side-dish eaten by Bedouin is dates in ghee.¹³⁴
In the naptan šarrim texts, the main source of protein is the different types of bread, although the issues of pulses such as chick peas and lentils would help to prevent any deficiency caused by low availability of lysine. The diet seems to provide adequate amounts of Thiamin and Niacin, as the flour used for bread is not highly refined so that the vitamins in the cereal germ are retained. The Riboflavin intake is also probably adequate, although cereals provide only poor sources. The lack of Vitamin A and Vitamin C sources are quite marked. On the face of it, only the chick peas and the very rare provision of ghee are sources for Vitamin A and the only sources for Vitamin C are the dishes made from germinated cereals or pulses - such as pappasu, a dish issued fairly regularly but in small quantities.

While these naptan šarrim texts can be taken to give the basis of the king's meals and to list the foodstuffs providing the bulk of the nutrients, they do not list all the foodstuffs available at Mari. There is some evidence for meat and fish being provided for the king which would add to the protein value. The onions and garlic (šamaškilum and ṣaramnu) mentioned as being used for the king's meal are useful sources for Vitamin C. Fruit too was used by the pastry-cooks at Mari (see 3.6.4): these include 'apples', 'pears', 'plums', 'apricots' and figs and dates. Apricots are among the best sources for Vitamin A and the other fruit would also contribute well. Even dried figs and dates are of value. The fresh fruit would also provide a good Vitamin C source, although dried fruit would lack this.

Some details of the food supplied for marriage ceremonies can be found in an Old Babylonian text from Ur. This shows that the bride's father supplied food and shelter for the bridegroom's mother and the rest of his party. He provided sheep, different types of beer, bread, lard (išag), oil (iGIS), and ghee (iNUN) for food, as well as garments and oil for anointing. The groom appears to have spent four months in his father-in-law's house. The total food allowed for him for this period was 4 GUR bread, 8 GUR beer and 120 (jars) of second beer, plus various oils. This works out as 10 ŠILA bread, 20 ŠILA beer plus 1 jar second beer a day. It is not clear whether the bride's food is included in these provisions or whether it is intended to supply the servants and friends who accompanied him to the wedding party.
Neo-Assyrian period

In the Neo-Assyrian period, some texts dealing with rituals for the cult of Anûr give details about the type of food and its method of preparation to be offered to the gods or given to the temple functionaries. It seems that all parts of sacrificial animals were utilised. One instruction, unfortunately broken, says that a tail (UZU.KUN) ... in bouillon but not soaking (A. MES. UZU IM.SI-PU) should be placed before Anûr. The injunction 'not soaking' suggests that this could have been a dish in its own meat jelly, rather than an oxtail soup or stew. Another instruction refers to placing the heads and legs of sacrificed sheep on huḫurru-bread - possibly a dish in the manner of parcha (see 3.2.1 p.153). Beer and wine and oil are also listed as foodstuffs to be offered to the gods or their functionaries. Cuts of sheep, bread and beer are the foodstuffs allocated to the priests of the Nabu temple, of Gula of the desert, and the kâlu priest, by royal decrees.

The list of foodstuffs provided by Aššurnaṣirpal for the feast celebrating the opening of his palace at Nimrud provides an example of what might be eaten at important festive and royal occasions during the Neo-Assyrian period, rather than for the routine feeding of the king and his immediate entourage. The occasion was a formal one involving the entertainment of some 69,574 people for a period of ten days so that the quantities had to be large.

The list starts off with the numbers of oxen, cattle, sheep, lambs and other meat animals provided. Examples are 100 fattened oxen, 1,000 cattle, 14,000 sheep, 1,000 fattened sheep, 1,000 lambs, 500 deer, 500 gazelles. In addition vast numbers of birds were provided including 500 geese, 1000 ducks and 10,000 small birds. 10,000 fishes and 10,000 eggs are also listed. Among the cereal products were 10,000 'loaves' of bread and 100 (measures) of roasted barley. Fruits such as pomegranates, figs and dates, pistachio nuts, vegetables such as garlic, onions, lentils, and cress, and spices such as cumin were all recorded. Other provisions included ghee, milk and oil, and beer and wine were given for the drinks.
The list is a mixture of prepared foods and ingredients for other dishes. For example, the bread is ready for eating, but all the meat-animals require preparation. The inclusion of spices and various sorts of vegetables and cereal-grains suggests these were prepared as relishes and side-dishes or combined with the meat in stews. The amount of fruit listed is notable.

If the food provided for Aššurnaṣîrpal's banquet is considered from the point of view of nutrition, it can be seen that the supplies of meat were enormous, apparently forming the basis of all the meals eaten during the ten days the feasting lasted. The meat, fowl, fish and eggs, together with the bread and roasted barley, would supply adequate amounts of protein and the B Vitamins; the fruit, vegetables and pulses provide Vitamin C, and the fish, dairy products, nuts and pulses contribute to the Vitamin A requirements. However, this was a banquet for a particular occasion, and although it seems that these foodstuffs were both known and used it does not mean that even the 'Aristocracy' always ate this variety of food-items.

The issue of cuts of sheep, bread and beer given to the priest in certain temples (see p. 254) may more nearly represent the staple ingredients of a meal. Here again there would seem to be good sources for proteins and the B Vitamins, but a deficiency of Vitamin C and Vitamin A. However, the instructions given about cooking food in connection with the cult of Aššur indicates that nearly all parts of animals are used: liver and kidney are excellent sources of Vitamin A and they also contain some Vitamin C. This use of all parts of animals, including the head, birds and fish as food is also indicated by the scenes on reliefs and stele.

The pomegranates, grapes and figs included among offerings re-issued to the temple functionaries again provide some sources for Vitamin C. Fruit trees including pomegranates, figs and 'plums' and possibly dates, were grown in the vicinity of Nimrud. This is indicated both by texts and by the depiction of pomegranates and fig trees growing in the countryside on reliefs and by the presence of date-palms in scenes such as Aššurbanipal's banquet (Fig. 7). Date
stones, fig seeds and pomegranates appeared in deposits at 7th-century Nimrud (see 3.6.2) All this suggests that fruit was fairly easily available at this period, so that a deficiency of Vitamin C is unlikely.

The Seleucid texts giving details of the offerings to be made to the gods at Warka originated in the time of Nabupolasser and so can reasonably be taken to give a picture of the gods' meals in southern Mesopotamia in the mid-first millennium. The first course of the morning meal consists of best quality barley-fed young sheep, a milk-fed lamb, an ox, milk-fed calf, and fat sheep not fed on barley, while the second course consisted of barley-fed sheep, milk-fed lamb, sheep not fed on barley, ox, lambs, and large numbers of birds including ducks, geese and pigeons, and eggs. The first and second courses of the evening meals consisted of sheep and birds (there were no birds in the second course) but the quantities were much smaller.

Also provided for these meals were beer, milk and wine, mixed barley and emmer-wheat bread, dates from Babylonia and Tilmun, figs and raisins. For the journeys of the gods, bread and 'sweetened bread' and pieces of bread soaked in oil (ka-ši-ip-e-ti 𒈗𒈊) and dates were provided. The bread was made from 81 𒈭.N (486 𒉌.𒈊) barley flour and 27 𒈭.N (162 𒉌.𒈊) emmer-wheat flour. These quantities made 243 𒈠.NINDA so that each 'loaf' was 2.66 𒉌.𒈊, and the bread was distributed to a number of gods and temples. For the deity Anu, 8 𒈠.NINDA were delivered for each course in the morning and 7 𒈠.NINDA for each course in the evening.

On looking through the above evidence for food provided for kings and gods, it can be seen that meat was a frequent item. It appears at the gods' festivals at Early Dynastic Lagaš, in the feasts given by Gudea, in the provisions for Ibbi-Sin at Ur. It is also plentiful in the offerings in the Neo-Assyrian period both in the north and the south, at Assurnaṣīrpal's feast, and it is included as a regular part of the foodstuffs allocated to the priests by the Neo-Assyrian kings. Only in the Old Babylonian period is the evidence for meat at the king's table less firm, but what evidence there is, together with the
numbers of animals kept, suggests that meat was a frequent part of the 'aristocracy' diet. Dairy products were common especially in the south. There is less evidence for these at Mari in the Old Babylonian period and in Assyria in the Neo-Assyrian period (references are usually to ghee), so it is possible that milk and cheese may have been less acceptable in the north.

4.2.5 People

This section will deal with the people who received rations and wages paid in kind from religious or secular employers. The evidence is mainly textual. Of necessity the employees involved are those who worked for temples, palaces and similar large estates which kept records of payments. It is probable that the types of food and the amounts distributed to these employees were similar to those given to employees working for masters who did not keep records, but this can only be an assumption and may not take into account casual labourers or people working for poor masters, who may have received much less, or the self-employed.

These lists form the main source of evidence for the daily food of the ordinary people. Although they are restricted to those working for large-scale employers, the professions of the workers involved cover nearly all jobs, from shepherds working alone to textile workers in 'factories'. It is therefore reasonable to assume that a study of these lists will give a fairly accurate picture of the diet of the ordinary people.

No distinction will be made about the social or legal position of the employee - i.e. whether he is a dependant receiving 'rations' or a free employee receiving 'wages'. The issues will be referred to as rations for the sake of uniformity. Other sources of maintenance, such as a share in the crop from a field, will be mentioned. But for the purpose of assessing the quantitative value of the diet the barley rations are taken to be the main source of food for the recipients.
Early Dynastic period

In the Early Dynastic III period at Lagas, detailed records were kept of the monthly issues of foodstuffs to employees who were listed according to their professions and sometimes by name.

The most common foodstuff issued was barley (SE) but emmer-wheat (ZIZ) was also issued. The ration lists do not supply information about how the issues were used, simply recording the amounts given to each person. However, one or two texts do mention the purpose for which barley and emmer-wheat were given and although it is not certain that these particular issues were actual rations, some idea can be gained about the likely dishes prepared from the rations.

Emmer-wheat was used for bread and beer, and barley for beer-bread (BAPPIR), green malt (MINU), ZI.GU-flour, bread (NINDA DURUN, DURUN - long lasting bread?) and fodder. The quantities of barley were about 2 - 2½ times greater than those of emmer-wheat. The beer-bread and malt could be used to make beer, but they could also be eaten as dishes in their own right.

Some texts from Early Dynastic III Lagas give details of foodstuffs issued to individuals apparently for specific festivals. One such festival is the EZEM d.BAU, and records of the issues for this come from the reigns of both Lugalanda and Urukagina. The festival appears to be organised by the wife of the ruler. EZEM d.BAU is the name of a month at Lagas and the amounts of emmer-wheat or of emmer-wheat and barley issued as rations for this month are similar to the regular barley issues for other months. But other issues include a variety of foodstuffs so that it would seem that the EZEM d.BAU month was one for which special rations were thought to be necessary.

On one occasion the NIN.DINGIR-priestess of the goddess Bau received barley, emmer-wheat, ghee, dates and a NIG.DU.A-measure of 'apples'. Although most of the other men and women were given only barley and emmer-wheat, a few (about 9 out of 45+) received dates,
'apples', ghee, cheese (?) (LAK 490)\textsuperscript{155} as well. Five also had perfume-oil (?) (I.IR.A) and one had a type of bread (NINDA.BAN.DA.NI). The most usual quantities (received by 6 out of the 9) was 72 SILA barley and 72 SILA emmer-wheat, 36 SILA dates, 18 SILA cheese, 5 NIG.DU.A 'apples', 1 SILA perfume-oil and 1 SILA ghee.

Other issues for the 

Other issues for the EZEM d\textsuperscript{160}BAU are emmer-wheat, dates and 'cucumber' (UKUS.DUR);\textsuperscript{156} the amounts are 18 SILA emmer-wheat, 2 SILA dates and 1 SILA 'cucumber'. Sometimes an issue of barley is also given.\textsuperscript{157}

Some people received an even more varied ration: bread, beer-bread, beer and fish were given to a number of men of different professions during Lugalanda's reign.\textsuperscript{158} Other men received these items plus roasted barley (SE.SA).\textsuperscript{159} In Urukagina's reign\textsuperscript{160} men (in connection with Nina rather than Bau) received 1 (loaf) white bread (NINDA BABBAR), a fish and a measure of beer. The amounts recorded for these last issues (1 'loaf' bread, (one) fish and one measure of beer, 1 SILA roasted barley) indicate that these issues were not for a month and they may have been intended for only one day.

Special issues were also made for the mourning rites for Baragnantara, wife of Lugalanda, in the reign of Urukagina, Year 2.\textsuperscript{161} Women and cult-singers were given 2 (loaves) of DURUN.DURUN bread, 1 (loaf) GA\textsubscript{5} bread,\textsuperscript{162} and a measure of beer, while the chief cult-singer (GALA.MA\textsubscript{5}) received 10 (loaves) DURUN.DURUN bread and 6 (loaves) BAR.SI bread.\textsuperscript{163} Other women (possibly from Baragnantara's household) also received 1 (portion) BAR.SI-bread, 1 (loaf) GA\textsubscript{5} bread and a measure of beer.

In Laga\textsuperscript{\textcircled{a}}, the regular barley rations were distributed as shown in Table 11 (p.271).

The majority of the male workers at Laga\textsuperscript{\textcircled{a}} received 72 SILA per month\textsuperscript{165} or approximately 2 litres per day. This is equal to 1.53 kgs barley and, if Figures 1 and 2 and Table 11 are compared, it can be seen that these workers have an energy intake of 5400 Calories per day—well above the FAO recommended intake of 3000.\textsuperscript{166} Women
### Table 11

<table>
<thead>
<tr>
<th>Ref./Date</th>
<th>Recipient</th>
<th>Monthly</th>
<th>Daily</th>
<th>Litres*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Or.34/35 p.43</td>
<td>Men</td>
<td>96</td>
<td>3.2</td>
<td>2.65</td>
</tr>
<tr>
<td>Lugalanda 6</td>
<td>Men</td>
<td>72</td>
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</tr>
<tr>
<td></td>
<td>Men</td>
<td>48</td>
<td>1.6</td>
<td>1.33</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>36</td>
<td>1.2</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>24</td>
<td>.8</td>
<td>.66</td>
</tr>
<tr>
<td>ibid.</td>
<td>Women</td>
<td>36</td>
<td>1.2</td>
<td>1.00</td>
</tr>
<tr>
<td>ibid.</td>
<td>Women</td>
<td>24</td>
<td>.8</td>
<td>.66</td>
</tr>
<tr>
<td>ibid.</td>
<td>Women</td>
<td>18</td>
<td>.6</td>
<td>.50</td>
</tr>
<tr>
<td>ibid. p.60</td>
<td>Children</td>
<td>12</td>
<td>.4</td>
<td>.33</td>
</tr>
<tr>
<td>(DP 228) No.5</td>
<td>Women</td>
<td>18</td>
<td>.6</td>
<td>.50</td>
</tr>
<tr>
<td>ibid. p.70</td>
<td>Men</td>
<td>60</td>
<td>2.0</td>
<td>1.66</td>
</tr>
<tr>
<td>(STH 1,17) No.9</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*1 SILA = .83 litres*164

received 36 SILA a month, or approximately 1.0 litre per day, have a calory intake of 2700 Calories - again over the FAO recommended intake of 2200.

Young adolescents with 18 SILA per month, approximately .5 litre per day, have an intake of 1800 Calories. This is low and only suitable for children about 4 or 5 or younger, according to the FAO. As some of the people receiving this ration are clearly employees and not toddlers they are receiving insufficient rations, unless these were supplemented. Children receiving only 12 SILA per month, or .33 litre per day, have an intake of 900 Calories per day, which is the recommended intake for babies in their first year.

It is possible that in many cases these children were in fact only babies and that the ration of 12 SILA was given to supplement breastfeeding in the first stages of weaning - or even to supplement the mother's ration. The case of one woman (Min-gal-lam) and her children is cited by Maekawa:168 when the children are listed with their mother they receive only 12 SILA per month but later, when she has died and
they are listed as orphans they receive 18 SILA. However, in view of
the fact that some other orphans are also given 12 SILA it is possible
that the increased rations of 'Min-gal-lam's children was because they
had grown older and were entitled to receive an adolescent's ration.
If this is so, then their rations through childhood were inadequate,
and continued to be so during adolescence.

When the nutritional (as opposed to the energy) value of these
rations is considered it can be seen that 2.4 SILA per day contained
145.5 gms of protein which provide some 582 Calories or about 11% of
the Calories, a figure inside the range of a well-balanced diet. But
although this would seem satisfactory on paper, cereal protein is
deficient in the amino acid lysine.

Most of the rations have adequate levels of thiamin and niacin.
Some of the rations (36 SILA, 24 and 18 per month) are low in ribo-
flavin, and the same amounts are low in calcium - especially the
children's rations. The iron intake appears to be sufficient, although
any adolescent girls or women with under 18 SILA a month would require
a supplementary intake.

The most conspicuous deficiencies in these rations at Lagak are
Vitamin A and Vitamin C, which are completely lacking in amounts of
nutritional significance. And it must be remembered that the calcula-
tion of Calories, proteins, vitamins and minerals are based on the
entire rations as given, and that no allowance has been made for losses
in preparation and cooking. (For example, it has been estimated that
between 15 and 25% of the niacin content may be lost in cooking.)
These rations at Lagak cannot be considered adequate because of this
lack of Vitamin C and Vitamin A. Experiments have shown that clinical
signs of Vitamin C deficiency (scurvy) appear after about 30-70 days
when previously well-fed men are given a diet with very little ascorbic
acid and if scurvy is allowed to continue, without any intake of
Vitamin C it can result in death. Vitamin A deficiency is usually only
seen in people whose diet has been deficient for a long time, but
children are particularly vulnerable, especially when their diet is
also lacking in protein and Calories.
If the employees at Lagaš were existing only on these rations one might expect that scarcely any of them would reach adolescence because of this lack of Vitamins A and C. However, the ration lists at Lagaš are from the 6th year of Lugalanda and over the six years of Urukagina, and a glance at some of the names listed shows that at least some of the same people continued to receive rations throughout the period. Other sources for Vitamin C and Vitamin A must be looked for.

The ration lists can be divided into two main groups: rations for the LÚ₆.KUR₅.DAB₅.BA; and rations for the IGI.NU₆.DU₈.IL ŠAG.DUB.DIDLI, the GIM.DUMU and the GIM.DUMU.TUR.TUR.LA.NE. (Personnel who received both rations and land; personnel carrying out various occupations, female personnel and their children and personnel belonging to the establishments of the children of the ruler.) The main difference between these two groups is that the LÚ₆.KUR₅.DAB₅.BA do not seem to receive rations every month in the year and they are also allotted a parcel of land (GAN.KUR₆). The other employees receive their rations in every month during the year.

The LÚ₆.KUR₅.DAB₅.BA receive their rations from the 8/9th month to the end of the year. This is roughly the period from October/November to February, when the date-harvest is over and most of the cereal-sowing has already been done and the work on the fields is slack. It is also a time when stocks of harvested grain are likely to start running out, especially towards the end, when the new harvest is being waited for. It would seem that the LÚ₆.KUR₅.DAB₅.BA were expected to maintain themselves from the areas of land allocated to them but that they were given rations during the winter in order to supplement their own harvested stocks. The allocated land appears to have been included as parcels within larger fields so that it is probable that the man had to grow whatever crop his employer wanted, mainly barley or emmer-wheat. Whether he would have been able to set some area aside for vegetables is uncertain but likely. The size of allocated land varies. Some men have as much as 26 ikû while others may have only 4 or 2 or even 1 ikû. (See below p.298 for further discussion.)
That foodstuffs other than barley were issued from time to time has been seen from the issues made at specific festivals. A diet based on such amounts of mixed foodstuffs as cereals (barley and/or emmer-wheat), dates, dairy produce and 'apples' would provide adequate calories, protein and the B vitamins. The dates, 'apples' and dairy produce would provide Vitamin A - probably in sufficient quantities to maintain an adequate level. The Vitamin C intake is low, as the dates only contain ascorbic acid when fresh, and the apples have only 6 micrograms of Vitamin C per 100 grams of edible portion.

The special rations of bread, beer-bread, beer and fish, also contain good sources of nutrients. If the amounts are for one day, they would appear to be sufficient to provide adequate energy and protein. Native beer is a good supplier for the B vitamins while the fish would provide some Vitamin A. Again there seems to be no obvious source of Vitamin C.

If the special rations for EAUM of 18 SILA emmer-wheat, 2 SILA dates and 1 SILA 'cucumber' are to last for the whole month, the recipient only gets .6 SILA emmer-wheat (.383 kg), .06 dates (.498 kg) and .03 (.249 kg) 'cucumber' per day. This would provide about 1963 Calories. The dates if fresh would also provide some 5 mg of Vitamin C and the cucumber some 3.5 mg of Vitamin C. The dates would have about 2 micrograms of Vitamin A. However, it is not clear whether these issues were for a month or for a much shorter period, so that it is probably best to consider them simply as sources for the normally scarce vitamins, A and C.

The recipients of these 'special' rations do not seem to belong to the same group of employees as those who receive the monthly barley rations.

If the monthly barley rations are considered again, it would seem that the only likely source for Vitamin C would come from allowing the barley to germinate and preparing green malt (MUNU) from this. Other sources of Vitamin C may also have been wild plants such as purslane, a salad plant which can be eaten raw and which has a high...
content of ascorbic acid and Vitamin A equivalents. Purslane grows well in dry sandy areas, and can also be cultivated. In addition the employees may have been able to eat some of the fruits and vegetables grown. Indeed it is difficult to believe that at least some of the employees did not have some access to onions, chick peas and cress, all of which were among the regular crops grown in the area of Lagaš.

Agade Period

Barley was also issued on a regular basis in the Agade period, for example at Umma, Nippur, Asmar and the Kish area. At GA.SUR (Nuzi) both bread-wheat (GIG) and barley are recorded as distributed to various people.

Other texts suggest some of the uses to which the barley and wheat could have been put, and in some cases what appear to be regular issues were made of certain of these products. Quantities of flour were issued to named individuals at Umma, unfortunately the text is not dated nor does it state that the flour is for rations, although this is possible. Beer was distributed to named individuals at Nippur while at Khafajeh amounts of beer and flour were issued daily at the rate of 120 SILA to 20 or 30 SILA flour. These amounts are greater than the usual daily rations for one person, but as the end of the tablet is destroyed it is not known what the issues were for or whether they were in fact meant to be rations. A large quantity of barley was issued for a household in the Kish area which was specifically stated to be used for bread.

Another commodity which was probably issued regularly is oil. A text from Asmar lists a number of individuals receiving quantities of oil (1). Unfortunately the tablet is damaged so that what the oil was for, and for what period it was issued, is unknown. However, a number of the names on this tablet also appear in monthly barley ration lists so that it may be reasonable to assume that the oil too was a regular ration. Most of the women involved received 3 SILA oil, those with a son receiving an extra 3 SILA. One or two women received 6 SILA by themselves while one woman and her son received 9.
At Umma, during the Akkadian period, issues of bread and barley-flour (TAPINY) were made to men from other towns (Warka, and Ga-ŠUR) as well as from Umma. 186 Altogether 100 (loaves) were issued and the amount of flour allocated for making the loaves of bread was 15 and 2/3 ŚILA — about 9.4 ĠIN of flour a loaf (about .16 of a litre).

Beer was issued, probably monthly, to employees at Nippur. 187 The amounts were usually 1 measure for workers such as the leather-worker, carpenter and the textile worker, but other individuals such as the AGA.DUŠ received two measures. Another list records groups of ploughmen 188 being issued with a measure of beer and one pig each. Measures of a type of emmer-wheat (ZI1.AIA.D178) were also issued but it is not clear to whom. Flour and fish were issued 189 as provisions to a group of employees, who are probably Subarians, held as prisoners of war. Others, including 'house-born slaves of Enlil' and a boatman only received the flour.

The regular monthly barley rations in the Agade period were as in Table 12 (p.277).

As can be seen from this table, the evidence comes from four different towns and gives a good picture over most of the country including the north. The ration rates are fairly constant from town to town, especially as far as women and children are concerned.

As in the Early Dynastic period, on comparing Fig.1 and Table 12 it can be seen that the higher rates of rations provide more than sufficient energy intakes, proteins and many of the vitamins and minerals. The iron intake for adolescent girls is perhaps on the lowish side but is still adequate. Again the Vitamin A and Vitamin C are missing.

The evidence from texts recording other types of rations, such as beer, flour, fish etc, do not really help to trace the sources of the deficient nutrients. The beer, either issued as rations or made from the barley or emmer-wheat rations, would help to increase the B Vitamins while the fish should provide some Vitamin A. The main
Table 12

<table>
<thead>
<tr>
<th>Ref./Date</th>
<th>Town</th>
<th>Recipient</th>
<th>Monthly</th>
<th>Daily</th>
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<tbody>
<tr>
<td>Westenholz</td>
<td>Nippur</td>
<td>Men</td>
<td>120</td>
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</tr>
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<td>Nippur</td>
<td>Men</td>
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<td>2.00</td>
</tr>
<tr>
<td>Pre-Naram-Sin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot; Jena 42</td>
<td>Nippur</td>
<td>Men</td>
<td>20</td>
<td>.66</td>
</tr>
<tr>
<td>&quot; Jena 29</td>
<td>Nippur</td>
<td>Men</td>
<td>80</td>
<td>2.60</td>
</tr>
<tr>
<td>&quot; Jena 28</td>
<td>Nippur</td>
<td>Women</td>
<td>60</td>
<td>2.00</td>
</tr>
<tr>
<td>&quot; Jena 34</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td>Women</td>
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<td>2.00</td>
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</tr>
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<td>Women</td>
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</tr>
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<td>Asmar</td>
<td>Boys</td>
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<td>.66</td>
<td></td>
</tr>
<tr>
<td>Asmar</td>
<td>Men</td>
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<td>4.00</td>
<td></td>
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<tr>
<td>Asmar</td>
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<td>80</td>
<td>2.60</td>
<td></td>
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<tr>
<td>Asmar</td>
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<td></td>
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<tr>
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<td>Kish</td>
<td>Men</td>
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<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Kish</td>
<td>Men</td>
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<td>1.00</td>
<td></td>
</tr>
<tr>
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<td>2.00</td>
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<td>1.00</td>
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<tr>
<td>GA.SUR</td>
<td>Women</td>
<td>20</td>
<td>.66</td>
<td></td>
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<tr>
<td>GA.SUR</td>
<td>Boys</td>
<td>20</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>GA.SUR</td>
<td>Children</td>
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<td>.33</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>20</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

sources for Vitamin C must, as in the Early Dynastic III period, be derived from wild plants and fruits and from such preparations as green malt. The dairy scenes on some Akkadian cylinder seals (see Chapter 3.3.4) indicate the preparation of cheese and other dairy products which may well have been available to certain sectors of the
population — for example the herders and some farmers. It may be that such foodstuffs were bought by the 'employees' using some of their rations. The use of such items would of course improve the diet. 'Onions' were grown in the Akkadian period and are recorded as being issued to individuals at Nippur, and the use of onions in the diet would add to the source of Vitamin C. And coriander leaves (\(\text{š}E\text{.Lú}\)) may also have provided a source for Vitamin C.

Ur III period

During the Third Dynasty of Ur barley continued to be the most common type of ration, being issued to weavers, shepherds, troops etc. However, other items are recorded as rations: at Lagash for instance barley flour (\(\text{TAPIN}\)) was issued to men (\(\text{MRIN}\)) and, unfortunately in an undated text whose place of origin is unknown, \(\text{zb.GU}\) flour, barley flour, and semolina-cream (\(\text{A.TIR}\)) were included in the issues to about 13 men.

Oils and fats also formed a regular ration issue. At Ur, the oil-ration for the troops was 88 SILA 10 shekels issued in the month of the festival of \(\text{ME.KI.GAL}\). Also at Ur, female weavers and men-workers receive 4 SILA and 3 SILA (apparently on half rations) and 5 SILA respectively.

At Ur rations were issued in a number of different commodities: these include barley, dates, bread, fish and oil, often in combination. For example barley and oil was issued to porters and 'court-cleaners', in amounts varying from 10 SILA to 5 SILA \(\text{šE}\) and \(\frac{1}{2}\) SILA oil. Male and female workers received barley and vegetable oil (\(\text{I.GIŠ}\)); barley and fish were issued to ox-drivers; oil and fish to female weavers and their children; male and female workers plus children and old women received barley, dates and oil, while others were given bread, dates and oil. Bread and oil by themselves were also issued as rations while dates alone were quite a common issue. Oil, dates, fish and once bread are also recorded together in a ration list. The men receive amounts of oil, dates and fish, women oil and fish and an old woman and a boy seem only to receive oil (the end of the text is damaged). These all seem to be regular rations,
apparently given on a monthly basis. There is some slight evidence for the employee having some choice about which commodity he was paid in: in one text giving the rations for two officials they receive 'oil on account or — or instead of? — (MU ..., SE) barley and fish. The rate is 10 SILA oil for 20 SILA barley and 1 SILA oil for 5 SILA fish. But even if these officials had a choice this does not necessarily imply that all employees had a similar one.

It has been suggested that the issues of oil at Ur may have been for a year and not for a month. This is partly because the monthly issues of oil at Lagaš (10 shekels) amount to 2 SILA a year, which compares with issues of 2 SILA and 5 SILA a time at Ur. Another piece of evidence thought to favour annual issues is that more than half of the UET III texts dealing with oil rations date to the 12th and 11th month of the year. However, many of these oil issues are made with other foodstuffs which are issued in quantities too small to have been meant to last a year and in Ibbi-Sin Year 9, oil rations were issued on months Number 4, 5 and 9 as well as 11 and 12. In Year 8 barley and oil were issued in month 6.

As well as regular monthly payments some employees appear to have been paid for the job done. For instance during Ama-Sin's reign, beer and bread were issued (on the 10th of the 9th month Year 6) as rations for building his house. The amounts paid varied between 20 (SILA) beer and 20 NINDA to 15, 12.5 and 10. And in a text at Ur court-cleaners receive 8, 7 and 5 SILA flour. None of these amounts fit in with the normal monthly pattern of rates per head (see below) so that it is probable they were issued to cover the length of time required to complete the job.

Other texts from the Ur III period also suggest that rations were issued for shorter periods of time than one month. These are the so-called 'Messenger texts' mostly found at Lagaš and Umma. These texts are lists of foodstuffs issued to individuals travelling between one town and another. On some texts from Lagaš, they are said to be going to Susa or Ur. As the distance from Umma and Lagaš, to Susa is much greater than that to Ur, and the amounts issued do not vary
according to the destination, it seems that the food provided was not for the whole journey. 215

The most commonly issued amounts are 5 SILA beer, 3 SILA bread, 5 GIN onions (SUM), 216 3 GIN oil and 2 GIN 'salt substitute' (NAGA) and 3 SILA beer, 2 SILA bread, 5 GIN onions, 3 GIN oil and 2 GIN 'salt substitute'. There are minor variations within these amounts — for example occasional amounts of 5 SILA beer and 5 bread are given with the standard issues of onions, oil and 'salt substitute', or 4 GIN oil may be issued with only the usual amounts of beer and bread but with no onions or 'salt substitute'. The individuals receiving these amounts are referred to by name and sometimes also by title. Sometimes the quantities recorded are considerably increased: for instance 10 SILA beer, 10 SILA bread, 10 SILA oil, 4 GIN 'salt substitute' and 6 GIN onions — here the recipients are mainly referred to by profession. Sometimes a second type of beer (not measured in SILA) — DIDA-beer — is included with the other standard issues; here the recipients are referred to by name and title, or by profession. Fish are occasionally added to the standard issues, but as far as can be seen from the dated texts this does not happen after Šu-sin's third year.

The variation in amounts suggests that the issues were not intended to last for the same length of time — even allowing for differences according to status. It is possible that the amounts of 5 SILA beer and 3 SILA bread etc, and 3 SILA beer and 2 SILA bread may have been intended to sustain the 'messengers' while performing a specific task or until they reached a way-station where their stores would be replenished. The distance between the beginning of the journey and the way-station marking the first stage is unclear. 3 SILA and 2 SILA barley a day are among amounts given as daily issues made to men at this period and if this is put against the amounts of bread given to the 'messengers' it might suggest that their issues were for 1 day only. However, matters are not as straightforward as that: the barley rations were apparently meant to supply all requirements for cereal preparations such as bread and beer, and separate regular issues of beer are rare. 3 SILA of KAŠ.SIG₃ beer on average would require 3.75 SILA barley 217 and allowing that 2 SILA bread equals 2 SILA barley this
messenger ration would require 5.75 SÌLÀ barley or just under 3 days' regular rations of barley. It is of course possible that 'messengers' received rations of beer in excess of a daily subsistence ration because difficulty might be experienced in obtaining water on their journey.

The identification of NAGA is uncertain but it is probably a salt substitute (see 3.7.2, p.224). It is usually issued together with onions. This strong-flavoured vegetable is easier to eat when dipped in salt; in addition the consumption of extra salt is invaluable in hot climates, especially when performing arduous tasks, as the heat can cause excess sweating and thus loss of salt from the body. Such losses can be made up by taking liberal amounts of liquid and salt. Any journey taking place in southern Mesopotamia, especially from May to September (about months II-VI) would involve travelling through great heat. Out of 19 'messenger' texts for which the month is given, 10 are dated to the 4th, 5th or 6th months, 3 to the 7th, 1 each to the 8th and 9th and 4 to the 11th. Thus many of the 'messengers' were expected to travel in difficult heat conditions. If NAGA can be taken as a salt its consumption would not only improve the flavour of the onions but would add considerably to the health and well-being of the 'messengers'. The inclusion of beer in these rations would also help to prevent collapse from water depletion. (However, the issue of NAGA for 'messengers' during the winter months suggests that it was not given as a preventative against heat exhaustion but that it was considered a regular ration for these employees.) Occasionally flour was given instead of bread in the 'messenger' texts: these include barley flour (TAPIN) and È.GU-flour.

There are several references to fish and meat being issued to employees during the Ur III period. At Ur, for the new year, female weavers were given fattened sheep, and other employees (in a different year) received fish. Fattened sheep and bread were issued as provisions for the ensi's wife apparently as a monthly ration at Lagas, and at Puzriš Dagan, records for the kitchen show that vast numbers of animals were sent
there including ones specially designated for the troops and the warriors or other state employees. And the issue of sheep-carcasses to prisoners of war for them to eat, suggests that meat may have been a fairly commonplace foodstuff at this time. It has been suggested that the prisoners of war would only be given spoiled meat from old or sick animals, which had perhaps begun to go off, but nevertheless it was still eaten by the prisoners.

The regular rations in the Ur III period were as follows:

<table>
<thead>
<tr>
<th>Ref./Date</th>
<th>Town</th>
<th>Recipient</th>
<th>Monthly rate</th>
<th>Daily rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amherst 24</td>
<td>Lagaš</td>
<td>Irrigation workers/ A.BALA.DU.A.TARA.ME</td>
<td>60</td>
<td>2.00</td>
</tr>
<tr>
<td>Šulgi 37</td>
<td></td>
<td></td>
<td>40</td>
<td>1.33</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>30</td>
<td>1.00</td>
</tr>
<tr>
<td>Amherst 47</td>
<td>Lagaš</td>
<td>Farmer/ENGAR</td>
<td>300</td>
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<td>Šulgi 50a</td>
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<td>Oxherder/DUMU.GU₄</td>
<td>120</td>
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<tr>
<td>Amherst 57</td>
<td>Lagaš</td>
<td>'Mourners'/ER.DU</td>
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<td>Workers</td>
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<tr>
<td>RA 55, 25</td>
<td>Lagaš</td>
<td>Ploughmen</td>
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<td>3.00</td>
</tr>
<tr>
<td>TUT 155</td>
<td>Lagaš</td>
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On consulting Figure 1 it can be seen that those people receiving 2 SILA, 1.3 and 1 SILA per day have more than adequate intakes of energy. The protein intake is also adequate. The thiamin and niacin intakes are adequate, as are the riboflavin; in the case of men receiving 1 SILA a day the riboflavin intake is on the low side. Calcium levels too are adequate, again except for the men and women with 1 SILA per day - but even here they are only a little below the FAO recommended levels. And the iron intake is sufficient even for the women.

If the lower levels are considered, the energy intake is much too low, and the man receiving .16 SILA per day has a disastrously low energy intake if this is his permanent daily ration. He has been left out of the following assessment.

The children on .3 SILA are only adequately provided for if they are in their first year. The calcium levels are low but the iron levels seem adequate as those females receiving .3 SILA a day are called 'daughters' and therefore may be assumed to be below puberty. Thiamin and niacin are adequate although those men receiving only .3 have rather low intakes. The riboflavin intakes are low.

As before, it can be seen that these barley rations fail to supply Vitamin A and Vitamin C, unless such foodstuffs as malt are prepared, giving a source of Vitamin C.

The mixed rations, such as those found at Ur, provide much better diets nutritionally. They are however difficult to assess quantitatively as only very rough estimates can be made for the value of the issues of dates and fish in litres and then grams. If the value is taken to be 1 SILA = 1 litre (as in the barley rations), an estimate can be made for the calorific value. An individual receiving .6 SILA barley and .6 SILA dates per day would have a more than adequate energy intake (3390 Calories). The dates would supply some Vitamin A. The fairly regular issue of meat would improve the protein value of the diet, and counteract the deficiency of the amino acid lysine, found in the mainly cereal-based diets.
The Isin/Larsa and Old Babylonian periods

In the Isin-Larsa/Old Babylonian periods rations were issued in a number of different foodstuffs, although barley continued to be the most common.

At Ur rations were issued in barley, bread, dates and possibly dairy products. Both barley and bread (made from barley) are recorded as rations in a number of texts. For example, on one occasion 30 ȘILA barley and 80 ȘILA bread were issued to each of 30 men divided into 3 teams,\(^\text{229}\) while on another occasion 3 men received 90 ȘILA bread and a fourth 30 ȘILA barley and 40 ȘILA bread.\(^\text{230}\) In the latter, the mixed ration equals only 70 ȘILA altogether, which may mean that barley was considered more valuable than bread, perhaps because the recipient had the choice of whether to make it into beer or gruel etc. On the other hand the fourth man may have simply been paid less. Bread alone, at the rate of 120 ȘILA and 90 ȘILA was sometimes issued as rations.\(^\text{231}\) The evidence for regular rations of oil and dates is smaller than in the Ur III period, but a shepherd received 10 ĠIN oil and 1 ȘILA dates in the 3rd month, 7th year of Abisare.\(^\text{232}\) The small amount of dates involved suggests that this may have been a payment for one day, or for a specific job. Oil and dates are recorded in a list of rations given to various people including pāšišu-priests.\(^\text{233}\) Among the other items are beer, 2L.CU-bread, flour and ghee. Dairy products may have been a regular form of rations at Ur. One text gives details of amounts of milk or sour milk (GA(?)) distributed to various individuals.\(^\text{234}\) Ghee was also issued to individuals\(^\text{235}\) but it is not clear whether these issues were for rations or for some other purpose.

At Larsa rations were paid in barley, dates and flour. Men working from months 9 to 11 (probably year Šumuel Yr.12)\(^\text{236}\) received 60 ȘILA barley a month. Agricultural workers during harvest time appear to have been paid according to the type of job.\(^\text{237}\) For example barley-cutters receive 20 ȘILA barley each while the binders (ERIM Lú-tu(?)-tab-ba) received 15 ȘILA and the men who gathered up the sheaves received only 10 ȘILA. An extra 60 ȘILA barley was allowed for providing drinks for all those workers, but it is not known what period this was for. Other workers, apparently connected with threshing,\(^\text{238}\) were
paid at the rate of 12 ȘILA and 4 ȘILA while some subsidiary workers received 2 ȘILA each for drinks, presumably for drinking during the threshing.

Small quantities of flour were issued to named individuals in a list which also includes amounts of flour for baking. The amounts for the people are 1 ȘILA and 1.5 ȘILA - possibly issued for one day. Dates also were used as regular rations; in one case women were paid in this foodstuff - the amounts were 15 ȘILA and 10 ȘILA but in one case 15 ȘILA are given for 2 women. The dates are referred to as ȘE.BA - (barley) rations.

At Lagaba, in northern Babylonia, barley forms the main regular ration. One text records the amounts issued to individuals as 'food for the house' (ȘUKU.š). Dates as food for the household were issued together with dates as fodder and for a named individual. Dates and barley were sometimes issued together as a regular ration. Each person did not necessarily receive both barley and dates - some might only have dates while others received only barley, but a number did receive both. There does not seem to be any system whereby more barley was issued to an individual or more dates. One man might receive 60 ȘILA barley and 30 ȘILA dates while another in the same list received 10 ȘILA barley and 15 ȘILA dates.

Two texts list people who in nearly every case received issues of both barley and dates. One gives the rations for the 'house' for the month of AB.E.A and the other the food for the house, dated 1st of APIN.DU.A - both Samüliluna year 28.

The quantities for the month ranged from 30 ȘILA barley and 30 ȘILA dates to 10 ȘILA of each (in most cases the amounts are equal but occasionally one person may receive more or less of either commodity) while the amounts on the other text are 1 ȘILA barley and 1 ȘILA dates, or 1 ȘILA barley and 1 ȘILA dates (one person has 4 ȘILA barley and another 2 ȘILA barley only). The names of three people appear on both lists.
Ipqu-annunitum received 30 S\textsuperscript{1}ILA each of barley and dates for the month but only 1 S\textsuperscript{1}ILA of each on the other list. Ṣambuhtum received 30 S\textsuperscript{1}ILA of each as opposed to 2 S\textsuperscript{1}ILA barley, and Alitum received 10 S\textsuperscript{1}ILA barley and 10 S\textsuperscript{1}ILA dates compared with 1 S\textsuperscript{1}ILA of each. It would seem that the second list, dated 1st of APIN.DU\textsubscript{8}.A, was for one day only; those people receiving 30 S\textsuperscript{1}ILA barley and dates were paid at a rate of 1 S\textsuperscript{1}ILA per foodstuff per day. Alitum would seem to be better off paid daily as this rate is equivalent to 15 S\textsuperscript{1}ILA barley and 15 S\textsuperscript{1}ILA dates per month! The fact that Ṣamūhtum received 2 S\textsuperscript{1}ILA barley but no dates on 1st APIN.DU\textsubscript{8}.A suggests both that he was able to 'opt' for what rations he received and that 1 S\textsuperscript{1}ILA barley was held to be equal to 1 S\textsuperscript{1}ILA dates in this case.

A tabulated list of barley, oil and dates\textsuperscript{248} suggests that all these items were considered regular rations. However, in this case no individual mentioned received all three - four were issued with barley and oil, while the fifth receives oil and dates.

At Lagaba, as at Larsa, it seems that issued of drinks were made for workers\textsuperscript{249} probably, though not certainly, for consumption while working.

The evidence from the Diyala region is dominated by the existence of a Law Code from the Kingdom of Ešnunna,\textsuperscript{250} which lists required rates of pay for various professions. The hiring fee for a wagon, with oxen, and the driver, is 1/3 shekels silver and 100 S\textsuperscript{1}ILA barley; a boatman received 11 S\textsuperscript{1}ILA, plus 2 S\textsuperscript{1}ILA per kor capacity of the boat; a harvester 20 S\textsuperscript{1}ILA barley or 12 grains silver; a winnower 10 S\textsuperscript{1}ILA barley; a donkey driver 10 S\textsuperscript{1}ILA barley and a further 10 S\textsuperscript{1}ILA for the donkey; and a hired man received 15 S\textsuperscript{1}ILA barley and 1 shekel silver.

The wagon-driver, boatman and donkey driver are specifically said to 'drive' for the whole day while the hired man is said to receive daily wages. A second hired man is to serve for one month and received 1 shekel silver plus 60 S\textsuperscript{1}ILA barley for his food.\textsuperscript{251} It is not clear whether these are daily or monthly rates: as daily rates they appear to be high. It is possible that (with the exception of the hired man
who was taken on to work for a month) the payments were connected with particular jobs of work - the harvester and winnower for the duration of the harvest, the boatman and wagon-driver for the length of a journey - so that the references to 'driving for the whole day' would only refer to their hours of work. However, these men do not seem to be employees fully dependant on their masters for everything so that they may have been paid at a higher rate.

Contracts of hire give varied conditions of pay. In a contract hiring a man for 1 year, from Harmal, the hired man received 4 CUR barley (or 100 SILA a month/3.3 a day) and 6 mina wool. Another contract, also from Harmal, is more complicated. The hired man receives 4 CUR barley in wages plus 1 shekel silver for his wool allotment. He is to get 2 (GUR) 3 (PI) 3 (BAN) (that is - 810 SILA) at the beginning of his service and the rest of his wages when he has completed the year. If he is unsatisfactory or runs away he will forfeit his wages. The amount given at the beginning of the year equals about 2.25 SILA a day.

At Neribtum (Ischali) a contract gives the details of a shepherd's hire for a year; the wages are 5 CUR barley plus 2 CUR 2 PI rations and 1 shekel of silver for clothing. In addition the shepherd will receive 50 out of every 100 sheep, but he must make good any losses from the flock out of his wages. The rations equal 2 SILA a day.

If these amounts are compared with the Laws of Eannuna it can be seen that the amounts for food are similar to those paid to the man hired for a month, but the additional payments of silver for clothing and the extra wages in barley suggest that the hirers were more generous than the Laws. The foodstuffs supplied to these workers was barley but the references in one Law (No.11) to oil suggest that this was also provided. The terms for the shepherd enable him to build up his own flock and thus provide him with dairy products such as sour milk, cheeses and ghee.

The Laws of Hammurapi also give directions about payments for workers. In No.258 an ox-herder hired for a year receives 6 CUR
barley - 5 SILA per day. No.271 says that a driver, wagon and oxen
are to get 180 SILA a day, but as No.272 gives 40 SILA a day as the
hire of a wagon alone, 140 SILA can be taken as the fee for the driver
and oxen. Several laws give the amount of silver to be paid: No.273:
a hired man should get 6 grains a day for 5 months and 5 grains a day
for 7 months (at Ešnuma rates, this is equivalent to 10 SILA and 8.3
SILA), other workers receive 5 grains (No.274) and 3 grains (No.275).

Some contracts either roughly contemporary with Hammurapi or
from the reign of his son Šamšuiluma, give further details of the wages
and maintenance current at the time. From Nippur, in the reign of Rim-
Sin of Larsa,
256 a contract gives the details of maintenance to be
provided yearly by 4 brothers for their sister, a nadītu: this is 2
GUR, 2 PI barley (2 SILA a day), 8 SILA oil, and 8 mana wool. From
Šamšuiluma's reign (either in the 3rd or 4th year)
257 a tablet records
that a slave-girl is to receive (as wages) 1 GUR barley (.8 SILA per
day) while in an adoption contract (from Šamšuiluma year 13)
258 the
adopter will be given an amount of bread (?) every month, plus 1 GUR
1 PI barley a year (1 SILA a day), an amount of wool and 5 SILA oil.
These amounts, which are for maintenance, are low compared with the
amounts specified in the Laws of Hammurapi. They do show that barley
and oil were considered staple foodstuffs. A difference may be that
the amounts paid in the Laws of Hammurapi were intended for the support
of families, while the amounts given for maintenance are for one person.

At Mari, there are two main texts giving details about rations
paid out to employees. One deals with personnel at Mari itself
259 while the other deals with workers at Terqa.
260

These lists give the monthly rations distributed to various types
of workers. They include males and females, young men, women, boys,
girls and small children, so that it is possible to see the differences
due to age, sex and status. The rations are given in barley or bread,
both of which are included in the barley totals at the end of the sections and at the end of the texts.
Three women at Terqa receive a particular bread (NINDA.GU) but this too is included in the barley totals at the end of the text. Often both types of rations are issued to people performing the same jobs. At Mari, 21 field workers received bread and 7 barley, while the 14 female weavers have bread and 22 barley. Also at Mari, a group of young people all received barley rations. There seems to be no distinction among the professions between bread or barley, nor does there appear to be one in the amount of rations issued. Men receiving 90 SILA a month can get either bread or barley, and this applies to all the other grades of pay.

One pound of flour will bake a loaf of about one pound in weight so that 1 SILA flour would in turn produce a 1 SILA loaf of bread. Barley would require grinding into flour before bread could be produced but as most of the grain would be used, and little loss might be expected from sifting etc, it may be reasonable to take 1 SILA barley to equal 1 SILA flour - and so 1 SILA bread, so that there is no real difference in the quantities.

There are a number of problems involved in issuing monthly rations. Barley can be handed out once a month and stored by the recipients. It can also be used in a number of ways - to make bread, beer, burghul etc. But bread will not keep for a whole month and in many areas today it is baked every day according to need. If the actual bread was issued, this presupposes that the recipients came every day, or perhaps every other day, to receive their rations. However, the term NINDA may be used here in a manner similar to that of the naptam Karrim texts, where it covered issues of different flours and prepared dishes. Flour could be distributed monthly, in the way that barley could. The choice may have been one of personal preference among the workers.

At Rimah, barley rations were issued to various employees in Iltani's household including men, women, young people and children. Barley was also the usual type of rations at Chagar Bazar. A number of tablets were found at that site dating mainly to the 11mu of Adad-bani and covering about 10 different months of the year. The employees
receiving rations again include men, women, young people and children. While these ration lists do not suggest how the barley was utilized by the employees, two other texts suggest that barley was issued to make beer and bread. In one quantities of barley were given to 13 girseq-d-officials to make bread and beer at a rate of 1.3 ŠILÂ each. Barley for bread and beer was also issued to trainee-scribes.

There are fewer texts referring to the issue of meat to employees in the Old Babylonian period, but of course this may only be the accident of discovery and publication. However, in some cases its issue may be inferred. For instance at Ur, issues of ghee and dates are made to individuals together with pig-fat. As pig-fat can only be obtained from the carcase of a pig, it is reasonable to suppose the rest of the pig was eaten also, possibly by employees. At Sippar numbers of sheep were issued as provisions, and for the 'heartening' of the foreigners (PAD ù šá.gi.kará ša a-he-e) (perhaps the meat was to be used at feasts to which foreign visitors to Sippar were invited).

There is some evidence for meat being issued to individuals at Mari. A few texts list one or more sheep against the name of an individual man, while another, unfortunately badly damaged, lists sheep and 'legs' (UZU malNku) 'remitted' (puqqud) to named individuals who included female scribes and girl-singers. Officials such as Kibri-Dagan, Šamaš-nasir and Belsunu are listed with sheep and oxen - the items being totalled as 7 GÎ§.PU, (possibly some joint or portion?).

Prepared food was issued for rations at Mari, as well as barley and plain bread. Sour-bread (NINDA emsu) was issued for the maintenance of the female-weavers, for the messenger of Qatna and for two named individuals. Sasq too was issued for female musicians, probably as monthly rations, although this is not certain. These references date to the 'Assyrian period' at Mari but a naptan [karrim text from the reign of Zimri-Lim specifically records the issue of sour-bread for the king's own meal. The messengers' bread is not added into the total of food for the king's meal.
An individual, Neptim, is also included in a naptam larrim list: he receives 60 ŚILA sour-bread—probably a monthly ration based on the amounts given to a variety of employees in the wage lists. 275

CIR-officials and a 'deportee' (LÚ.ZI) 276 are included in a 'monthly' account of the king's meal. 277 The 'deportee' is issued with 10 ŚILA NINDA mersu and 4 ŚILA oil on the 18th of Abum while the CIR-officials have 80 ŚILA mersu, 5 ŚILA oil and 1½ ŚILA 'honey' on the 30th of that month. The inclusion of these people within a record of the king's meal, especially as there is a separate entry for the king's meal on 30th Abum, suggests that the CIR-officials were not among those members of the household who regularly sat down at the king's table. On the other hand, this may mean that the CIR-officials were not in fact eating at Mari on that occasion but had been sent elsewhere on the king's business.

Another preparation which was issued to people was himri, a fermented drink made from barley, to which fruit (inbu) was sometimes added. This was issued to the abarakkatim for their use, and the large quantities of barley and fruit which were used in its manufacture suggest that it was a common drink. 278

The regular barley rations in this period are as in Table 14 (p.292). 279 (See also C.71.1.)

It can be seen from this that children and young people receive widely varying amounts of rations. The distinctions are according to age and status. For instance at Mari, a number of males are described as TUR and receive 40 ŚILA per month. These youths are associated with other men who receive either 90 or 60 ŚILA. It seems likely that they are 'apprentices', young adolescents learning their trade. 280 Girls, described as M.TUR (young girls) receive 60 and 40, 30 and 20 ŚILA, suggesting that a scale according to age, within a main age group, was in operation. The young girl who received 60 ŚILA is called a dependent of Ewennikki and may have been in a special position as she receives more than an adult female who is a dependant of another person. The energy value of the rations provided for children and young people at
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<td></td>
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<tr>
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Mari is on a satisfactory level: even the lowest amount given to a girl (.6 SÌLA) would provide her with 1800 Calories per day— a fairly respectable amount for a child (if allowance is made for size and weight).

At Rimah and Chagar Bazar, the men receiving 1.0 SÌLA and the women receiving .6 SÌLA a day have a low Calorie intake, as are the riboflavin and calcium intakes. The children's rates go down rather low. At Rimah girls are listed as receiving .5 SÌLA and .3 SÌLA per day. In one case a girl has .6 SÌLA per day. While the rate of .5 SÌLA may possibly provide sufficient Calories etc for a child, .3 is too low to be considered adequate. Most of the children at Rimah are referred to as TUR and MÈTUR after their mothers' names and the rations for the mother and the child are lumped together—it is not always easy to be positive about the division between mother and child unless this is indicated by the numbers of women and children in the sub-totals. At Chagar Bazar the children receiving .3 SÌLA per day may have been infants, and as such would receive sufficient Calories.

The stability of the issues can be seen from the texts from Chagar Bazar. For example a shepherd receives the same ration (30 SÌLA) a month for different months, a groom is shown to receive the same ration (40 SÌLA) a month for two different months and a farmer and his wife and children receive the same amounts for two different months (farmer: 60 SÌLA, wife and two children 20 SÌLA each).

The main qualitative problems arising from the rations in this period is where did the Vitamin A and Vitamin B come from.

Mid-second millennium

At Nippur during the Kassite period, both barley and dates formed the main rations. Barley was distributed to employees as individuals and as families. Issues of barley and dates are given for twelve months in a text which gives not only the sex of the recipients but their relationship to each other—such as son, wife, grandson etc. The issues are the same for each month and are expressed as if only one commodity, so that it is not certain how much was barley and how much dates. But as dates are mentioned in the heading it is probable that both were used in the distribution of rations.
At Nuzi barley was probably the most common type of rations, but bread-wheat (GIG) was also given. For example employees from the palace, including men, women and children, of many different professions, all received 20 SīLA barley each a month, while in another text a group of women were given both bread-wheat and barley. These ladies (who were weavers) were also given amounts of oil, but it is not clear how regular these issues were or for what purposes.

The rations issued monthly are as follows:

Table 15

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Town</th>
<th>Recipient</th>
<th>Monthly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEXIV 91</td>
<td>Nippur</td>
<td>Women</td>
<td>12.5</td>
<td>.4</td>
</tr>
<tr>
<td>BEXIV 58</td>
<td>Nippur</td>
<td>Men</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>40</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>25</td>
<td>.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>30?</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>20</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>15</td>
<td>.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>20</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infants</td>
<td>10</td>
<td>.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infants</td>
<td>5</td>
<td>.16</td>
</tr>
</tbody>
</table>

(This text is headed SÉ and ZU.LUM but the individual issues are expressed in SÉ (barley).)

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Town</th>
<th>Recipient</th>
<th>Monthly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS XIII, 19</td>
<td>Nuzi</td>
<td>Men</td>
<td>100</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men</td>
<td>90</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>HSS XIII, 113</td>
<td>Nuzi</td>
<td>Young men</td>
<td>20</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Young men</td>
<td>14</td>
<td>.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>14</td>
<td>.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>10</td>
<td>.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boys</td>
<td>10</td>
<td>.3</td>
</tr>
<tr>
<td>HSS XIII, 406</td>
<td>Nuzi</td>
<td>Men</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>20</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>20</td>
<td>.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>14</td>
<td>.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>10</td>
<td>.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>4</td>
<td>.13</td>
</tr>
</tbody>
</table>

If Nippur is considered first, it can be seen that the lower ration levels (women receiving .4 and men receiving .5 and the young people and children on .5 and .3), all have now energy levels. The
children on .16 ŚILA per day are described as 'breast-fed' (GAB) so that their rations are only a supplement. Such rations also tend to be low in calcium and riboflavin, while the levels of iron for the adult women are a little low (see Fig.1).

The distribution of rations according to age is well illustrated at Nippur. Two texts, dated some 14 years apart, record a number of the same names. The following changes are to be seen:

Table 16

<table>
<thead>
<tr>
<th>Name</th>
<th>A (BEXIV 58)</th>
<th>B (BEXIV 91a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dukkinilu</td>
<td>20 ŚILA</td>
<td>60 ŚILA</td>
</tr>
<tr>
<td>Ina-pi-Marduk-dinu</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Lultamar-Nusku</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>Rabâ-Ša-Ishara (f)</td>
<td>10</td>
<td>66.6 (for her family)</td>
</tr>
<tr>
<td>Innamar (f)</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Ina-Akkadi-ra-bat</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>(mother of Innamar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hululatim (f)</td>
<td>10</td>
<td>12.5</td>
</tr>
</tbody>
</table>

In the earlier text Dukkinilu is described as a GURUS.DUMU.DUMU. Fourteen years later he received a full adult rate. Similarly, Lultamar-Nusku had risen from a GURUS.DUMU.DUMU to a full-grown adult. Lultamar-Nusku was described as an UŠ.BAR in the earlier text so that it seems he was already working. He has two sisters, Rabâ-Ša-Ishara and a baby sister (M.L.DUMU.GAB). In the second text Rabâ-Ša-Ishara has risen from a ration of 10 ŚILA to 66.6, said to be for her family. This suggests that either she has children of her own, or that she has been made responsible for her baby sister (and possibly her mother, unless the latter has died).

Hululatim, described in the first text as a M.L.DUMU.GAB and either baby aunt or cousin of Dukkinilu, does not appear to have received a full adult ration. In the later text she shared 25 ŚILA a month with another female.
Innamar, Mú.DUMU.GAB of Ina-Addadi-rabat, in the earlier text, has graduated from 5 SÌLA to 95 SÌLA in the later, while her mother has a slight increase. As this is not a normal increase for age, there must have been a change in the status of Innamar.

The fact that two GURUS.DUMU.DUMU received different rations, one of 20 and one of 15 SÌLA, suggests that either they were of different ages (although Lultamar-Nusku cannot be very young as he was working—possibly around 12-16), or there is some difference in the family position. For instance Dukkinilu's father seems to be away from the family on a journey and did not receive any rations.

At Nuzi, rates of rations tend to be lower, as many of the women, young people and children receive only .46 SÌLA while in one text women receive only .33 and .13 per day. The energy value of these diets is low, as is the calcium and riboflavin. The iron for the women with only .33 and .13 a day is also low.²⁸⁹ (Fig.1)

Some palaeoethnobotanical evidence for foodstuffs has been found in this period, as what may be the remains of a meal were found in the shaft of a well in the Burnt Palace at Nimrud, dated to around the 13th century.²⁹⁰ It contained shrivelled barley husks, vegetable matter, twenty puffed grains and a grape pip, suggesting that a mixed meal of barley, vegetables and fruit (dried or fresh) had been eaten.

Neo-Assyrian period

Monthly ration lists are rare in the Neo-Assyrian period, but a number of letters and administrative texts dealing with provisions for the army indicate the different types of foodstuffs consumed by the ordinary people.

A letter from a king²⁹¹ to one of his officials commands that each of the 'king's troops' under him should be given 1 homer (100 SÌLA) of barley each, 30 SÌLA are for their flour during the campaign while the remaining 70 SÌLA are for their families. Unfortunately the expected duration of the campaign is not given. Another commander,²⁹² in charge of equipping a contingent of chariot-troops asks, in addition to fodder and straw, for 90 SÌLA flour, 1 SÌLA wine, ½ SÌLA
oil, 10 ŠILÁ salt, 10 ŠILÁkuddimmu and 120 ŠILÁ kibbân-plant. The quantities of wine and oil asked for are very low.

Another cavalry commander was given the daily needs of his troop contingent: x bowls of wine, 210 ŠILÁ bread, 200 beer, plus fodder and copper to buy oil for the lamps. During Sargon's 8th campaign, the army was provisioned with flour and wine.

A long text from Nimrud, unfortunately damaged, lists amounts of foodstuffs issued to various people and for various purposes. The foodstuffs include bread and beer, apparently made from barley, and the people involved include palace servants, smiths, weavers, and the man who feeds the birds. Fodder for the horses is also issued. Some barley is also issued expressly to obtain milk from cows (GA.ĀB); the milk seems to have been intended for various parts of Assyria, one lot went to Arrapha, while others are for estates in the 'lower country', in the country of Rirua and the country of Baru-a.

This damaged text gives a little evidence for the quantitative value of the diet at Nimrud.

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Recipient</th>
<th>Monthly</th>
<th>Daily</th>
<th>Litres*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parker, ii 13'</td>
<td>Charioteer (M)</td>
<td>30 ŠILÁ</td>
<td>1 ŠILÁ</td>
<td>1.88</td>
</tr>
<tr>
<td>Iraq 23, ii 23</td>
<td>Servant</td>
<td>18</td>
<td>.6</td>
<td>1.12</td>
</tr>
<tr>
<td>ND 2803, ii 21</td>
<td>šakintu-woman</td>
<td>120</td>
<td>4</td>
<td>7.5</td>
</tr>
<tr>
<td>ND 2803, ii 33</td>
<td>Women</td>
<td>42.5</td>
<td>1.4</td>
<td>2.6</td>
</tr>
</tbody>
</table>

* 1 ŠILÁ = 1.81 litres

(Many of the figures are only tentatively restored)

These are all more than adequate rations.

Issues of wine were made to units of the household of the ekal māšarti at Nimrud. It has been calculated that 1 ŠILÁ/qû of wine was issued at a basic rate for ten men per day, or for 6 skilled or professional men, with a more generous ration for senior men. If this qû is taken as 1.8 litre this would allow .18 litre per man.
(with the ten-man-ration), but if the \(\text{q}\) is taken as the single \(\text{q}\) of .9 litre, then only .09 litre is given per man. This small amount of wine, in either case, indicates that wine was not intended to be the main form of drink. And this is also seen from the provisions listed for a contingent of chariot-troops in which the amount of wine asked for is only 1 \(\text{q}\). Possibly the 120 \(\text{q}\) barley listed here is for beer. In the other list of cavalry requirements given, 200 \(\text{q}\) beer are listed with x bowls of wine.

Many small pottery vessels were found at Nimrud. Some of these have been measured and would have held from 25 ml to 100 and 200 ml. The wine ration (at .18 litre per man) would have filled the smallest vessel some 7 times or (at .09 litre per man) 3½ times. The average capacity of the vessels measured was just under 60 ml. It seems likely that these were not for the main thirst-quenching drink of Assyria, but the social 'coffee' or possibly liquor-type drink which was sipped rather than gulped.

4.2.6 Land tenure

Some private people in Mesopotamia appear to have owned and cultivated their own land, or to have been assigned land for cultivation by the State. The crop or part of it from this land may be expected to have acted as the cultivators' source of maintenance. It is not proposed to go into detailed discussion about the land tenure system, but simply to remark on its existence.

In the Early Dynastic period, it has been seen that some workers received rations for part of the year but were also allocated a piece of land which maintained them in the rest of the year. Private land has also been attested for the Ur III period and there may also have been land assigned to people for cultivation in exchange for part of the crop. By the Old Babylonian period there is evidence that some men were allocated land they employed other men to cultivate. The crop was divided so that the owner usually received \(\frac{1}{3}\) and the cultivator \(\frac{2}{3}\). If the state or other private owner employed the cultivator the crop was similarly divided. Other individuals were
assigned fields or gardens which they could cultivate in exchange for certain services for the State. There were many regulations controlling this type of land tenure. 304

In the mid-second millennium land also seems to have been cultivated in exchange for services 305 and this also seems to have continued in the first millennium. Land was also privately owned and part of the crop was paid to the State as part of its revenue. 306

Whether this land provided an adequate source of maintenance can only be assessed if the size of the plots and the amount of yield is known. For example: at Lagas, „Sebîlu received 72 Sîla a month from the 8th to the 12th month and he was also allocated 26 gânu Kur6 (see p. 273). At a yield of 1004.6 Sîla 307 an ikû this would give him a harvest of 26,119.5 Sîla. Assuming he kept 2/3 of this, he would have 17,413 Sîla or 14,452.79 litres for 7/8 months - 2,064.6/1,806.6 litres a month. Lugalpae also received 72 Sîla in rations and had a plot of 4 ikû which at the same yield would provide him with around 278 litre a month for 8 months. 308 Such fields would provide adequate rations even if the yields were lower, and the fields were to supply whole families.

In the Old Babylonian period the average yield was 500.4 Sîla per ikû. 309 Assuming the cultivator retained 2/3, this works out at 27.8 Sîla per month, which would provide 2520 Calories per day. A figure, although lower than that recommended for an adult male by the FAO, is more than sufficient for an adult female and is in fact bigger than the average energy intake (2255 Calories) for Iraq as calculated by the United States Department of Agriculture in 1961. 310

The number of ikûs farmed by the cultivators varied. In the research done by the Diyala Report 311 it was found that during the reign of Šumu-abum to Šamšu-iluma, the size of plots varied from 3 ikûs to 35. Taking the smallest size, a plot of 3 ikû was expected to have a yield of 900 Sîla per ikû 312 so that its cultivator would have 1800 Sîla per year - 150 per month for his and his family's maintenance - allowing an average of a family of 4 313 this would
give 37.5 SILA per head a month, a similar amount to the rations (3420 Calories).

From these two brief examples it may be suggested that the cultivator relying only, or mainly, on his share of his crop, might expect to have a similar standard of living as those workers relying solely on rations. Obviously this depends on the number of people in the family relying on the crop, whether outside labour had to be paid for, and whether the area listed as issued was the cultivated area every year. Šemlüdu would not have been able to cultivate all his 26 iku himself (9.36 hectares), especially as he was in charge of other workers. He may therefore have had to pay shares from his part of the crop to other subsidiary cultivators.

One of the great advantages in being allocated fields or gardens for cultivation is that the cultivator not only had access to the crop of the land but had the opportunity of growing vegetables etc in the margins of a cereal field or round the base of the fruit trees. In the case of gardens, he would have direct access to fruit - valuable sources of Vitamin A and Vitamin C.

4.3 Conclusions

The overall picture of the diet of the ordinary people suggested by the ration lists is one in which there is a marked deficiency of Vitamin A and Vitamin C, and some deficiency in riboflavin and calcium. In addition some employees receive inadequate amounts of Calories. It is instructive to compare the findings calculated from the ration lists with the results of two nutritional surveys carried out in modern Iraq. 314

In the earlier modern survey (A) 55 families from different parts of Iraq were classified into 5 groups according to income. Class I (15 families) included merchants, land owners and important government officers, Class II (18 families) were less well-to-do merchants and government officials, Class III (6 families) lower government officers
and workers in trade, Class IV (6 families) poor city dwellers mainly working as servants or labourers, and Class V (10 families) poor peasants or mud workers from villages near the big towns. The numbers of persons in each family were counted and the diet was calculated as grams per day per family. This total was added together and divided by the number of people in the family (excluding infants except for milk). Every two children under 15 were considered as 1 adult. The disadvantage of such a method is that differences in consumption due to age and sex are obscured.

The later survey (B) was made on a sample of families (105) of brick workers living around Baghdad. The average consumption per capita was calculated and compared with a survey made of farmers in the Baghdad Liwa. Survey A found that calcium intake was low in all classes, varying between 431 and 722 mg per day. At the time of the survey this was considered to be 'somewhat near the minimum requirements', but present-day recommended intakes (between 400 and 700 mg) show that this intake was adequate. A low intake of milk was taken to be a factor in the development of rickets and dental caries. The iron intake was low in Class V. Class V was also low in Vitamin A, thiamin, niacin and Vitamin C. Class IV was deficient in riboflavin and Vitamin A, Class III in calcium and thiamin. Classes I and II had reasonably nutritional diets, except for calcium.

Survey B also found that the average consumption of calcium, Vitamin A, riboflavin and Vitamin C were low for both the brick workers and farmers, although the latter's intakes of calcium and riboflavin were slightly higher than that of the brickworkers. The diet consumed was a mixed one.

In Survey A the staple diet (calculations were based on average consumption) was bread. All the five classes consumed large amounts of khubez-bread (Class I had the lowest amounts) and Classes I and II ate substantial amounts of sammon-bread. Class III only took small quantities of sammon-bread, Class IV took very little and Class V none.
at all. The largest consumers of rice were Class IV, although all classes had some. Meat, fish, chicken and offal were part of the daily diet of Classes I-III, with Class IV consuming only meat, fish and chicken. Class V only had small amounts of meat and fish. The greatest milk drinkers were classes I and V. Other dairy products were fairly widely eaten, although Class IV had no butter and Class V no cheese. Ghee was the main cooking oil.

Fruits were also quite common in Classes III and IV, although in Class IV the quantity of citrus fruit was small. In Class III the most popular fruit was water-melon, followed by bananas and dates, while in Class IV the two main fruits were water-melon and melon. The amount of fruit taken in Class V was much lower. Again the main fruit was water-melon, with dates second and melon third. The only other fruits listed as purchases were very small quantities of dried grapes and lemons.

A wide range of vegetables was purchased, including onions (in all classes), egg plant, okra, tomatoes, cucumber, marrow, broad beans, cow and green pea and pumpkin, turnip and beetroot. Only small amounts of potatoes were taken by Class V. Spinach, cauliflower, cabbage and french beans were not bought by Class V, whose main vegetables were marrow, followed by pumpkin and okra. Burghul and lentils are used by all classes although the amounts taken by Class V are so small as to be almost insignificant. Other foodstuffs purchased include sugar (by all classes), tea and coffee (the amounts in Class V were very small).

In Survey 3 again the staple food was based on bread - made from barley flour and whole-wheat flour. Rice was also important. Diluted sour milk was the main dairy product and only small amounts of fresh milk were consumed. The farmers, as might be expected, took far more sour and fresh milk than the brick-workers. And they also consumed more butter/ghee. The meat intake came from meat, fish and chicken - here the brick workers had more than the farmers. Small quantities of pulses (such as lentils, gram, chick peas, cow peas and broad beans) were eaten. Vegetables were also consumed (unfortunately only divided
in the survey as 'winter' and 'summer' vegetables) including fairly small amounts of potatoes. The main fruits were watermelon and melon with dates coming third. The farmers' intake of these fruits was much larger than the brick workers'. The brick workers bought small amounts of citrus fruit, but the farmers' purchase of citrus fruit was almost insignificant.

A certain amount of variation according to area was found in these surveys. For instance Survey A found that dairy products were mainly consumed by those peasants with a cow, goat or sheep (although most of the milk products were sold) and that city dwellers did not like milk. Rice was important in the south and central areas, while burghul was more important in the north. Dates were available in the south and fruits, either fresh or dried, in the north. The rate of extraction of flour for the bread varied: in the cities the bread was made of high extraction flour so that it was white. Families tended to buy it. In small towns and villages the bread was usually made at home and tended to be made from low extraction flour.

Another survey, of the nutritional status of infants and children between 1 month and 5 years, was carried out in three different areas of Baghdad \(^{317}\) covering people of different economic status. It was found that the nutritional status of the babies fell from the 4th month and was marked by the 7th. The growth deficit continued up to 5 years old. About 2-5% of the 'comparatively better off' families suffered from severe malnutrition. It was suggested that ignorance of proper child-feeding and the frequency of infections were the cause of this poor state of nutrition, as well as poverty.

It can be seen that a similar wide range of foodstuffs to that available in modern Iraq was also available in ancient Mesopotamia (with the obvious deletion of food only fully available in this area since modern times, such as potatoes, tomatoes and even rice and citrus fruits).

Texts show that cereal preparations such as bread, gruels, porridge, 'burghul', roasted barley, malted grain etc were available
throughout the period, as was meat from cattle, sheep, goats, game animals such as deer and hare, fish and birds. This evidence is backed up by the finds of bones on sites and the depiction of feasts and foodstuffs on cylinder seals and reliefs. A wide variety of vegetables was available, including onions, chick peas, lentils and cress. Although onions and cress appear only in the textual record, chick peas and lentils are also found in the palaeoethnobotanical record from the third millennium. Cucumber is mentioned in Early Dynastic III texts at Lagaš and was found in the palaeoethnobotanical remains at Nimrud in the first millennium - so that it seems reasonable to suppose it was available throughout the period. Other vegetables which appear in the palaeoethnobotanical record are the grass and field pea, bitter vetch and broad bean, and it is possible that these may be equated with some of the terms for vegetables, as yet unidentified, found in the texts.

Many types of fruit were also available. The date was common; in the south it is mentioned in texts from the Early Dynastic III period and it appears on cylinder seals and plaques. References to it in texts at Nuzi in the mid-second millennium and its appearance on a Neo-Assyrian relief from Nineveh suggest that it may also have been grown in the north. Pomegranates were available from the Ur III period and possibly earlier, while figs and 'apples' and probably grapes were available locally from the Early Dynastic III period. Pears, plums, 'apricots' are mentioned at Mari in the Old Babylonian period and at Nuzi and later in the Neo-Assyrian period. These references, and the depictions of fig and pomegranate trees on the Neo-Assyrian reliefs suggest that fruit was plentiful, especially in the north.

Ghee ( gönderil) is the most commonly-mentioned dairy product, but sour milk and cheese also appear frequently, especially in offering lists. Actual depictions of milking or dairy scenes tend to be from the third millennium but as herds of cattle, sheep and goats continue into the first millennium and as the textual references to dairy products also continue, it is reasonable to suppose they continued to be consumed. Vegetable oils and fat from animals are also available.
Some chronological and areal differences can be detected. For example, fish forms an important part of the economy at Lagash in the Early Dynastic III period but seems to be less important later and in other areas. It seems likely that local conditions (such as the nearness of the marshes and the lower reaches of the rivers) in the kingdom of Lagash encouraged the fishing industry. The emphasis seems to have moved slightly away from fishing in later periods but it is unlikely that fish ever ceased to form part of the diet in a land where settlements always lay close to rivers or canals. And in fact the evidence of fish-hooks, and the depiction of fish on cylinder seals and reliefs show that fishing continued in the second and first millennia.

It would also seem that there was a slightly greater variety of vegetables and fruit available in the first millennium: Assurnasirpal's stela lists 'turnips' (laptu) and the 'jujube' (gamru), while seldom appearing on food texts elsewhere, and what may be an artichoke is carried in a procession of foodstuffs for a feast for Sennacherib. This may reflect the wide area of the Assyrian empire.

From this summary it can be seen that a wide variety of foodstuffs were available from the third to the first millennia and the textual evidence of the types of food offered to the gods and provided for the kings' meals suggest that these items were in fact utilized. Obvious differences between the 'aristocracy' of ancient Mesopotamia and Classes I and II of Survey A are the lack of sugar, tea and coffee, and citrus fruits in ancient Mesopotamia. Unfortunately no estimates can be made of the quantitative nutritional value of the 'aristocracy' as no details are given which can be confidently turned into daily consumption, but it would seem that the foodstuffs available would provide a diet of similar quality to that of the richer classes in Iraq today.

The same foodstuffs were in existence for the poorer people in ancient Mesopotamia, but the items listed in their ration lists indicate that not all were necessarily made available. In summary the staple was barley, sometimes with emmer-wheat, from which beer, malt, bread and other cereal dishes were made. Dates, ghee, 'apples', 'cucumber'
and fish were also issued on occasions in the Early Dynastic III period at Lagash. Dates continued to be issued in the south, for instance at Ur in the Ur III period, and at Nippur in the Kassite period. And the issue of vegetable oils is recorded in the Ur III, Old Babylonian, Nuzi and Neo-Assyrian periods. Fish and meat are occasionally recorded as being provided for the ordinary people, although, as now, this seems to be for more 'special' occasions.

Mixed diets are nutritionally better than a diet consisting of only one type of food. For example the net dietary protein (as a percentage of the total Calories) in a diet of bread, rice and lentils is 5.1%, bread and yoghurt is 10.6% and bread, cheese, yoghurt, meat and egg is 12.5%. The first of these diets is poor, but the second and third are good. Provided the food is eaten in sufficient calorific quantities, the different types of protein supplied supplement each other.

There are examples of mixed diets being issued to people in Mesopotamia. The 'messenger rations' in the Ur III period, apparently intended to cover the people on a journey or part of a journey, consisted of beer, bread and oil, with the addition of 'onions', salt-substitute (NAGA), fish and a second type of beer, in certain cases. Here protein is supplied by the bread, beers, and fish - the fish supplementing the bread for the limiting amino acid lysine. Onion will supply a little Vitamin C - especially if eaten when green and immature, and it will also increase the palatability of the meal, acting as a spice. Other vitamins, such as the B vitamins, will be supplied in the beer. The plain rations of beer, bread and oil will have provided sufficient calories but the quality of the diet is poor. At Mari, also in the Ur III period, bread and beer were issued to people, including scribes (NAR.GAL and NAR). The quantities of bread and beer are adequate.

In the Old Babylonian period, workers carrying out building work at the E.BABBAR at Ur were given daily rations of 2 SILA dates, 2 SILA cheese, 2 SILA bran from 'linseed' (GABA SE.CIŠ.) and 2 GIN oil. They may also have been given meat. Such a diet may be considered
good. The amounts are more than adequate and must have been intended as wages to cover the workers' families rather than daily rations. These, however, may have been an elite of workmen, as others in the Old Babylonian period, working on digging the Tigris, and building work, were only issued barley, bread and oil, although the quantities were adequate from the point of view of Calories. 322

It is perhaps reasonable to compare the diet of the people of ancient Mesopotamia with Classes IV and V of Survey A and the workers of Survey B. The ancient diet as recorded in barley ration lists, from which quantitative assessments can be made, is a much narrower one than the one in the modern surveys. The average energy intake has been calculated for Classes IV and V, and the brick workers, and it is possible to do a rough comparison between these and the people of ancient Mesopotamia. 323

Table 18

<table>
<thead>
<tr>
<th>USDA</th>
<th>CLASS IV</th>
<th>CLASS V</th>
<th>BRICKWORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2255 Calories</td>
<td>2613 Calories</td>
<td>1813 Calories</td>
<td>2545 Calories</td>
</tr>
</tbody>
</table>

| ED III | AGADE | UR III | OLD BABYLONIAN | NIPPUR | NUZI |
|--------|-------|--------|----------------|--------|
| 3152 Calories | 4320 Calories | 2820 Calories | Mari: 5760 | 2880 | 3780 |
| Lagaba: 2520 | Average: 4140 Calories |

Mesopotamian average: 3515 Calories

The first impression given by this comparison is that the energy intakes in ancient Mesopotamia were higher than the modern surveys. There appear to be some regional variations within ancient Mesopotamia. For instance the energy intake at Mari is much higher than at Lagaba at roughly the same period. This contrast is also apparent if the rations for individuals are looked at. At Mari (out of 84 employees) 27 receive 90 SILA, barley or bread, a month, while 21 receive 60 and another 21 receive 40. At Lagaba (out of 36 employees) only 1 receives 60, while 13 receive 20, 11 receive 10 or 15, and 8 receive 30.
The energy intake in the Agade period at Nippur is also high and contrasts with Laga's in the earlier Early Dynastic III period and the following Ur III period. This may reflect the importance of the city of Nippur rather than be a true picture for the whole country. There is also a drop in the average energy intake at Nippur between the Agade and the Kassite period.

All the energy intakes of ancient Mesopotamia are above the average Calorie intake for Iraq calculated by the USDA in 1961, and are in the region of the 3000 Calories per day recommended for an adult male by the FAO.324

Survey A325 found that the energy intakes were reasonable for Classes I-III, but lower than adequate for Class IV and very low for Class V. Indeed in this last Class some families had an average intake of only 1460 Calories. They found the people of Classes IV and V to be undernourished, and on clinical examination thin.

Although the average energy intake in ancient Mesopotamia is satisfactory when compared with the FAO reference figures, this must not obscure the fact that a great number of people in Mesopotamia received low energy intakes and they must be considered undernourished. This applies to all those men who received 1 SÌLA or less a day (although the rate of 1 SÌLA may be considered borderline for men) and women on .6 SÌLA or less a day, adolescents with less than .6 SÌLA per day and children with less than .5 SÌLA per day. This applies to the majority of the adolescents and children and if these rations are their main source of Calories it would seem that they reached adulthood in an undernourished state. This may be even more emphasised when it is remembered that the energy intake figures are calculated from the total ration and that no allowances have been made for wastage in preparation or cooking. (However, it is likely that the people receiving low rations consumed most of their food.326)

People living on a low energy intake will be thin and unable to carry out prolonged physical exertion. If a previously well-fed and active person is put on a continued low energy intake, he will lose
weight rapidly at first, but this loss of weight will gradually slow down even without an increase in food supply. Reasons for this include the reduction in the size of the body which then requires less energy to move and keep warm etc, and the reduction by the person involved of any unnecessary movement. Thus the body has adapted to the lower energy intake and lower weight. However, the person would not be able to carry out the same level of physical activity as he had when receiving an adequate energy intake, and he would be lethargic in thought and body, and be less resistant to disease. This lethargy of mind and body, together with lack of resistance to disease and a high rate of mortality, are found in communities which have had to survive on low energy intakes.

This picture of an apathetic underfed people lacking in energy and drive should only be taken to apply to certain classes in Mesopotamia. The overall level of artistic achievement shown by cylinder seals, plaques, jewellery, statues, reliefs and building etc, and intellectual ability as shown by literary and religious texts and the continual efforts to increase the cultural and economic influence by means of both trade links and the forcible annexation of territory, give an impression of a land in which the majority of the population is vigorous both mentally and physically. It is true that there are various times when the standard of artistic achievement is held to fall, but it would be an over-use of the evidence to tie these in with variations in the nutritional value of the diet. As far as the belligerent abilities of the ancient Mesopotamians are concerned, it might be argued that one poorly nourished country was fighting another but this does not necessarily follow. If the average energy intakes are looked at again, it will be seen that the average at Mari is much higher than that of Lagaba - but the kingdom of Mari was conquered by Babylon (in whose vicinity Lagaba is thought to be) and not vice versa as might be expected from the Calorie averages.

When the levels of other nutrients provided by the issued rations are examined it can be seen that they are inadequate in four main categories: riboflavin, calcium, Vitamin A and Vitamin C. These four nutrients were also found to be low in Survey B.
The apparent low level of riboflavin may not be very serious. No severe or major disease has been traced to riboflavin deficiency. Therapeutic doses of riboflavin have been known to cure swollen and chapped lips, sores at the angles of the mouth and redness and congestion at the edges of the cornea. Such conditions are common in poorly nourished people and riboflavin deficiency may be assumed to contribute to these and other deficiency illnesses. However, people have been known to live for very long periods on very low intakes of riboflavin, so that those employees whose barley rations provide low intakes of riboflavin may require lower amounts of this vitamin than suggested by the FAO figures.

The low level of calcium is complex. Calcium is required for bone formation; although a skeleton should be mature at 25 years of age, bone is not a permanent substance but must be slowly but continually renewed. It is necessary for the diet to contain sufficient calcium to allow for this renewal plus the amount of calcium normally lost in the urine every day. If a diet is based mainly on cereals the absorption of calcium is inhibited by the presence of phytic acid. It might therefore be expected that a diet based on a cereal, and so low in absorbable calcium, would give rise to such deficiency diseases as rickets. And indeed Survey A found that rickets and dental caries (also caused by poor calcium absorption) were common in Iraq.

The situation is complicated by two main factors. First, various studies have shown that it is a lack of Vitamin D which is the main cause of rickets. This vitamin is present in only a few foods (the liver oil of fish are the only rich source) and its main source is sunlight on the skin. So that people living in an environment where they are exposed to a lot of sunlight should not suffer from rickets. Unfortunately certain cultural traditions (for instance in Muslim countries) such as the complete veiling and covering of women and the custom of keeping children in shady courtyards and out of the sun, have tended to nullify the effect of the sunlight and so rickets have developed.
Secondly, experiments have shown that if a person who usually has a high intake of calcium is put on a low calcium diet he will go into a negative calcium balance. However, if the low calcium diet is continued, the person will adjust to it and return to a state of equilibrium. Vitamin D is also important here as it promotes the absorption of calcium.\textsuperscript{332}

In ancient Mesopotamia there does not appear to be a cultural tradition for covering up the body either of men or women. If cylinder seals and reliefs are examined, in the third millennium it can be seen that the men usually wore a kilt leaving their chests and arms bare, or else a kilt with a shawl over one shoulder. In most cases women seem to have worn a skirt and a shawl, but this also left the arms and often one shoulder bare. There are some examples of well-covered women, with what might be called a poncho over both arms and shoulders. The faces are not veiled. Similar types of clothes continued to be worn in the second millennium. There are changes in fashion, but a completely covered-up style is rare. On the whole women are more covered than men. This is also the case in the first millennium. The Assyrian soldiers often wear kilts and 'vests' which leave their lower legs and arms bare. While files of prisoners are shown being marched away, dressed in long-skirted robes which nevertheless expose the arms. There is some slight evidence in the texts for the veiling of wives, for example the Middle Assyrian laws state that all married women must be veiled in public places while prostitutes will be punished if they do so.\textsuperscript{335} This may only apply to public streets and squares etc, or to the Middle Assyrian period only. Ashurbanipal's wife is not veiled when she is dining with him in the garden, although there are many servants present. (Fig.7)

Excavations of houses in ancient Mesopotamia have shown that the majority were built on the courtyard plan, but it is difficult to know how much of the normal life of the women and children would be restricted to these areas. And as the height of the courtyard walls is uncertain, it is not known whether such restriction would have prevented the sun from reaching the inhabitants.
Only a few studies have been made of bones and teeth excavated in ancient Mesopotamia and few of these deal with features which might be used as evidence of rickets. A study of the dentition of Kish, mainly taken from Cemetery 'A' burials dated to the pre-Sargonic period, found that the incidence of dental caries was not high when compared with the same dental disease in the present population. Approximately ten out of all the teeth examined showed traces of carious lesions. Another report on the human remains at Kish stated that 'I could find no traces of skeletal disease except in the teeth. Here there was not in the teeth I examined any evidence of caries, except possibly in one molar.' Again, in a study of bones from Nippur (dated to the early first millennium and later) few cavities were found in the teeth although much wear, due to attrition, was found. A study made of human remains at Ubaid (dated to the fourth millennium) and of remains from Ur (dated to the early second millennium) When the teeth were examined only three traces of caries were found in the material from Ubaid and none in the material from Ur. The main dental problem in all these studies was wear due to attrition, thought to be caused by the coarse nature of food eaten. While by no means conclusive, if this lack of evidence for dental caries is taken together with the lack of evidence for complete covering of the body, it would appear that the supply of calcium and Vitamin D were adequate in ancient Mesopotamia, and that the people were adapted to the low calcium intake suggested by the ration lists.

It has already been suggested that a major source for Vitamin C may have been the preparation of malted and sprouted barley. The barley rations as they stand provide no Vitamin C and therefore this vitamin must have been obtained either from such preparations or from other food sources, such as vegetables, wild plants and fruit, known to have been available.

Possible descriptions of scurvy have been found in a number of medical texts with the suggested use of a medicine or 'wild grapes' as treatment. If this can really be taken as so, it suggests a high order of medical observation, although it might be expected that further observation would have revealed that other
fruits, such as apples, apricots, pears and pomegranates were a more effective cure.

The FAO recommended intake of Vitamin C is 30 micrograms a day. This figure is about 3 times the minimal requirement and this wide margin of safety was set because much ascorbic acid is lost in cooking and fruits and vegetables can vary greatly in their Vitamin C content. Experiments have shown that an intake of 10 micrograms a day will provide protection against scurvy and is sufficient to cure the disease. There is some slight evidence that human beings may sometimes be able to synthesise Vitamin C (as do the majority of mammals), but these findings have not yet been confirmed. No real conclusion can be made about the incidence of scurvy in Mesopotamia. Foodstuffs providing supplies of Vitamin C were available but there is little evidence for their consumption by the employees receiving rations. It seems likely that the 'aristocracy' would be mainly free from this disease but that it would occur in the rest of the community from time to time. There may have been a certain amount of seasonality in the disease: it is known to appear if a diet is devoid of ascorbic acid for a period of about 30 - 70 days, and can be cured (as has been said) by doses of about 10 micrograms. So that scurvy which developed during the winter months might be cleared up when the green vegetables and fruit appeared.

The low intake of Vitamin A must also be considered. Vitamin A is stored in the liver of the human body so that the deficiency diseases associated with its lack do not appear quickly. Most children start life with an adequate store of Vitamin A in their liver, but unless they receive an adequate intake this store will become depleted and never returns to the right level unless increased intakes are available. Such deficiency of Vitamin A is the main cause of xerophthalmia and keratomalacia - conditions which if not halted can produce permanent blindness. The lack of sources for Vitamin A in ancient Mesopotamia has already been commented on. It is suggested here that this deficiency was a major problem. It is possible that the frequent use of the phrase 'IGI.NU.DU₈' 'blind' usually taken to refer to prisoners of war who have been deliberately blinded in fact
refers to people who have been blinded or partially blinded by a Vitamin A deficiency. In addition, in the statuary, eyes are depicted very large and are the predominant facial feature, so that it may be that their health and sight was a major preoccupation in Mesopotamia. However, as in the case of Vitamin C, it must be remembered that good sources of Vitamin A were available — apricots, apples, green and dried (much lower) chick peas, coriander, lentils, offal, especially liver, and dairy products, so that it is unlikely that the 'aristocracy' suffered from Vitamin A deficiency. But blindness and partial blindness are obvious conditions, so that their appearance in any numbers, even in the lower ranks of society, would be of note.
CHAPTER 5

CONCLUSIONS

The purpose of this study was to find out what the Mesopotamians ate, how the food was produced and prepared, and whether they had enough of it. Now is the time to decide whether these questions have been answered and what has been learned about the Mesopotamian way of life.

The background

The available evidence is insufficient to draw any firm conclusions about the climate and rainfall from the third to the first millennium and it is probably safest to accept that they were similar to present day conditions. Some variations have been suggested (1.1.3): in the period between 3500 and 2400 BC there is archaeological evidence for floods at Ur, Kish, Fara and Nineveh of a greater severity than those experienced either before or after that period. This has been taken as an indication that the rainfall may have been heavier at that time, at least at the sources of the Euphrates and the Tigris and their tributaries. By the second half of the third millennium and in the second millennium there are some indications that precipitation may have decreased. These indications also occur in the countries outside Mesopotamia. In Egypt there are references to drought and low Nile floods, and pollen cores from the Indus Valley region have been interpreted as indicating arid conditions beginning in the second millennium. Within Mesopotamia there is a drop in cereal yields from the end of the third millennium, and an increasing reliance on barley, a crop more resistant to arid conditions than wheat (2.1.6 and 2.4). There was a gradual fall in the number of settlements in areas like the Diyala and the Warka region, outside the main political 'heart' of the land in the second millennium. The problem of assigning changes caused by political events to alterations in climate patterns has been discussed more fully (1.1.3) but undoubtedly political upheavals are aggravated by agricultural problems and agricultural problems brought about by climatic changes would be aggravated by any political unrest. It may be tentatively taken that one of the causes behind the 'depopulation' of settlements in large areas of Mesopotamia towards the end of the
second millennium was dessication due to decreased rainfall and perhaps increased temperature. Settlements increased in number during the first millennium so it may be that the rainfall improved, although the political situation is also more stable at that time. A slightly warmer climate than present may be inferred from the representation of dates on palm-trees in the Royal Gardens at Nineveh in the century, a town north of the line above which dates cannot ripen today.

In northern Mesopotamia, the Euphrates and Tigris flowed through their trough valleys. The only difference in the landscape may have been greater tree cover on the Jebel Sinjar and other hill-ranges (1.1.3).

The rivers followed more easterly courses than today when they entered the alluvial plain (1.2.4 and 1.2.6 and Figure 5). Little is known about the lower reaches of the Tigris but the Euphrates appears to have split into several branches, first at Sippar, and then again in the Warka and Larsa areas. The complete area covered by the marshes is not fully known. From the evidence of flood strata at sites like Ur, Kish and Fara, and from references to floods in texts, flood control was a problem and this may have led to areas of semi-permanent marsh existing where there are none today (1.2.7). The area of marsh therefore may have been greater in the third millennium. But if increased rainfall caused more flooding and therefore more marshes, it is probable that decreased precipitation would cause less flooding and so that the areas of marshes in the second millennium may have shrunk.

The increased rainfall and flooding in the early third millennium may have had two other results. The need to control the floods would add impetus to the organisation and care of irrigation, but the excess water, from both the 'natural' floods and from increased availability of irrigation water, would speed the rise of salinity in the soil (1.3.2).

Agriculture in the alluvial plain (2.2.4)

Outside the isoheyet of 300 mm reliable rain per year, irrigation is essential to agriculture, and this applies to all of southern Mesopotamia. The main technique used was that of gravity flow.
In this the banks of the river are breached to allow the water to flow into fields. It is a method particularly suited to the southern part of the alluvial plain where the rivers tend to be above the surrounding countryside and to have high natural levees. When the bed of the river is not so high above the plain, or is below the surrounding countryside some sort of lifting mechanism may be necessary to raise the water for irrigation. Shadufs seem to have been used for this since the Akkadian period and may have developed in the northern part of the alluvial plain (2.2.1).

It is difficult to assess the extent of artificially constructed canals in use during the Early Dynastic period (2.2.2). The settlement survey charts for that period in the Diyala plain, the Central Mesopotamia area and the Warka region suggest that towns followed a linear pattern, probably along the banks of natural watercourses. The pattern given by reconstructing the rivers from the settlements shows a dendritic network of streams following the main drainage of the area. No canals constructed against this pattern seem to exist. However, there are textual references to the building of canals, for example Entemena constructed a canal from Girsu to the Tigris, probably because the expansion of his state required greater supplies of water than were available from the Euphrates, which served the enemy state of Umma before Lagaš. In addition, keeping the canals in repair seems to have been the responsibility of the citizens whether they were mainly agricultural workers or had some other profession. It is possible that the artificial canals started in the Early Dynastic period were too small to show up on settlement surveys and only served fields rather than towns. Much work must have been done on the repair and enlargement of levees to control flooding, and the removal of silt from the beds of the rivers to prevent them changing their courses and forming other beds.

The Early Dynastic period in agriculture was one of response to problems. The severe floods indicated by the archaeological record in the early part of the third millennium must have meant that flood control was imperative. The centralization of sites which appears in the Warka region after the Jemdet Nasr period may represent an effort
to organise irrigation and flood control together. Thus settlements could be used over the number of canals built and the number of breaks made in the levees. This would have had the effect of increasing the amount of water available in arable areas while avoiding the waste of too much water into marshes, or land that was not to be cultivated.

But such abundance of irrigation water may have led to over-irrigation and this will lead in turn to water-logged fields and/or a rise in the salinization of the soil. There must be some sort of drainage to allow the excess irrigation water to run away. An irrigation canal at field level can be used as a drain for the unwanted water. And areas of the fields can be left fallow. This system, whereby the soil in the field has a chance to recover after a crop and the weeds which grow there - shiq and agul - can help to create a salt-free upper zone suitable for cereals and vegetables, was in use by the Agade period, at Umma at least, and may have been in use earlier.

Another response to agricultural problems in the Early Dynastic period was the development of the seeder-plough. This is an ard-type of plough with a funnel attached, through which the seed can be dropped at determined spaces and at a determined rate. Its first appearance on cylinder seals is in the Early Dynastic III period, which suggests that it was developed then or just before. Earlier representations of the plough, such as the pictograms dated to Uruk IV, do not show any funnels. Among the advantages of a controlled seeding rate is that less seed is used than in broadcasting methods, the seed can be covered more easily to prevent birds eating it, and it can be sown at the same time as the cross-ploughing, thus saving labour. In addition the amount of seed used can be judged and spaced according to the availability of moisture in the soil. The shallow furrow made by the seeder-plough will help to protect the seeds and will lessen transpiration.

That the people of the Early Dynastic period were successful in their farming methods is shown by the yields recorded in the texts - at least in the state of Lagaš (2.4). The rates given are among the highest found in the texts between the third millennium and the middle of the first millennium. For example some fields at Lagaš had an
average yield of 1004.6 ȘILA an ikū (2316 litres a hectare) – a return of 83.7 times the seed-corn used. In the Amara liwa in the 1950s, a figure of 573.12 kilos (approximately 749 litres)\(^1\) is given as the average barley yield per hectare, about a third of the Early Dynastic yield.

The population estimated for the whole of Mesopotamia in the Early Dynastic period (see 2.5 and Appendix II) is 1,578,953; 676,694 for the (surveyed) alluvial plain alone. With a yield of around 2300 litres per hectare, about 1\(\frac{1}{2}\) hectare per head of population would be required – half in cultivation at a time – to provide 2 litres per day plus extra for seed corn, fodder etc. The area necessary to support this figure is just over half the area under wheat and barley in AD 1930. There seems little doubt that the high yields found at Legal could have supported the estimated population easily.

The political changes that accompanied the rise of the Agade dynasty were not marked by any similar upheaval in agriculture. The irrigation patterns seem roughly the same as in the Early Dynastic period. Owing to the lack of detailed knowledge about the changes in pottery between the Agade, Ur III and Isin/Larsa and Old Babylonian periods, it is difficult to be more precise. Gravity flow continued to be the main method of irrigation. The shaduf, although in use at this time, was never a major method of irrigation in the south. There are few references to its use throughout Mesopotamia and few artistic representations of it. As its use is best suited to those areas where the river flows below the surrounding countryside, it may have developed in the north of the alluvial plain.

Figures of seeding-rates and yields from Girsu dating from the immediate post-Agade period, in the time of Gudea, show that the crop returns had gone down. A yield of 1435 litres per hectare (516.6 ȘILA an ikū) is recorded. If the seeding rates at Lagaš for the Early Dynastic period (12 ȘILA an ikū) and the Ur III period (25.6 ȘILA an ikū) are taken, they give an average of 18.8 ȘILA an ikū (52.2 litres per hectare). This figure would represent a return of around 27 over seed used.
The main reason given for this tremendous drop in return of grain over seed is the salinisation of the soil. And the increasing use of barley over emmer-wheat and 'bread-wheat' (GIG/kibtu) is also cited in support of this argument. It seems likely that salt was a great problem in the south at this period. The political upheavals, especially by the Gutians, may have disrupted the control of irrigation and drainage. But barley is a more suitable crop for this area than a wheat, whether or not there is salinisation to contend with. It requires less water for growth and has a shorter growing season, so that it is more likely to ripen before the dangerous flood season and before the real heat of the summer. It also has a slightly higher calorific value than wheat. So that the decrease in the use of wheats could have been caused by other considerations than increasing salinity. For example more arid conditions would favour the cultivation of barley.

The estimated population for the Akkadian period (Appendix 2 and 2.5) is 1,266,470 for the whole country (542,773 in the surveyed areas of the alluvial plain), a little less than in the Early Dynastic period. But with the lower cereal yields 2 hectares per head (1 under cultivation) would have been necessary to produce food, fodder etc, so that more land would have been brought under cultivation.

The picture presented by the Ur III period is one of centralization, of the rise of a powerful administrative system controlling all aspects of life, including agriculture, especially in the south.

Much attention was paid to the irrigation system and there are many references to the repair of canals, reservoirs and the construction of new ones, possibly in areas of land not previously cultivated. Yields of cereals recorded at Lagaš are in the region of 379 SILA per ikû (1052 litres per hectare). Different seeding rates were used according to the type of land to be sown but with an average of 25.6 SILA per ikû (71 litres per hectare) there would have been a return of around 14.8. Thus the situation had deteriorated at Lagaš since the late Agade period. However, at Ur the average yield is 911 SILA per ikû (2530 litres per hectare) - a slightly higher rate than at Lagaš in the Early Dynastic period. (See Appendix 1 for the different capacity values of the SILA in Early Dynastic and Ur III periods.)
The population estimated for this period is 1,560,421 for the whole country (668,752 for the surveyed areas) which is similar to that of the Early Dynastic period and an increase from the Agade. If the Lagaš and Ur yields are averaged, the result is lower than that found in the Early Dynastic period. 1.7 hectares per head would have been required to support the population.

There was a gradual expansion of settlement and of the irrigation system at the beginning of the second millennium - although again the problems involved in the precise dating of pottery makes the sure assignment of some sites difficult. Date-formulae refer to the Diyala river changing course (c.1900 BC) (2.2.2 - second millennium), and other inscriptions and letters bear witness to the work put into maintaining the irrigation system.

Most of the references to yields come from the Old Babylonian period. In the Sippar area, during the reigns of Šumu-abum to Šamšu-iluna, an average yield of 799.25 SÌLA per īkû (2220 litres per hectare) has been estimated. With a seeding rate of 26.5 SÌLA per īkû (73.6 litres per hectare) a return of 30 is given. But later, in the period covered by the reigns of Abi-ešu to Ammi-šaduqa, the region round Sippar had an average expected yield of 395.38 SÌLA per īkû (1098 litres per hectare). With a similar seeding rate this would give a return of about 15. In the Lagaš region, in the reign of Hammurapi, the yield was 306.7 SÌLA per īkû (852 litres per hectare) - a return of only 11.5 on the same seeding rate. These figures suggest that in the beginning of the second millennium the agriculture situation was a little better than in the Ur III period, at least in the north of the alluvial plain. This may have been brought about by the fact that the salinity problem in the northern part of the alluvial plain was not as acute as in the south. But the great drop in yields both in the north and the south of the plain in the later part of the Old Babylonian period suggests that not only was the political situation becoming more difficult but that other factors, such as salinity and possibly increasing aridity, were involved.
The population for the Isin/Larsa period is estimated at 1,994,223 (854,667 for the surveyed areas), an increase of almost half a million since the Ur III period. A further increase is estimated for the Old Babylonian period. A figure of 2,611,831 is suggested for the whole country (1,119,356 for the surveyed area). If an average yield is taken from the Old Babylonian figures — 500.4 šILa an iK (1300 litres per hectare) — and applied to the Isin/Larsa period and to the Old Babylonian period, around two hectares per head would be required, but the amount of land under cultivation would have had to rise by two-thirds between the Early Dynastic and the Old Babylonian periods, and more land would have had to be under cereal crops than was sown in AD 1937. However, the area which would have had to be cultivated and left fallow is less than the cultivable areas calculated in the agricultural census in 1957/58, so that theoretically at any rate such a population could have been supported.

The rise of the Kassites to power may have been partly responsible for the drop in yields at the end of the Old Babylonian period (although it should be noted that the yields at Lagâš were very low during Hammurapi's reign), disrupting the agricultural organisation. But the stability of the Kassite period, at any rate in central Mesopotamia, is shown by the increased number of settlements. The estimated population is 2,581,297 for the whole country (1,106,270 for the surveyed areas), roughly the same as the figures for the Old Babylonian period. Unfortunately little is known about the cereal yields for the Kassite period. Just for comparison, if the nearest yield-figures are taken — that is the 395.38 šILa per iK (1098 litres per hectare) from the Sippar region at the end of the Old Babylonian period — it would require 2.9 hectares per person to provide 2 litres per day per head plus fodder etc, including fallow areas. This would mean that all the cultivable areas listed in the agricultural census of AD 1957/58 would have been in use! It is probably best to take this low yield because of the previous pattern of falling yields and the suggested effects of dessication. As the surveys suggest depopulation in the Diyala and Warka areas, and only increased settlement in the central Mesopotamian region, it would seem that either the population estimate is exaggerated or that the nutritional status of some of the population may have worsened.
The settlement patterns dated to the end of the second millennium and the beginning of the first indicate depopulation all over the alluvial plain and the apparent breakdown of the irrigation systems. This may have been due to the long-term effects of the dessication suggested for the second millennium, but it was a period of great political upheaval which would have caused disruption in agriculture and settlement.

There appears to have been a slight resurgence of settled life from about the 9th century BC. The Assyrian Annals talk of well-populated areas around Warka and in the 7th and 6th centuries the size of Babylon increased until it became the dominant settlement in central Mesopotamia. The population estimated for the whole country in the first half of the first millennium is 821,310 (351,990 for the surveyed areas). Taking the low yield of 306.7 סילה per ikû (852 litres per hectare) given for the late Old Babylonian period at Lagaš (this figure has been chosen arbitrarily because the apparent depopulation at the end of the second millennium suggests that yields would be low), 3.8 hectares would be necessary per head of population and the area of land under cultivation would be similar to that of the Isin/Larsa period.

By comparing the estimated population and the area of land needed to supply the cereal requirements (made up of 2 סילה per day per head for food plus a further 2 סילה per day for all other purposes) with the estimates for the AD 1920s, 1930s and 1950s, it can be seen that the amount of land under cultivation per head of population (.45 hectares in 1937 and .55 hectares in 1957/58) was about the same in the Early Dynastic period (.63 hectares under cultivation - 1.26 hectares including fallow) and greater in the later periods. The yields in 1937/38 work out at .8 kg per head per day (very approximately 1 סילה per head per day) and at .73 kg per head in the 1950s. In the modern figures only wheat and barley have been considered - rice and other cereals have been ignored. In the third to first millennia barley has been the basis of the calculations. The allowance of 4 סילה barley per day per head for ancient Mesopotamia (to cover food and all other purposes) is about twice as much as the figures for the 1930s and 1950s and the modern figures are based on the total yields of the time and therefore must be taken to include fodder as well as food.
The energy provided by 2 SILA barley per day (see Chapter 4 and Figure 1) (5400 Calories) is well in excess of the FAO recommended daily intake for adult males (3000 Calories) and so is more than sufficient to supply all individuals, whatever their age or sex, with an adequate diet plus an allowance for wastage. The figures given in Table 6 (2.5) suggest the estimated population for ancient Mesopotamia could have been supplied with this amount, plus a similar amount for fodder, seed, storage etc, from local resources from the Early Dynastic to Isin/Larsa periods and the Neo-Assyrian period. In the Old Babylonian and Kassite periods the amount of land which would be required for cultivation and fallow is similar to the cultivable areas calculated by the agricultural census in 1957/58 and is probably on the high side. However, the 2 SILA barley per day allowance could be reduced by nearly a half (1.09 SILA per day would give 3001 Calories) and still provide an adequate diet (still keeping the same allowance for fodder etc).

In the Old Babylonian period this would mean that 1,955,524.7 hectares would have to be under cultivation a year (3,911,049.4 including fallow), 1.5 hectares per head of population; in the Kassite period it would mean 2,512,462.4 hectares under cultivation (5,024,924.8 including fallow), 1.9 hectares per head. The areas under cultivation are still higher than those under wheat and barley in the AD 1920s and 1930s, and it is probable that the amount set aside for fodder, storage, trade and so on should be reduced. Further reduction in the amount allowed for food is undesirable because this could put the poorer people at risk.

Rain-fed agriculture

So far only the irrigation agriculture of the alluvial plain has been considered. In the northern plains within the 300 mm isohyet irrigation was only a supplementary water supply (for example at Rimah and Nuzi in the second millennium) (2.3.1), and the main source of water for the crops was the rain. On the climate pattern already discussed (1.1.3) the country should have been fertile in the third millennium but there would have been increasing problems during the second. In the AD 1950s one worker tended an average of 7 hectares, approximately half of which was cultivated each year, in the northern livas, and 4 hectares (also with approximately half under cultivation)
in the southern (2.5). Most of the work was still done without the use of machines. Thus irrigation agriculture is more labour intensive and although the initial breaking-up of the land may be harder in the north, this is more than made up by the amount of work necessary to care for the irrigation canals etc. The average barley yield in the southern livas at this time (1950s) was 629.7 kgs per hectare compared with 368 in the north, that is, the northern yields were about 3/5 of the southern.

It may therefore be expected that the yields in the northern plains would be lower than those in the irrigated areas of the south in ancient Mesopotamia. Unfortunately there is little textual evidence with which to compare the southern yields. One text from Tell Rimah (2.4) in the Old Babylonian period gives 10 SÌLA per īkul (27.7 litres per hectare) as the seeding rate, but there is no further information about the actual yields.

This probably reflects local conditions and it is lower than the southern seeding rates at the same period. At Nuzi in the mid-second millennium the seeding rate has been calculated as an average of 38.5 litres per hectare, with a barley yield of 181 litres per hectare - a return of 4.7. The yield of emmer-wheat is higher (212.3 litres per hectare), but the best return comes from gājjatu-cereal - 593 litres per hectare. The average yield of all the cereals is 276.24 litres per hectare, a return of 7 times the seed.

Another contrast between the alluvial plain and the northern plain is the greater cultivation of wheats in the north. At GA.SUR (Nuzi) in the Agade period the crop was divided about half barley and half emmer-wheat and bread wheat, while in the mid-second millennium there was nearly sixteen times more emmer-wheat and bread wheat than barley (2.1.6). One reason for this may have been the lower risk of salinity in the northern plains.

The first millennium in the northern plains saw the introduction of some large-scale irrigation schemes by the Assyrian kings. One of the motives given by the kings was a wish to improve the productivity
of the low-lying land (2.3.1). The population in Assyria increased in the first millennium, partly due to the policy of deporting prisoners carried out by the kings. Ašurnaširpal refers to resettling towns which had been deserted in the time of his predecessors and he gives the population of Nimrud as 63,000. An estimate based on house-sizes suggests a population for Nimrud of 78,545 (Appendix 2).

Availability of foodstuffs

The above discussion on agriculture has concentrated on the cereal crops, but, as has been seen from Chapter 3, there was a wide range of other foodstuffs, such as vegetables, fruit, meat and dairy products, available in Mesopotamia.

There is palaeoethnobotanical evidence for the presence of pulses such as chick peas and field peas in the alluvial plain from the mid-third millennium (3.4). From the texts it is known that in the Early Dynastic period onions and garlic, chick peas and lentils were grown in parts of fields which had been specifically set aside for this purpose.

In the Old Babylonian and Kassite period, chick peas and lentils were grown as field crops with cereals and cress. These, and other vegetables, formed an important part of the diet, for example dishes made from them were common at the king’s meals at Mari (Old Babylonian) and in the list of provisions for Ašurnaširpal’s feast at Nimrud (Neo-Assyrian).

There is also evidence for the cultivation of fruit-trees from the third millennium onwards (3.6). In the alluvial plains the date was the most important fruit. Date-stones have been found at Eridu in the fourth millennium and in the Royal Graves at Ur in the third, and dates were issued as rations at Lagaš. They formed part of the regular rations at Ur in the Ur III period. Other fruits which were available in the alluvial plain were the fig, the pomegranate and the apple (3.6.4). The remains of dried apples were found in the Royal Graves at Ur, and dried figs and dried apples are mentioned with dates at Lagaš in the Ur III period. Although the pomegranate appears as a decorative motif in jewellery from the Early Dynastic period, it does not appear to be mentioned in the texts before the Ur III period.
In addition to pomegranates and figs, pears (GÍŠ.ŠENNUR(KIB).KUR. RA/kamišaru) and plums (GÍŠ.ŠENNUR/salluru) were grown in northern Mesopotamia. The wood of these trees was found at Nuzi in the mid-second millennium, suggesting that they were actually grown nearby. And plums and pears were imported into Mari. Dates may also have been grown in the north. Ubinnu-dates (green dates) are recorded, with other items, at Nuzi, but it is not clear whether these are locally grown or imported. The appearance of date palms with bunches of dates in the Royal Gardens at Nineveh in the reign of Aššurbanipal suggests that they were growing in that area in the first millennium.

Domestic animals (2.6) formed an important part of the Mesopotamian economy. Their wool, hair, hides and even dung were used as well as their meat and milk. Meat may never have been a regular part of the diet of the poorer classes but there is sufficient evidence to suggest that it appeared fairly often, if only to celebrate some particular occasion (3.2). Mixed herds of sheep and goats were kept, although different shepherds may have been responsible for different types of animals - for example wool sheep, or breeding sheep, and cattle appear to have been kept separately. Pigs were also used as a food animal (3.2.1). As well as domestic animals, meat was obtained by hunting game such as deer and antelope (3.2.3), birds (3.2.5) and catching fish (3.2.4). Textual references to fish are especially common in the third millennium but although there are fewer written references to fish later, fish bones and fish-hooks as well as artistic representations suggest that fish continued as a food source in the second and first millennia. The variety of birds apparently considered suitable for eating is large. Geese and ducks were the most common, but doves, pigeons and partridges were also eaten. About the earliest artistic representation of the hen was from Aššur in the Middle Assyrian period and it seems probable that the hen was not kept as a domestic fowl in Mesopotamia until the first millennium.

The main dairy produce (3.3) was ghee, but soured milk and curd-cheese were also made. The cheese may have been dried so that it could be kept. Supplies of fresh milk would also be available at certain times and the dried cheese could be ground and let down with water
whenever there was no milk available. Other animal fats included pig-fat and mutton-fat (3.5). Vegetable oils were also common. Although it is not absolutely certain, it seems likely that the main vegetable oil was linseed and not sesame, as previously thought. Olive oil seems to have been used in the northern areas — there are references to this being imported into Mari in the second millennium, and olives are listed in the provisions for Ašurnaširpal's feast at Nimrud (Neo-Assyrian).

These foodstuffs together with the different types of cereal dishes illustrate the wide range of cooking techniques used by the people in Mesopotamia. The main type of bread was flat bread, probably leavened by the use of a sour from a previous batch of baking (3.1.2). This bread was cooked by placing on the interior wall of a beehive-shaped clay oven, the tannour. And tannours were found in the third millennium and are still the main type of oven in use today. Cereals were also prepared by roasting the grains, or possibly as a type of burghul by boiling and drying. Gruels and porridges were made by steaming or boiling cereal-grains in water (3.1.1). In many cases flour and grains from different sorts of cereals may have been mixed together to make breads and gruels of different flavours. Spices such as coriander and cumin were added to breads for flavour, and onions were also used as flavouring (3.7). For example at Mari (Old Babylonian) these spices and types of onions were issued to cooks for use in a type of bread or cake called mersu. Nuts and dates were also added to mersu at Mari. Other sweet cakes, NINDA.LAL.LAL/NINDA mutgu, are referred to at Mari, Nuzi and in Neo-Assyrian texts (3.1.2).

Malted grains were also prepared, and eaten as dishes in their own right as well as used in the production of beer (3.1.1, 3.1.4). Many sorts of beer appear to have been made — distinguished by their colour and flavouring. One type of beer, alappmu, apparently flavoured with pomegranates, was taken at the king's meal at Mari. Beer may have been sometimes drunk in a non-fermented state, as well as an alcoholic drink. Apart from water, it seems probable that beer formed the main drink of the people of Mesopotamia. Wine (3.8) is known only rarely in the third millennium. Grapes were probably
cultivated in the south at Lagaš, but they may not have been used to make wine. The wine trade was an important one by the Old Babylonian period; wine was transported from Iamhad and other centres in Syria through the country of Mari. By the first millennium, wine was included as part of the soldiers' rations, as well as those of the higher officials, at Nimrud. Although the amounts issued were small this suggests that wine had become a common drink. (Date-beer was made particularly in the Neo-Babylonian period in the south and does not figure as an important drink before then.)

The main method of cooking meat was probably by boiling, as in a stew (3.2.1). Most of the parts of the meat-animals were used. On representations of meals on cylinder seals dating to the Early Dynastic period leg-joints and heads are shown piled up on top of each other. This may represent dry-roasted food, but is more likely to be the joints of meat picked out of the vessels after boiling.

The preservation of meat and fish was necessary in such a hot climate (3.2.1). Textual references added to archaeological evidence from the Early Dynastic period indicate that fish were preserved by drying and salting (3.2.4). What may be salt-meat is listed as one of the foodstuffs for Amûrâ-nâṣirpal's feast. An ice-house existed at Rimâh, suggesting that food may have been packed in ice to slow down deterioration in this area at least.

The remains of ovens suitable for cooking by roasting and/or boiling have been found at many sites from Jarmo in the sixth millennium. Ranges, with places to set the cooking-vessels (3.1.3) were excavated at Tell Asmar, Babylon, Mari, and a complete kitchen complete with tannour, ranges, worktables, open hearths and a well was found in the Gipar-ku temple at Ur.

The adequacy of the diet

It has been seen that, with the possible exception of the Old Babylonian and Kassite periods (see above, pp.321-23), that cereal grains produced would have been enough to provide the estimated population with an average of 2 SîLA a day plus a further 2 SîLA for
animal fodder, storage etc, and that there was a wide range of other foodstuffs which enabled the people to prepare a variety of dishes. How were all these sources split amongs the population and did this provide an adequate diet?

The figure of 2 SIIA would give 5400 Calories a day, a figure well above the FAO recommended intake for an adult male (3000 Calories). This figure was chosen partly because it would supply a more than adequate amount of energy and partly because it is a figure higher than most of the daily ration issues. No texts have been found which give an idea of the daily consumption of the rich, and the only evidence there is for daily consumption are the texts recording the barley rations issued to employees at large estates. These rations were mainly issued monthly and the daily amount can be calculated. It cannot be taken as certain that the entire issue given to an individual was intended for only his use, but the fact that women with children were given larger amounts (the extra often being specified for the children) than women without children indicates this. In many instances where large amounts of barley were issued to individuals it is unlikely that all the barley was used for food each day - some may have been used to obtain other foodstuffs or even non-edible goods. But in assessing the quantitative value of the Mesopotamian diet - in particular energy content - it has to be assumed that all the daily rations were used as food for one individual. In this way it can be seen what nutrients were available from the daily ration, even though it cannot be provided that the individual consumed them all.

Accepting the daily barley rations as the main food supply of the recipients, it can be seen (4.2.5, Figures 1, 2 and 3, Tables 11-15) that any male receiving more than 1.33 litres per day, and any female with more than 1 litre per day, had an energy intake as high or higher than that recommended by the FAO (3000 Calories for males and 2200 Calories for females). Men with 1 litre (2700 Calories) and women with .83 litres (2160 Calories) probably have a sufficient energy intake, especially if allowances are made for size and hotter climate. Those people, male or female, with .66 litres or less a day do not receive an adequate energy intake (unless they are children below 6 years old).
Some of the children in particular may have been at risk. Many of them only received 10 litres a month (.33 a day), which would give them around 900 Calories a day, only adequate for a child in its first year. The exact age of the children is difficult to establish, and it is probable that, except for those specifically referred to as breast-fed (GAB), most were weaned and past their first year.

The amounts of rations of barley and other cereal grains show a remarkable similarity from period to period and area to area. Thus a man working in Naram-Sin's reign at Nippur might receive the same amount as one working in Kassite Nippur, or at Nuzi or Mari. There are variations according to professions and status, as well as sex and age, but basically there seems to have been an amount which was considered correct as a daily or monthly ration. The energy content has already been discussed. Of the other essential nutrients the barley-rations would supply adequate intakes of thiamin and niacin. The iron is low for girls and women but adequate for men. The most serious deficiencies are in calcium, Vitamin A and Vitamin C. So far there is little evidence for problems caused by calcium deficiency and the lack in the barley-rations may have been made up from other sources (4.3). The lack of Vitamin A and Vitamin C must have been made up elsewhere, possibly from gathering fruit and wild plants and from treating cereal dishes in a certain way - for example preparing barley as sprouted grains.

The variety of foodstuffs known to have been available must have meant that sources of Vitamin A and Vitamin C were available to the 'aristocracy' (4.2.3). Those people who had plots of land, either in addition to or instead of rations (4.2.6) may have been able to grow vegetables amongst their cereal crops and round palm trees and other 'fruit trees. They may also have been entitled to shares in any fruit crop grown. This was the usual practice between date-cultivators and the owners of the palms (3.6.3) in the Old Babylonian period at least. Only the poorest members of society, and those who relied solely on barley-rations, will not have been able to utilize the sources available. For them the lack of Vitamin C and in particular Vitamin A must have been serious. There is evidence that blindness was common and lack
of Vitamin A may have been a contributary factor in this condition (4.3).

What type of meals did the people of Mesopotamia prefer or think right? Remains of food-dishes were found on saucers as part of a foundation offering in PG/1054 at mid-third millennium Ur (3.6.2, 3.6.4). Here the bones of sheep/goat, date stones, rings of dried apples and the remains of possible flat-bread suggest that a mixed diet of meat, fruit and bread was favoured. The rations issued to 'messengers' in the Ur III period usually included beer, bread, onions and oil, with the occasional addition of fish (4.2.5). The king's meals at Mari (4.2.4) show a wide variety of cereal and vegetable based dishes, with fruit, honey, oils and fish and meat. In accounts listing food given for a marriage ceremony in the Old Babylonian period at Ur, sheep, bread and beer together with ghee and 'linseed oil' were issued to the groom, his mother and other members of the wedding party (4.2.4).

At Nimrud, in the first millennium, what may be the remains of a cooked meal included barley, possibly cracked, grapes, perhaps dried, and green vegetables. Texts from the same period, and the list of provisions for Aššurnaṣirpal's feast, show that a wide variety of foodstuffs was favoured and that both cereal and vegetable dishes and meat were used. A text from Warka in the Neo-Babylonian period gives what may be a recipe and throws some light on the tastes of the people at that time. The recipe records boiling plenty of roasted spices, including mustard (kasū), cress (sahlu) and cumin (kamnu) in kasū-water, into which 2 shekels of cucumber are added. The mixture should be cooked until it is 1 SILA (a reduction of about half?). It is then strained and stuffed (?) (ta-nam-di(!) 'you pour') into freshly slaughtered meat. This suggests that highly spiced dishes were eaten and possibly that dishes of meat stuffed with vegetables were prepared.

Some proverbs may also help here. One says 'Barley flour in the fields is meat (and) fat' - freely interpreted, if you are working in
the fields barley-flour can taste as good as meat and fat! Another says: 'You are pouring off the fat from meat. You are mashing the roasted barley' — freely interpreted, the fat should be left with the meat, and roasted barley should be eaten whole. A third proverb, although even more obscure, refers to the food of the 'mother of the heroes' being drenched in fat and even if her food was drenched in honey and ghee, this would not console her for her sons (?). All this suggests that fatty meat was considered the best and that fat and oils were a sought-after part of the diet, and they may therefore have been rare. Even at Mari, oil was not issued at every meal for the king.

All the essential nutrients were available within the foodstuffs existing in Mesopotamia from the third to the first millennia, so that it was possible for the population to have an adequate diet. The 'aristocracy' appears to have exploited the sources, and their nutritional health can be assumed to be good. Those members of society depending entirely on the barley and other cereal rations were at risk from the lack of Vitamin C and Vitamin A. And the energy intake for their children is often insufficient to provide fully for growth and development. Such people would have had inadequate diets when young, the time of greatest vulnerability, which would lower their standard of health and efficiency in later life. It seems probable however that only the strongest and fittest children would survive, so that those children who had suffered most deprivation in early life would be unlikely to live until they were adults. The health of the adult population may therefore have been less affected by the malnourished children than appears at first.

If the lowest levels of barley rations are set aside (that is all those receiving .66 litres or less barley a day) it has been seen that the rest of the ration-recipients had a diet which contained adequate energy intake and was also adequate in the other essential nutrients except for calcium, Vitamin C and Vitamin A. But there were other sources available for Vitamin C and Vitamin A and evidence for their exploitation, and it would seem that the nutritional health of most of the Mesopotamian population was good. The gloomy picture of
an apathetic population, subject to illness, applies only to the poorest level of society, solely dependent on barley rations.

Further lines of research

The present study has provided a basic knowledge of the range of foodstuffs available in Mesopotamia, what was actually eaten and how far the diet was adequate for the people - in particular those people dependent on barley rations from palaces or temples, as these are the only people for whom we have evidence. However, there are various lines of further research which would be useful to fill out certain aspects.

Changes in tools and pottery are often studied from the point of view of changes in style without much attention being paid to the way in which they were used and how that may have altered. This is perhaps more true of the study of pottery where few attempts are made to decide the purpose of the vessel. Such studies might point out further changes in agricultural techniques and in eating habits. In addition the calculation of the capacities of pots, preferably using the actual pots themselves rather than type-drawings, may help to establish the size of the capacity measures and their relation to each other.

In the same way the increasing study of palaeoethnobotanical and palaeozoological remains will increase our knowledge of the food available. Recent interest has been concentrated on the early problems of domestication of plants and animals and the historical period has been neglected. Possibly it is thought that the cuneiform texts will supply all the desired information. This is not necessarily so: many 'food' words which appear in texts cannot be safely translated, and more archaeological evidence for what foods were available in a particular place could help. In this way the identification of dried apples at Ur in the Early Dynastic period helps to confirm the translation of Gšš₃₃ba₃₃uru as apple rather than apricot.

These lines of research have been looked at in this study and one which was only lightly touched on and which needs much fuller examination is the subject of diseases caused by poor nutrition. There are many medical texts which not only give instructions on the steps to
take to 'cure' the disease but describe the symptoms. A study of these texts might isolate nutritional diseases, which would give valuable information about the health of the community. Such a study would require not only a good knowledge of Sumerian and Akkadian but also a knowledge of medicine.

An examination of bones from graves could also add valuable information about calcium and Vitamin D deficiency. And it might be possible to work out the height of the population and from this calculate the likely weight. This project would help provide a picture of the size of the people of Mesopotamia. The representations of people on cylinder seals and reliefs etc might be of use as a supplementary source of evidence.