

The Transformation of Nomadic Society in the Arab East

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CAMBRIDGE
UNIVERSITY PRESS

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, UK www.cup.cam.ac.uk
40 West 20th Street, New York, NY 10011-4211, USA www.cup.org
10 Stamford Road, Oakleigh, Melbourne 3166, Australia
Ruiz de Alarcón 13, 28014 Madrid, Spain

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First published 2000

Printed in the United Kingdom at the University Press, Cambridge

Typeface Monotype Times New Roman *System* QuarkXPress™ [SE]

A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication data

The transformation of nomadic society in the Arab East / edited by Martha Mundy and
Basim Musallam.

p. cm.

Includes bibliographical references.

ISBN 0 521 77057 2 (hb)

1. Bedouins – Arab countries. 2. Nomadism – Arab countries.
3. Bedouins – Relocation – Arab countries. 4. Bedouins – Economic conditions – 20th century.
5. Bedouins – Social conditions – 20th century. 6. Bedouins – Government policy – Arab
countries. I. Mundy, Martha. II. Musallam, Basim.

DS36.9.B4 T73 2000

909'.0974927–dc21 99-045363

ISBN 0 521 77057 2 hardback

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Environment and development

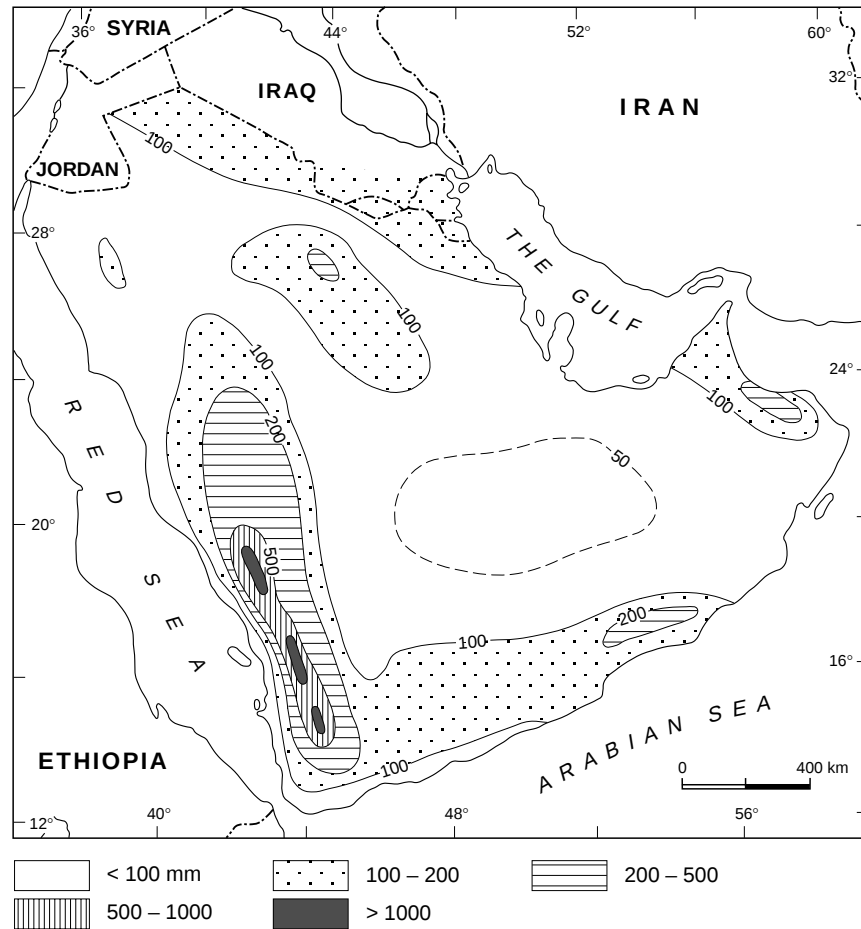
PAUL SANLAVILLE

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Most of the studies in this volume concern the steppe on the inner edge of the Fertile Crescent, adjoining the Arabian desert. Others, however, consider areas right in the heart of the Arabian Peninsula, where conditions differ quite markedly, and for which the term 'steppe' is not appropriate.

The latitude and annual temperature variations of the Arabian Peninsula make it a tropical area, in spite of the fact that winters can be cold, particularly at high altitude. Most of the peninsula is desert, with very low rainfall, generally below 100 mm except in certain mountainous regions. These less arid regions are: (a) the western edges of 'Asir and Yemen, where rainfall on high ground exceeds 200 mm (sometimes even 500 mm); and (b) the mountains of Oman (see map 1.1). Rainfall occurs in winter and is caused by cooler air masses. Rain also falls in summer (June–July) on the mountains in the south, when the intertropical weather front moves northwards. These are monsoon rains. This area is perceptibly more arid than the inner edge of the Fertile Crescent. Summer temperatures are very high indeed and rainfall occurs only a very few days a year and varies greatly from year to year. As a result the local vegetation looks very different: the climate is Saharo-Sudanese and is favourable to trees but not to grasses. Rather than being steppe, the landscape consists of very open scrub jungle, mainly acacias and thorn bushes concentrated in the wadis. This strip of desert margin within the Arabian Peninsula is fairly narrow and extends between the mountainous zones stretching through the Hijaz, 'Asir, Yemen, Hadramawt and Oman and the vast dune-covered depressions in the centre, the Nufud and the Rub' al-Khali. The strip consists of sand and pebble foothills traversed by a dense network of wadis, whose sporadic outpourings quickly disappear into the sand (see map 1.2). These inner foothills are used as thoroughfares by nomads but, except in exceptional cases, agriculture is confined to the oases and is always irrigated.

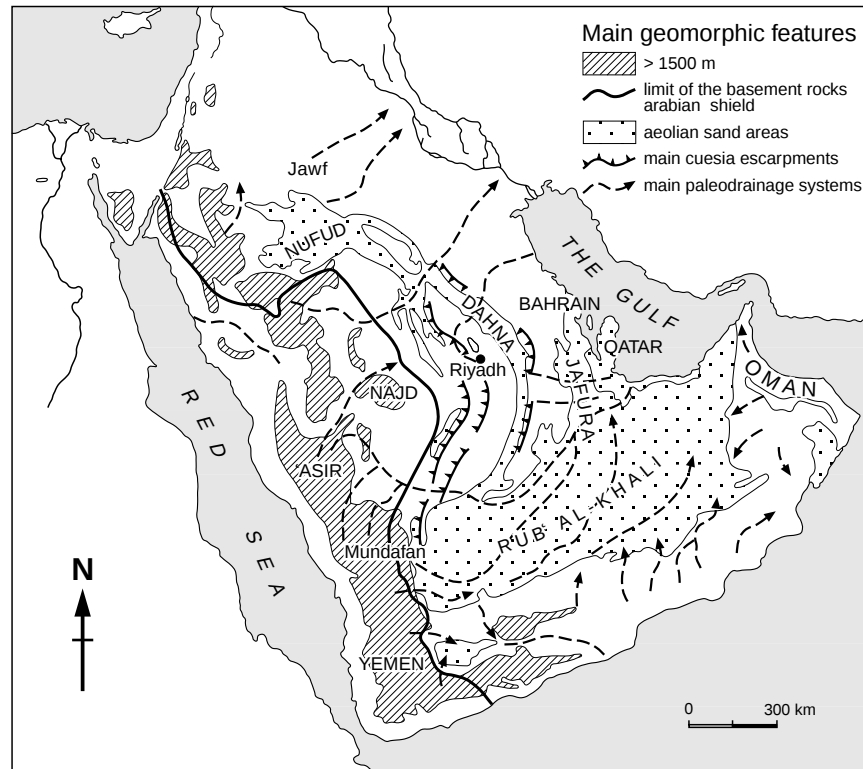
The inner edge of the Fertile Crescent, on the northern border of the Arabian desert, presents quite a different picture. It covers a great arid and semi-arid arc extending right through Jordan, Syria and Iraq. Lying as it does between the desert, used by the nomads as pastureland, and the areas occupied since neolithic times by settled agriculture, this inner border is difficult to



Map 1.1: Average annual precipitation in the Arabian Peninsula

demarcate exactly. In appearance the area consists of vast plains and plateaux broken by limestone hills (the mountains of the Palmyrena and Jabals Bishri, ‘Abd al-‘Aziz and Sinjar) or volcanic outcrops (the Druze mountain); a dense network of wadis covers the plain, which dips gradually southwards in Iraq and northern Syria, less gradually eastwards in southern Syria and Jordan. The vegetation best adapted to local climatic and soil conditions is steppe grassland, comprising a rich variety of species. In well-watered areas this steppe also supports oak and pistachio trees. Very early exploitation of the steppe by mankind has caused progressive damage to the vegetation and has led to the almost total disappearance of trees.

During the most recent glacial period in the northern hemisphere the

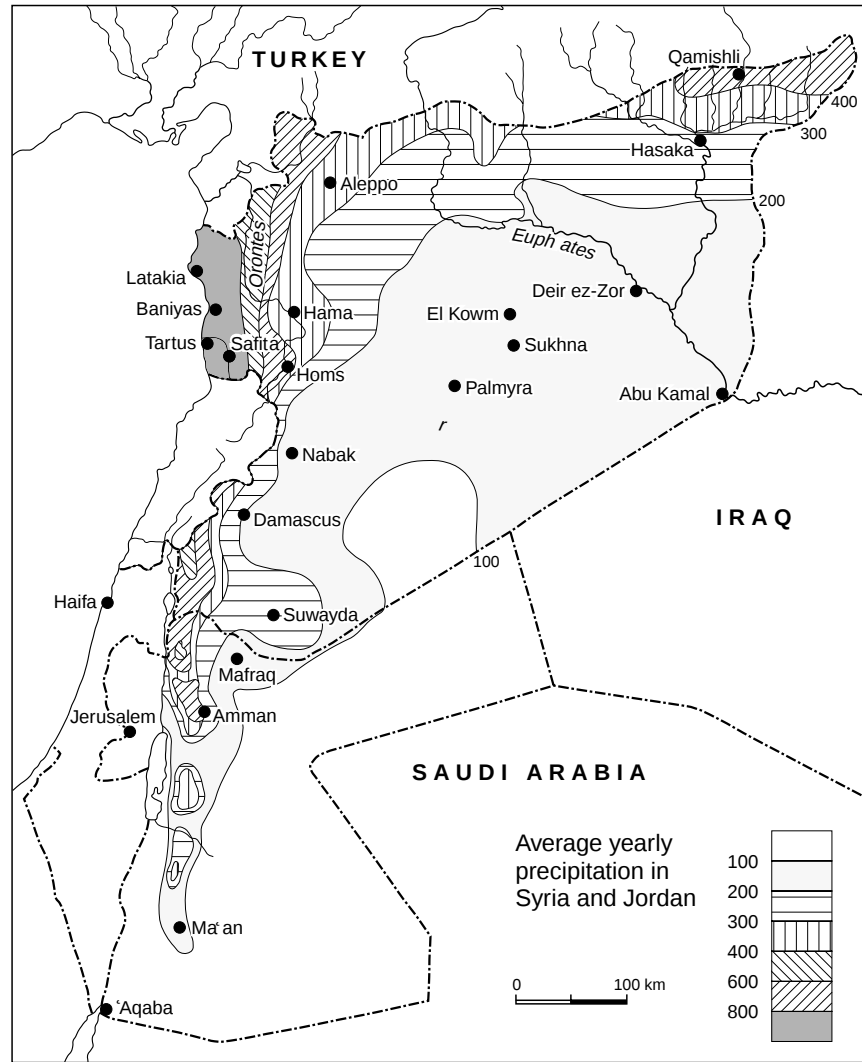


Map 1.2: Main geomorphic features of the Arabian Peninsula

climate of this region was one of extremes of heat and cold, but this has gradually changed over the past 12,000 years into the climate that we are familiar with today. As the climate there grew warmer, the Fertile Crescent played host to the neolithic revolution; the population adopted a settled way of life and began progressively to domesticate both plants and animals, growing crops (wheat, barley and pulses) and raising sheep and goats. From the fourth millennium BC the region witnessed the birth of the urban revolution. It is a region that has played a key role in the history of mankind. Land occupancy and land use in this transitional area have changed quite radically over the millennia, keeping pace with climatic changes and political and economic vicissitudes.

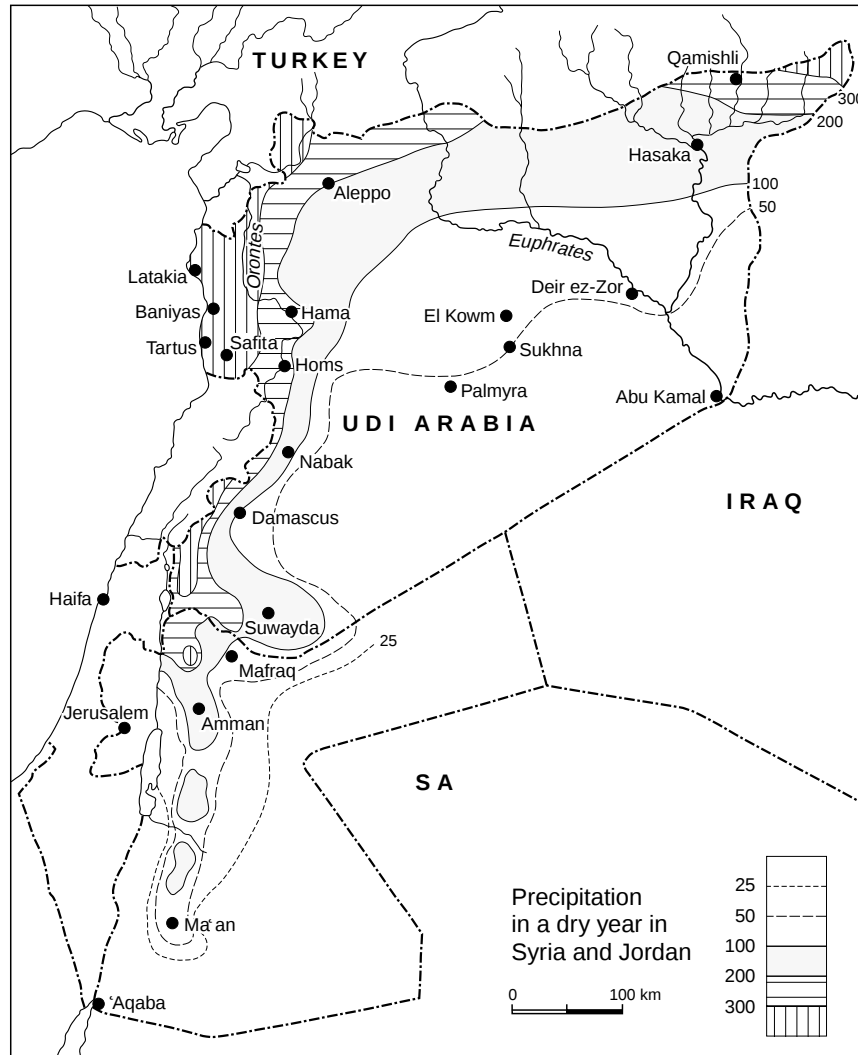
Climatic uncertainty

The steppes on the northern border of the Arabian desert enjoy a Mediterranean climate with two principal seasons. The rainy season extends over a seven-month period, from October to April, with the maximum rainfall in December, January and February. The summers are extremely hot and dry, and their length increases the further south one goes. Rainfall varies both



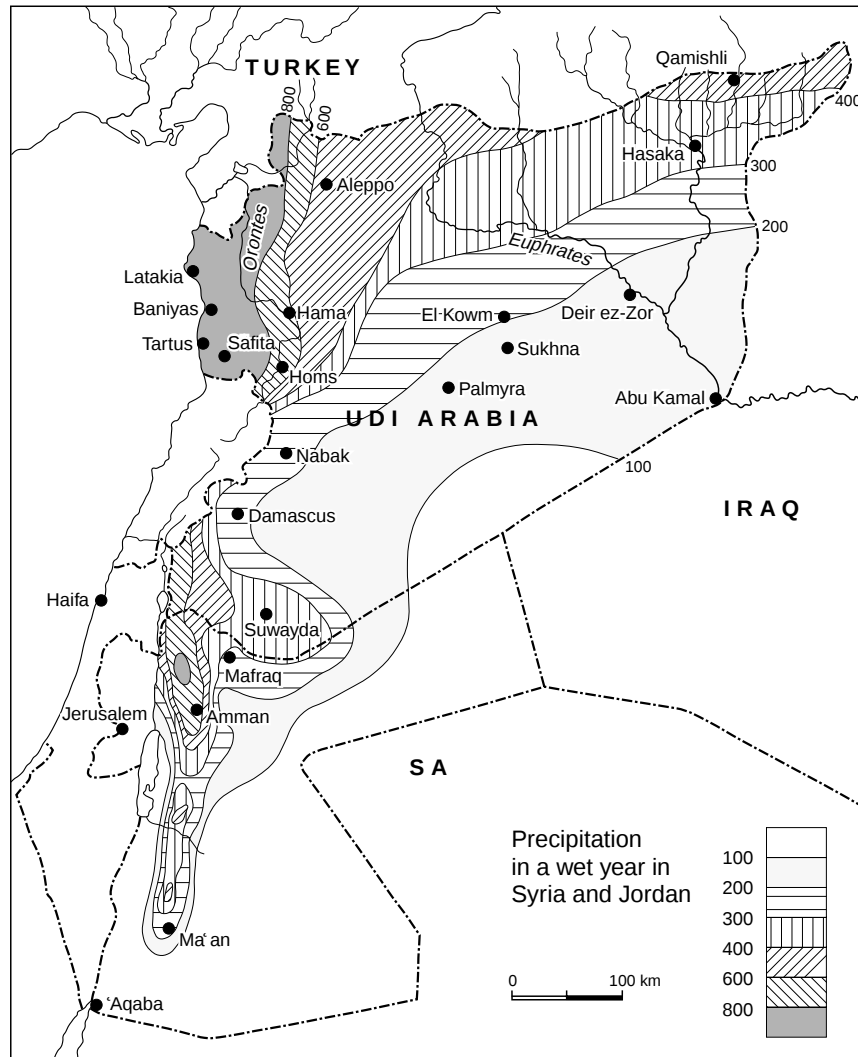
Map 1.3: Average annual precipitation in Syria and Jordan

in annual quantity and in its distribution throughout the year. It is not easy to describe this transitional zone, between the cultivated belt and the desert, in statistical terms. The data available on climatic matters are inadequate because statistical records are too recent and rainfall observation stations too widespread; the data that do exist have never been properly interpreted, and the readings available are marked by great irregularity, both temporal and spatial. Some idea can be gained from a series of statistics which emphasise the irregularity of the annual rainfall and its general unpredictability (see map 1.3).



Map 1.4: Precipitation in a dry year in Syria and Jordan

Schematically, the zone falls between the curves representing twenty-five and forty days rain per annum, and between the isohyetal lines representing 100 mm and 250 mm average annual rainfall, i.e. well short of what is needed for growing normal cereal crops. Harvests in this area, when crops are sown, are extremely risky. In fact rainfall varies extremely from one year to the next and can be as low as the desert norm (less than 100 mm) or relatively high (300 mm, sometimes more); the latter figure allows cereal crops to prosper, but the variation in rainfall gives rise to some terrible disappointments in drought



Map 1.5: Precipitation in a wet year in Syria and Jordan

years. The northern border of the steppe could be said to correspond approximately to the 150 mm isohyet in a dry year and the 350 mm isohyet in a wet year (see maps 1.4 and 1.5).

It is estimated in Syria, therefore, that over a period of ten years, the occurrence of years in which the rainfall is too low for any crops to grow is three in areas where the average rainfall is 300 mm, and nine in areas where the average annual rainfall is less than 150 mm. The irregularity of this pattern of rainfall can be expressed by a calculation of average variability across a number of

years, i.e. by the average departure from the norm. This variability is in the region of 45–50 per cent, higher still in zones where the average rainfall is lower.

In order to understand the steppe one has to take a certain number of variables into account. These include, first, the number of days of rain and the irregularity with which they occur, year by year or even month by month. The most irregular months fall at the beginning and end of the wet season, i.e. at the most critical moments in the growing season, when the first shoots come up and when the ears of grain are formed. Second, the seasonal distribution of rainfall: the rainfall peak is in January–February in the west but shifts to March–April in the east of the Syrian steppe and in Iraq. Third, transpiration by evaporation, depending largely on the wind and on temperature: this increases sharply as one moves southwards, in Jordan, and accentuates the water deficit for plant growth. And fourth, land contours also play an important role. Altitude increases rainfall and the mountainous areas feed the aquifers under the wadis. The hills and mountains form an obstacle to the humid winds and their eastern foothills are often very dry indeed.

The enormous regional differences in this area cannot be emphasised too strongly. Many showers are caused by local storms, distributed in completely random fashion, and this may make rainfall statistics completely different from one monitoring station to the next, as the statistics on year-by-year variability at monitoring stations in Palmyra, Suwayda and Hama show. For example, the year 1975 was slightly wetter than average in Hama, and even wetter in Palmyra, whereas the same year was exceptionally dry in Suwayda. In 1987 Hama experienced the average rainfall, Suwayda considerably more than the average and Palmyra much less. The winter of 1991–2 was very damp in western Syria, but abnormally dry in the steppe.

Populations exploiting this arid margin have to put up with very unpredictable rainfall, and to survive the consequences of this upon vegetation and the environment. The so-called Fertile Crescent is very narrow in places: to the east of Damascus, for instance, where the double barrier of the mountains of Lebanon and anti-Lebanon brings the desert right up to the foothills of the Qalamun range; and in the southern part of Jordan. In other parts the Crescent is relatively wide: nearly 200 km on either side of the Euphrates at Raqqa in Syria, or on the eastern side of the Jabal Druze. Here the transition to desert is much more gradual; the isohyetal lines vary widely from year to year.

Although rainfall is the most important factor determining agricultural potential and the high level of climatic risk typical of the region, it is not the only factor. Agricultural potential is also closely linked to temperature and soil quality. In winter, water loss through evaporation is low because temperatures are relatively low, and in areas receiving more than 200 mm of rain per year water needs are generally met. On the other hand, as soon as spring comes, temperatures rise quickly and drought conditions reappear very

quickly. Because temperatures vary enormously year by year the development cycle of barley can vary by three or four weeks, according to the temperature prevailing in the cold season. The effects of lack of water are even more of a threat when the temperature shoots up in the spring. In order to complete their development cycle the plants depend heavily on water that has accumulated during the winter.

The water available at the end of the growth cycle depends on rainfall and also on the ability of the soil to conserve excess. Pedological conditions are not on the whole very favourable. The soils are generally thin and therefore not very suitable for the practice of dry farming, which is based on the accumulation of water from one season to the next. When the depth of the soil is less than 60 cm, only a portion of excess rainfall can be utilised by the plants to complete their development cycle. In addition, the soil is mainly calcareous or gypseous, and therefore lacking in nutritive elements – particularly in phosphates, nitrogen and organic matter. Furthermore, the soil is structurally unstable and therefore fragile; in the least well-watered areas it deteriorates very easily.

The threat of desertification

Several chapters in this volume consider the damage being done to the environment and to natural resources, in cultivated areas as well as in the grazing lands. The observations made by their authors leave no room for any doubt about the serious nature of the problem, and the urgency of finding solutions. In some areas the damage has become virtually irreversible, and the land is becoming desert. Scientists engaged in studies of the area have given a clear picture of the stages leading up to the present situation.

Traditional pastoral practices, where the flocks visited the pastures twice a year, in spring and in autumn, took into account the fragility of the steppe environment, giving it time to recover between grazing. The flocks would leave the steppe during the latent season, to go and crop the stubble in the cultivated areas (in summer) or to retreat into the desert (in winter). Since the end of the nineteenth century, however, and at an ever-quickenning pace, pressure on the steppe has increased. The reasons for this are manifold:

- The advent of motor transport has played a decisive part by reducing distances and by permitting the rapid transport of water, foodstuffs and animals to any area. Motor transport has made possible the rapid expansion of cultivated areas, and has allowed flocks to graze areas that were previously difficult of access, where now they can remain even during severe droughts.
- The increase in population, dramatic urbanisation and a general rise in the standard of living have brought about a growing demand for meat, particularly lamb and mutton.

- Agricultural policy has, directly or indirectly, encouraged intensification in the use of resources, without imposing any controls. Political and economic crises, frequent in the recent history of the region, have often had a direct effect on the desert areas, which have been used as overspill areas. In Jordan, the wave of emigration triggered by the Israeli occupation of the West Bank in 1967 was followed immediately by an expansion of land under cultivation into the desert regions of Jordan. In Syria the considerable increase in barley production between 1986 and 1990 is the direct result of the economic crisis that afflicted the country after 1985; it is detrimental to the steppe. These two examples demonstrate how the dry regions are used as pressure valves or outlets during times of crisis, but unfortunately this exploitation damages their longer-term prospects. In Syria, barley-growing has spread into the steppe, reducing the land available to nomadic herdsman. Barley is now grown below the 100 mm isohyet, in what is termed zone 5 (and even beyond), well beyond the theoretical limit of rainfed culture; 15 per cent of barley cultivation now lies outside this limit. The steppe thus plays a considerable role in barley-growing and sheep-rearing, but the flocks only receive a small proportion of their nourishment from this locally produced barley, the major part nowadays being provided by pellets and straw purchased by herders.
- These developments have been accelerated by the authorities, who have done their best to settle the nomads while rushing through measures to suppress tribal property rights and to prohibit the fallowing of land. They have authorised the cultivation of drier and drier areas.

The environmental consequences of such developments are very serious. Flocks that are too large stay too long in one place and take no account of the latency periods required for plant growth. Herds of livestock trample the plant cover and cause great circles of desert to appear in areas where they are herded together. Motor traffic builds up. Land is often cultivated on perpendicular slopes, which destroys local vegetation and exposes bare soil to the danger of erosion by wind and by water.

Archaeological and geographical research has revealed how the agricultural colonisation of the region advanced and retreated by turns over the centuries. During periods of dense, intensive occupation the number of villages and the population of each village increased; the inhabitants penetrated further into the arid margin, which was itself occupied at the time. There were also periods of decline, when the settled areas were more or less abandoned to the nomads and their flocks. There were phases of dense occupation during the Halaf and Obeid periods (sixth and seventh millennia), then during the chalcolithic period and the Bronze Age (fourth and third millennia) and finally round about the beginning of our era, peaking during Roman times. Other

periods, however, show a marked decline, for example the more recent Bronze Age (middle of the second millennium AD) or from the seventeenth century on; it is not clear to what extent the changes are attributable to environmental modifications or to historical, political or economic factors.

Such a vision of *la longue durée* helps to put into perspective the problems that we observe today, which form part of a cycle that began when agriculture was first developed in the region. Nevertheless, pressure on the land has never been so strong nor the disequilibrium so great since pastoral and agricultural exploitation began. In the past the low population made the temporary abandonment of deteriorated lands quite feasible; this is no longer the case today, however, as population growth in the Middle East is one of the highest in the world and pressure on the land is extreme.

Signs of the deterioration of basic resources are increasingly in evidence, although the economic and social consequences cannot compare as yet with those affecting other parts of the world, in particular the Sahel, where such developments have been studied in detail. Although periodic droughts cause a damaging decline in productivity in the Near East, their effects are not as dramatic as the effects of drought in the Sahel. In the Near East aridity is less extensive, the cycle of drought much less prolonged and, most important of all, the economic and social consequences are mitigated because the states are richer, their economies more diversified and the populations affected have access to more varied resources.

The increasing desertification cannot be ignored, however: plant cover has been considerably reduced, interesting species are disappearing, to be replaced by plants not attractive to livestock. Soil fertility has decreased enormously since fallowing was abolished, and the drop in the quantity of nutrients in the soil (phosphates and nitrogen) has the effect of lengthening the growing cycle and thereby increasing the risk of plants being scorched when the hot weather starts.

Some spectacular examples of soil erosion have been reported: ravines being hollowed out or large bodies of earth carried away by water running off the hills. Wind erosion, perhaps the most spectacular of all, creates mobile sand dunes (barkanes) that sometimes block roads or cut off railway lines. Unfortunately we do not possess many details of this erosion, either statistical or cartographical, but it has been estimated that wind erosion could account for the loss of 10 to 50 tonnes of soil per hectare per year. Sand travels through the air across short distances and is soon brought to a halt by obstacles in its path (usually hills). Dust is raised by the wind and is transported in suspension at relatively high altitudes, sometimes for a long way, and this accounts for the definitive loss of a considerable volume of fine soil particles from the area. Water erosion is the greater threat in zones where rainfall is higher, wind erosion the greater in drier zones with sandier, less structured soil.

Soil erosion is bound to increase as the plant cover deteriorates and becomes more sparse. The history of the region shows that periods when the

population pressure was heavy have always been followed by periods when erosion was bad; the regeneration has taken a long time afterwards, and often seems to have remained incomplete. We can learn from the examples above, always bearing in mind that the pressure imposed by man on the environment has never been as great as it is today.

Rational development

Thanks to the presence of two international research agencies in the region (ACSAD and ICARDA), large sums of money have been spent on research and on the application of technical improvements. The various research programmes are producing promising results, but these results have not, as yet, been very widely applied. The implementation of the results has come up against a number of obstacles, political, economic and social. Agricultural policy appears to pay no heed to the results or to the proposals put forward by the research bodies; one wonders what kind of relations must exist between the research bodies and the policy makers.

The proposals made by the research organisations raise a few questions themselves. On the one hand some of the proposed improvements run the risk of missing their objective and of contributing to the destruction they are designed to avert. A case in point is the application of fertilisers, proposed for the semi-arid zones as part of a package of measures centred round the introduction of leguminous fodder crops. Used on their own, fertilisers compensate for the chemical deficiencies of the soil and thus make it possible to maintain cultivation in sensitive areas for a longer period; this may simply serve to hasten the physical degradation of the soil. Study of the problems of soil degradation has only recently begun, previous agronomic research having principally (if not exclusively) focused entirely on the application of technical solutions. Basic phenomena such as the physical and chemical deterioration of cultivated land are still little understood.¹ It is difficult to forecast whether or not the projected improvements will lead to the long-term stabilisation of productivity.

Collaboration between politicians, practitioners and academics (from the natural as well as the social sciences) is essential for the production of a mini-series of thematic and deductive maps. This could cover selected areas of Syria and Jordan, in places where geographers and anthropologists have already started work and which are already well known to archaeologists and historians. In this way an effective dialogue could be set up, the first and indispensable step towards the drawing up of the integrated development plans that so many people have requested.

¹ For further research on these issues, see Sanlaville, 2000.