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Yeki bud, yeki nabud

ESSAYS ON THE ARCHAEOLOGY OF IRAN IN HONOR OF WILLIAM M. SUMNER

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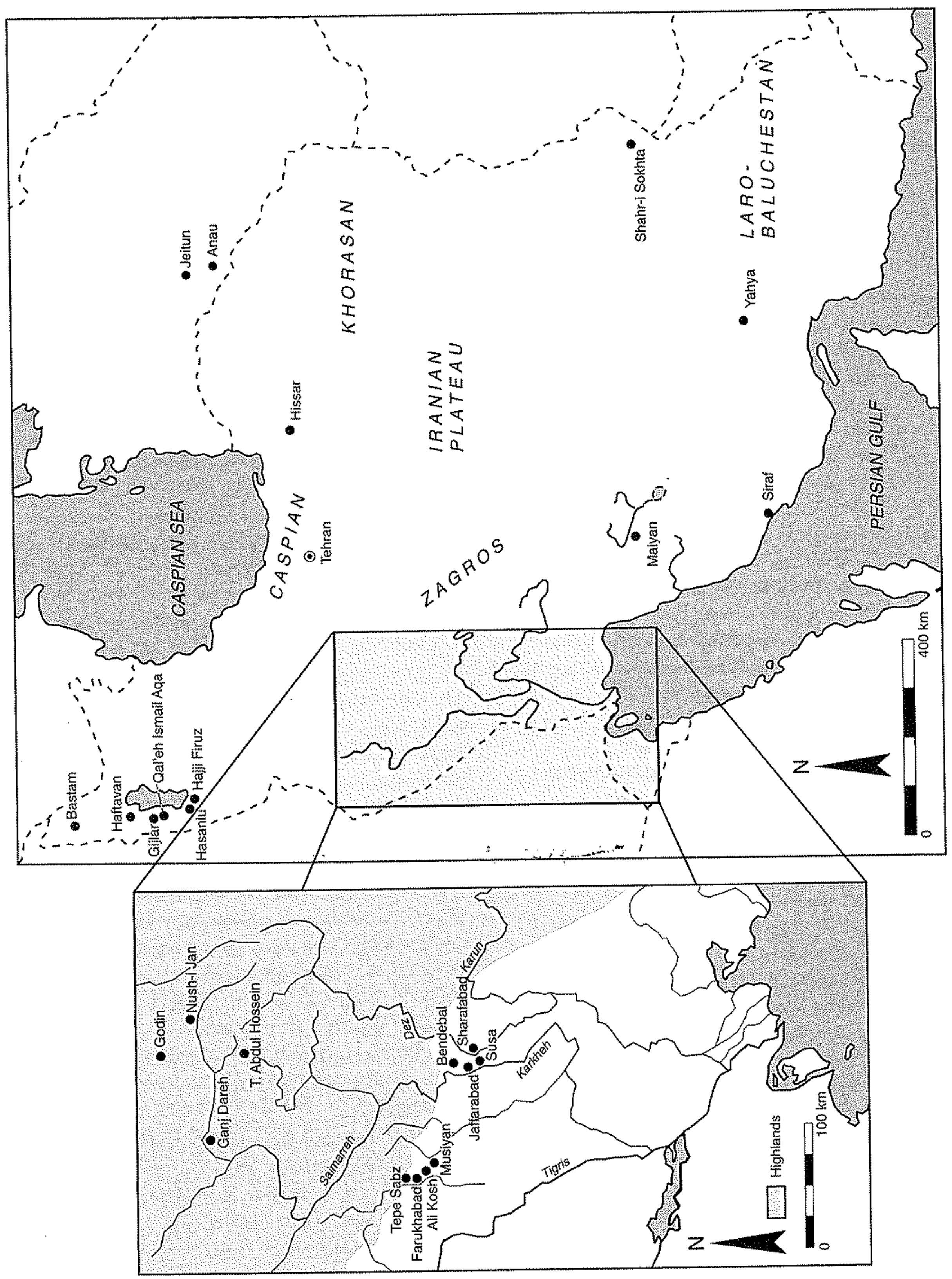

2.1 Sites mentioned in text. *Prepared at MASCA*

CHAPTER 2

ARCHAEOBOTANY IN IRAN, PAST AND FUTURE

NAOMI F. MILLER

THE TWO MOST IMPORTANT SOURCES of evidence for vegetation and land use in ancient Iran are plant remains found on archaeological sites and pollen from lake cores. The former more directly reflect plant use by ancient people, for they are remains of plants used for food, fodder, fuel, construction, and other purposes, brought into settlements by people and animals. They consist primarily of seeds and wood remains, usually preserved in charred form, and also include some archaeological pollen. In contrast to remains from archaeological sites, lake sediment pollen records regional vegetation. It is important both for reconstructing the environment in which people lived and for identifying human impact on the vegetation.

From the beginning of modern archaeobotanical studies in the 1960s, plant remains from Iran have provided important information about a variety of topics. Collaboration among botanists, archaeobotanists, and other archaeologists has been affected by intellectual trends in the rest of the Near East and elsewhere. An early example is Hans Helbaek's (1969) work on the Deh Luran plain, which was part of one of the earliest and most influential projects concerned with early agriculture—Hole, Flannery, and Neely's (1969) *Prehistory and Human Ecology of the Deh Luran Plain.* Hans Helbaek pioneered the study of the development of agricultural economies and technology and was the first person in Iran to use flotation to obtain plant remains. As an archaeologist, Henry Wright's broad-based interest in the early civilizations prompted him to take flotation samples (he was probably the first to measure soil volume) from Farukhabad and Sharafabad (see Wright et al. 1981). William Sumner's unstinting support of archaeobotanical research at Malyan provided the material for one of the first large archaeobotanical studies of an early city (Miller 1982). Setting the environmental scene for all this was basic work by Willem van Zeist and colleagues on pollen cores from the central Zagros mountains that documented the harsh conditions of the last Ice Age and the gradual return and spread of trees to the Zagros (van Zeist and Bottema 1977, 1991).

After a brief outline of the major vegetation zones of Iran, this chapter discusses some of the issues that archaeobotanical data are well-suited to address: human impact on the environment that accompanied the development of agricultural and pastoral economies starting about ten thousand years ago, the impact of the early civilizations on the landscape, and the spread of new crops and technologies from and to neighboring regions (figure 2.1).

All the members of the basic Near Eastern crop complex—the wheats (emmer, einkorn, hard wheat, and bread wheat) and barleys (the two-row and hulled and naked six-row types), lentil and other pulses, and flax, whether for oil or fiber—have been grown in Iran for more than seven thousand years. With the possible exception of grape, fruit-growing began later. After the Bronze Age, we know a variety of other crops that came to Iran, such as millets, sesame, rice, cotton, and sugar cane, but the introduction of these crops is not always attested archaeobotanically (see Zohary and Hopf [2000] for overviews of the different crops) (table 2.1). The long span of human settlement in Iran led inevitably to changes in the landscape, and this too can be traced in the archaeobotanical record.

PHYTOGEOGRAPHY

Iran can be divided into five major vegetation provinces: Caspian, Zagros, central Iranian Plateau, Khorasan, and Laro-Baluchestan (this section is based primarily on Zohary [1963]). The influence of the Mediterranean climate regime is manifested by moisture-bearing winds that predominate in the winter. Trade winds associated with high pressure are a significant factor for the extreme summer aridity in most of Iran. Generally speaking, precipitation increases with altitude and decreases with latitude. Although archaeological and archaeobotanical research has favored some regions over others, this overview is provided as background to this and subsequent chapters, and to encourage future archaeobotanical research. A number of surveys of the climate and vegetation history in the Near East are available that include discussions of pollen and macroremain evidence for Iran (for example, Miller 1997a; van Zeist and Bottema 1991; Willcox 1991).

CASPIAN REGION

The Caspian region includes the Caspian Sea lowlands and Elburz mountains to the south. The mountains run in an east–west direction and reach a maximum elevation of 5670 m. There is a pronounced rain shadow on the southern slopes facing the central Iranian Plateau. The coastal plain and northern slopes are favored with more than 1000 mm annual precipitation, and the lower altitudes experience mild winters. The climax vegetation is described by Zohary (1963) as thermophilous and temperate forest. Despite the agricultural richness of this area today, there are no archaeobotanical reports published for any site in this region. One area that may prove fruitful is the southern slopes of the Elburz, a possible route for agriculture into Turkmenistan (Harris and Gosden 1996; see below).

ZAGROS REGION

The Zagros region incorporates the highlands of western Iran. The mountains run in a northwest–southeast direction. The rain shadow on the eastern slopes can be quite pronounced, but the western slopes are influenced by winter moisture from the Mediterranean. Interspersed among the 3000- to 4800-m peaks are intermontane valleys, the location of most of the settlements in this region. Precipitation varies from 200 to 1000 mm, so dry farming can be practiced in most of the region. The dominant vegetation in the wetter north and west is xerophilous oak forest, with a general trend toward the drier south and east to a pistachio or pistachio-almond steppe-forest. Susiana, with its cool moist winter and hot dry summer can be considered part of this region, though it lies just at the edge of the dry-farming zone. Most of the archaeobotanical research in Iran has been done in this area.

During the last glacial period, cold, dry conditions could not support forests. In the central Zagros, pollen from Lake Zeribar shows that the vegetation was mainly cold dry steppe dominated by *Artemisia* and members of the Chenopodiaceae family (van Zeist and Bottema 1991). With warming in the Holocene, trees repopulated the Zagros, though vegetation change followed climate change. It took some time for oak to reach its present distribution. For example, oak had not yet reached the site of Tepe Abdul Hosein, occupied during the Neolithic (Willcox 1990:226). Even as late as the Proto-Elamite period, small quantities of oak in the archaeobotanical record of Malyan may indicate its absence in a region that today is at the edge of the oak forest (Miller 1990a).

CENTRAL IRANIAN PLATEAU

The central Iranian Plateau, almost completely surrounded by mountain ranges, has a very dry continental climate. Elevation is about 1300 m, though the land rises to 4000 m in some places. Steppe and desert (including the Dasht-e Kavir in the north and the Dasht-e Lut in the south), sand dunes, salt deserts (*kavir*), gravelly and pebbly steppes are common. Some spots are unvegetated, due to annual precipitation that ranges from 200 mm down to 0 mm. At the higher elevations there are some remnant forests, but mostly the region is characterized by *Artemisia* or *Astragalus* steppe, with psammophilous (sand-loving) and halophilous (salt-loving) species being common. Very little archaeobotanical research has come out of this region. Tepe Yahya lies at its southern edge, and Shahr-i Sokhta is on the east, but the environment is so harsh in most of the region that there has never been much human occupation there.

KHORASAN REGION

The Khorasan region in northeastern Iran is an upland area that reaches an elevation of 3000 m. Annual precipitation ranges from 100 to 500 mm. Consequently, the vegetation is primarily steppe or desert, with forest remnants in the upper elevations. The natural vegetation in much of the area would be juniper steppe-forest. Archaeobotanical remains from Hissar have been investigated—in addition to staple cereals and pulses, some native wild olive and also grape seeds were encountered (Costantini and Dyson 1990).

Table 2.1 Crop plants

	Barley		Wheats			Pulses		Fiber/oil	Fruit		Millet	Other
	2-row	6-row	einkorn	emmer	bread/hard	lentil	bitter vetch	flax	grape	date	(broom-corn)	
Neolithic												
Ali Kosh (1)	•	+	+	•	.	+	.	w	.	.	.	
Tepe Sabz (1)	•	•	+	+	•	•	.	•	.	.	.	
Musiyan (1)	+	?	+	+	+	+	.	+	.	.	.	
Jaffarabad (2)	b	.	+	•	.	•	+	.	.	.	.	
Bendebal (2)	b	.	cf.	.	.	.	.	.	.	.	.	
Ganj Dareh (3)	b	.	.	.	.	+	.	.	.	.	.	
Hajji Firuz (4)	+	+	.	+	.	.	.	+	.	.	.	Wine residue
Jeitun (5)	b	.	•	+	.	.	.	.	.	.	.	
Chalcolithic, Bronze Age												
Farukhabad (6)	•	+	+	+	+	+	.	.	.	.	.	
Sharafabad (7)	.	•	.	•	.	+	.	.	.	.	.	
Malyan (8)	•	•	+	•	+	•	+	.	•	+	.	
Godin (9)	.	•	+	•	•	•	.	.	.	.	.	Wine, beer residues
Shahr-i Sokhta (10)	+	+	+	+	+	+	.	+	•	.	.	
Yahya (11)	+	+	+	+	+	+	.	+	+	+	?	*Pistacia vera*
Gijlar (12)	+	•	•	•	•	+	.	+	+	.	.	
Hissar (13)	+	+	.	+	+	+	.	+	•	.	.	*Olea* cf. *cuspidata*
Anau North (14)	.	•	.	.	•	.	.	.	.	.	.	
Anau South (14)	.	•	.	.	•	.	.	.	+	.	.	
Iron Age and later												
Bastam (15)	.	•	.	+	•	+	.	.	+	.	+	*Sesamum indicum*
Nush-i Jan (16)	+	•	.	•	•	+	+	.	+	.	.	
Hasanlu (17)	+	•	+	+	•	•	+	.	+	.	•	
Ville Royale II (Susa, 1st cent. CE) (18)	+	.	.	.	+	+	.	.	.	+	.	
Q. Ismail Aqa (12)	+	+	+	+	+	+	.	+	.	.	+	

+: present; • present in relatively substantial quantity; b: barley unspecified; w: wild; cf.: uncertain determination

1-Helbaek 1969; 2-Miller 1983; 3-van Zeist et al. 1984(1986); 4-Michel et al. 1993, Voigt 1983; 5-Harris et al. 1996; 6-Miller 1981a; 7-Wright et al. 1981, Miller unpublished data; 8-Miller 1982, 1996a; 9-Badler et al. 1990, Miller 1990b; 10-Costantini 1977; 11-Costantini and Costantini Biasini 1985, Lamberg-Karlovsky and Tosi 1989; 12-Costantini and Biasini 1985; 13-Costantini and Dyson 1990; 14-Miller 1999; 15-Hopf and Willerding 1989; 16-Kyllo and Hubbard 1981; 17-Tosi 1975, Costantini 1988; 18-

LARO-BALUCHESTAN REGION

The Laro-Baluchestan region lies between the central Plateau and the southern coasts. It has a hot, dry climate. The results of archaeobotanical research at Siraf, one of the first sites in the Near East on which flotation was employed (Williams 1973), unfortunately remain unpublished.

ESTABLISHMENT OF AGRICULTURE AND PASTORALISM

The best evidence for the initial domestication of plants comes from the "Levantine corridor" (the Jordan valley to the middle Euphrates). Farming spread from that region, probably through a combination of natural population increase with subsequent emigration and "stimulus diffusion" (Bar-Yosef 1998; van Zeist 1986). That is, Pre-Pottery Neolithic B (PPNB) and PPNB-related archaeological cultures seem to have expanded along the Taurus-Zagros arc. These early farmers did not, however, domesticate all of the important early crops in the same time and place. For example, the original homeland of domesticated einkorn may be somewhere near Diyarbakir, Turkey, and bitter vetch would also seem to be Anatolian. In contrast to several of the other early domesticates, the wild ancestor of barley, *Hordeum spontaneum,* may have been taken under cultivation more than once; DNA analyses of modern plant populations may help locate where that might have happened (Zohary 1999).

In one of the first substantial archaeobotanical reports about the Near East, Hans Helbaek set many of the terms of discussion on this topic (1969). He pointed out that cultivation (that is, modifying the soil to grow plants) and domestication (manipulation of plants that results in genetic changes) are different processes. In this context, one might define agriculture as a system in which reliance on cultivation is so strong that it is no longer possible to revert to a foraging way of life, perhaps because population increase requires the high productivity of domesticated plants or because cultivation has changed the landscape itself (for example, through the destruction of habitat or over-hunting). In any case, the origins of agriculture, domestication, and cultivation are three different problems.

Helbaek used macroremains to investigate ancient farming, nutrition, ecology, and landscape change, and he recognized the importance of taking into account the archaeological context of the plant remains. At Ali Kosh, in the rainfall agriculture zone of Khuzestan, he found domesticated plants in the earliest levels, dating to about ten thousand years ago. They included emmer, a grain that was most likely domesticated first in the Levantine corridor. Other material, particularly obsidian, shows that there was contact down the Taurus-Zagros arc, so the routes of contact do not require us to assume large movements of population. The other cultigens were hulled two-row barley, naked barley, lentil, and a trace of einkorn. Most remarkable, however, were large numbers in the category "endemic legumes," clover-like plants that include *Astragalus, Trigonella,* and *Medicago,* all of which are preferred forage plants for grazers. Although Helbaek believed that the inhabitants of Ali Kosh collected them to eat, and that they also ate cereal chaff, it seems more likely that many of the remains actually came from animal dung burned as fuel (Miller 1996b), or perhaps from crop-processing (see Hillman 1984).

ENVIRONMENTAL CONSEQUENCES OF AGRICULTURE AND PASTORALISM

Helbaek's work as part of the Prehistory and Human Ecology on the Deh Luran Plain project was one of the earliest to raise the question of environmental change and human impact on the landscape:

> Left to itself, the terrain would have changed even if, as here presumed, the climatic conditions remained more or less stable. Exposed to man's exploitation, nothing would be untouched. (1969:412)

Both macroremains and pollen evidence from the early farming site of Ali Kosh (Woosley and Hole 1978) suggest a decline in sedges (generally plants of moist ground), but no other evidence for moisture change; that is, there was some localized shift in drainage, but not overall climate change. In addition, the seed evidence suggests that there was no straight-line development in agriculture, for in several important respects, the Bus Mordeh (7500–6750 BCE) and Mohammed Jaffar (6000–5600 BCE) assemblages are more similar to each other than either is to the intervening Ali Kosh phase (Miller 1996b). In particular, if the seeds of the steppe legumes originated in dung burned as fuel, their high proportion in the Bus Mordeh and Mohammed Jaffar phases argues for an economy based on pastoral pursuits. In contrast, the shrub legume *Prosopis* may have been introduced as a weed and would therefore be an indicator of cultivation. That would explain why it becomes common in the Ali Kosh phase (Helbaek 1969), when farming may have become more important relative to herding, and why it declines in relative importance by Mohammed Jaffar times. Even though the subsistence pursuits of Bus Mordeh and Mohammed Jaffar phases were similar, a comparison of the assemblages suggests that there was some degradation of pasture over time, as high quality fodder, represented by the steppe legumes, declined. Note that this long-term process has been observed along the Syrian Euphrates at Abu Hureyra as well (Moulins 1997; Miller 1998).

The archaeobotanical assemblage of another early agricultural site, Ganj Dareh, provides an informative contrast to the steppe site of Ali Kosh. Pollen and macroremain evidence suggest that when Ganj Dareh was occupied, open pistachio forest (with almond and other types) prevailed; the modern Zagros oak forest had not yet established itself (van Zeist et al. 1984[1986]:216). People at both Ali Kosh and Ganj Dareh herded animals (Hole at al. 1969; Zeder and Hesse 2000). For Ali Kosh, Helbaek (1969:387) reports no carbonized wood but tens of thousands of seeds in fewer than fifty samples. At Ganj Dareh, van Zeist et al. (1984[1986]) report for more than one hundred samples at least some wood charcoal in most, but fewer than twenty seeds per sample. We cannot compare charred seed and wood densities, because these sites were excavated before it became routine to report volume of soil floated. Nevertheless, the assemblages of charred material seem to reflect fuel use. Wood was a more important fuel in forests than on the steppe. Thus, Ganj Dareh has relatively few seeds compared to Ali Kosh, where dung appears to have been burned (as evidenced by the absence of wood, but presence large numbers of seeds) (see Miller 1984, 1996b).

AFTER THE NEOLITHIC

As farming economies became established, human impact on the environment increased. Cultivation, by constantly disturbing the soil, allowed domesticated plants to thrive, but also expanded the weed habitat. As domesticated flocks became a more significant factor in the environment, the vegetation of the natural pastures changed, too. Food preservation techniques helped even out the food supply from year to year. Where practiced, irrigation stabilized and also helped increase yields, especially after the introduction of summer crops allowed two plantings annually. As the pastoral component became an integral part of the agricultural system, whether through transhumance of some portion of a farming population or the development of specialized

nomadic pastoralism, more people (and animals) could be supported on the land, and the potential for overuse was realized—evidence for several kinds of land degradation appear in the archaeobotanical record: lower quality pastures and deforestation (apparent at Ali Kosh, see above, and at Malyan, see below).

The archaeobotanical record is particularly thin at the end of the Neolithic, and does not really pick up again until the fourth millennium in the Kur river basin of Fars, at Malyan, and to a lesser extent in Khuzestan in Susiana and Deh Luran. William Sumner documented the long settlement history of the Kur river basin (Sumner 1972). The excavations he directed at Malyan during the 1970s yielded archaeobotanical evidence of environment and land use primarily during Banesh (3400–2800 BCE) and Kaftari (2400–1600 BCE) times (Miller 1982, 1984, 1985). Despite the several hundred year gap in settlement in the middle of the third millennium, the settlement survey allows us to imagine some of the influences on the landscape that go beyond the evidence from the Malyan excavation. In particular, Malyan started out as a small center, in a valley characterized by a relatively low population density. In the Kaftari phase, Malyan had grown to its maximum extent and served or exploited, depending on your point of view, a populous hinterland. On these grounds alone, one might expect the archaeobotanical record to show changes in the landscape and land use patterns, and indeed it does. In particular, wood charcoal suggests that Malyan was established in the zone of pistachio-almond forest, which at the time also had juniper. In the Kaftari phase, under conditions of higher population density and correspondingly higher demand for agricultural products and fuel, this nearby forest was thinned, and the somewhat more distant (20 km or so) oak forest was tapped for more fuel. Ethnoarchaeological work at Malyan established the likelihood that many charred seeds found on Near Eastern archaeological sites originated in dung fuel; it is sufficient to note here that the argument was supported by a large increase in the proportion of seeds to charcoal that corresponded to the proposed deforestation.

The Khuzestan material does not allow the same sort of discussion, at least not yet, as samples are fewer and smaller. Almost any generalization one makes could be overturned with the analysis of relatively few additional samples. Nevertheless, there do seem to be some small differences between Farukhabad on the Deh Luran plain and Sharafabad and Susa in Susiana that may reflect differences between rain-fed and irrigation agriculture, in terms of crop choice for people and fodder for animals. For example, Farukhabad and other Deh Luran assemblages generally have more small-seeded legumes, where lentil is relatively more common in Susiana (Miller 1981a, 1981b, and unpublished laboratory notes).

NEW TECHNOLOGIES, NEW CROPS

As agriculture replaced the foraging way of life, new farming practices and food-processing techniques were invented. When we find evidence for new crops in archaeobotanical assemblages they may reflect new technologies as well.

IRRIGATION

On the Deh Luran plain, irrigation improves crop security and productivity. The earliest farmers did not irrigate, but Helbaek (1969) suggested several indicators of irrigation at sixth-millennium Tepe Sabz. Where Ali Kosh had a few flax seeds that were similar in size to the wild type, Sabz had larger ones comparable to later archaeological examples known to have been irrigated. An overall increase in the amount of six-row barley, which generally requires more water than the two-row type, suggested irrigation, as did a single spikelet fragment and a grain of free-threshing wheat. These three crops appear to have been domesticated earlier elsewhere, but there is no need to propose newcomers to the region brought the crops—they could have spread through a series of local trade contacts along the edge of the Zagros.

In the Zagros region and northern Khuzestan, irrigation is an option that reduces risk and improves yields. In lowland Susiana and the arid interior where rainfall is under 250 mm per year, agriculture cannot be practiced without it. We can infer irrigation at Shahr-i Sokhta from an increase in the size of flax seeds (Costantini 1977). Costantini found a similar assemblage in earlier levels at Tepe Yahya, also located in a very arid region where irrigation was practiced (Lamberg-Karlovsky and Tosi 1989). The very plump seeds of free-threshing wheat found both at Shahr-i Sokhta and Tepe Yahya are further indicators of irrigation (see Miller 1999).

FERMENTATION

Although the primary reason people consumed fermented beverages may well have been for their psychotropic effects, fermentation has nutritional and storage consequences as well. Wine, for example, extends the availability of grapes (raisins do, too). It would be hard to distinguish intentional production of vinegar in the archaeological record because it is a pickling agent as well as evidence that wine has spoiled. As of this writing, the earliest evidence for wine production has come not from macroremains but from residues of grape wine resinated with terebinth pistachio in a pottery vessel found at the Neolithic site of Hajji Firuz in northwestern Iran (McGovern et al. 1996). The site lies within the range of wild grape, so we do not know if the grapes fermented were cultivated. In the Near East generally, and Iran in particular, large numbers of grape seeds do not appear until the third millennium BCE. It is not possible to distinguish wild (*Vitis vinifera* subsp. *silvestris*) and domesticated (*V. vinifera* subsp. *vinifera*) grape based on shape, but Helmut Kroll (1999) observes that it is only in the domesticated variety that underdeveloped seeds occur in the ripe fruit. This criterion is new, so older reports do not mention whether underdeveloped grape seeds were encountered. It is nonetheless probable that vines were coming under cultivation during the fourth millennium. At Malyan, for example, there are a few Banesh grape seeds, but quite a bit more in the Kaftari phase, including a few hundred mineralized ones from a latrine deposit (Miller 1982). Many grape seeds were found at Shahr-i Sokhta, which is a further indication that grape cultivation had become widespread by the third millennium (Costantini 1977). Wood of the vine would be hard to cut, so its presence may best be interpreted as trimmings from cultivated plants. Never common, the first appearance of grape wood fragments at Malyan (Miller 1982) and Mehrgarh, Pakistan (Thiebault 1989) dates to the mid-third millennium, further supporting the view that significant grape cultivation is a relatively late phenomenon.

Once begun, the tradition of wine-making was never lost, judging from residue analysis on some jar sherds from fourth millennium levels at Godin. By about 3500 BCE, people were drinking beer there, too (Michel et al. 1993). In contrast to grapes, which can ferment naturally from yeasts that grow on the fruit, barley beer has a more complex manufacturing process that involves sprouting the barley to create the malt on which the yeasts work.

SUMMER CROPS: MILLET, RICE, SESAME

The dry summers that prevail over most of Iran do not permit summer cropping without some form of irrigation. Several exotic crops probably arrived in western Iran as domesticates. For example, Lorenzo Costantini reported the surprising presence of broomcorn millet (*Panicum miliaceum*) as early as the fifth millenium BCE at Tepe Yahya (Lamberg-Karlovsky and Tosi 1989), along with some *Pistacia vera*. The presumed homeland of the wild ancestors of both these food plants is Central Asia (Zohary and Hopf 2000). The earliest really secure evidence of broomcorn millet as a crop, however, comes from Haftavan (1900–1550 BCE) in northwestern Iran (Nesbitt and Summers 1988), and the best evidence for *Pistacia vera* dates to about the same time and comes from Djarkutan in Uzbekistan (Miller 1999). Assuming the identifications to species hold up, the geographically and temporally isolated Yahya finds may be evidence of trade rather than the spread of the cultivation of those crops. Rice from Parthian period (about 210 BCE–225 CE) deposits at the Ville Royale II excavation at Susa is the earliest attested to date for the Near East (Miller 1981b). Whether by sea or overland, rice most probably arrived in Iran from south or east Asia, but it is difficult to trace, as there are no reports from coastal sites and few from the interior. Sesame, which may have been originally domesticated in India, first appears in the archaeobotanical record of Iran in Iron Age Bastam (Hopf and Willerding 1989).

QUESTIONS AND CHALLENGES FOR ARCHAEOBOTANY IN IRAN

At this point, the single most important goal for archaeobotanical research in Iran must be continued documentation for all regions to trace changes in landscape and land use. Of particular interest is the spread of agriculture and the history of individual crops.

THE SPREAD OF AGRICULTURE BEYOND IRAN

The Near Eastern crop complex, which developed and spread over much of southwest Asia during the PPNB, was adopted by people in neighboring regions. Wheat and barley occur as early as the seventh millennium BCE at Mehrgarh in Pakistan (Costantini and Costantini-Biasini 1985). At Jeitun, a Neolithic site in Turkmenistan, connections based on material culture can be traced along the Caspian coast or the northern edge of the Iranian Plateau along the Elburz mountains (Harris and Gosden 1996), but einkorn is the main crop plant (Harris et al. 1996). It is hard to imagine that einkorn, having evolved in Anatolia, would thrive in the moist Caspian lowland forest. Therefore, based on the plant evidence, perhaps the southern route is the more likely. Excavation of suitable sites in both regions would certainly help answer this question.

ORIGIN AND SPREAD OF BREAD WHEAT

Hexaploid bread wheat (*Triticum aestivum*) evolved after initial wheat domestication. It has the genes of a tetraploid domesticated emmer, *Triticum dicoccum*, and a diploid wild type, *Aegilops squarrosa*. It could not have evolved until people brought the domesticated wheat into contact with the wild *Aegilops*, most probably southwest of the Caspian (Zohary and Hopf 2000). Since the grains of bread wheat are indistinguishable from those of the tetraploid free-threshing wheat, *Triticum turgidum*, it has not been possible to trace the evolution of this crop. Grains tentatively identified by Costantini as bread wheat at Hajji Firuz date to the early sixth millennium (Voigt 1983:275–277).

NEW CROPS

Throughout history, territorial conquest has provided a mechanism for the transfer of crops and other plants. As early as the eighth century BCE, we know that Assyrian rulers were bringing exotic plants and animals back to their gardens and parks, both self-consciously as a sign of mastery but also for their potential use and interest. Alexander the Great's exploits exposed the Greek world to new ideas, as well as plants, some of which presumably came from Iran or crossed it (for south and east Asian plants known to the Hellenistic world, see discussions of Zohary and Hopf [2000]). Two crops that are associated with the coming of Islam are cotton and sugar cane (Watson 1983); others, like maize and tomatoes, had to await European contact with the New World. Unfortunately, these contacts have not yet been documented in the archaeobotanical record of Iran.