Pottery Making and Communities During the 5th Millennium BCE in Fars Province, Southwestern Iran

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Preface

This book explores pottery making and communities during the Bakun period (c. 5,000 – 4,000 BCE) in the Kur River Basin, Fars province, southwestern Iran. It analyses ceramic materials collected at Tall-e Jari A, Tall-e Bakun B, Tall-e Gap, and Tall-e Bakun A, housed in the University Museum, the University of Tokyo and the Oriental Institute of the University of Chicago. At the beginning of the 5th millennium BCE, black-on-buff painted pottery spread from Mesopotamia and Susiana to Fars province, and the study investigates four research questions about black-on-buff pottery in the Kur River Basin:

1) Chronological relations of the Bakun-period sites: when were the sites dated in the chronological sequence of the Bakun period?
2) When and how were black-on-buff ceramics adopted and developed in the Bakun period?
3) How were black-on-buff ceramics and other pottery produced?
4) How was pottery production organised during the Bakun period?

First, the chronological relations between four main Bakun-period sites varied depending on previous studies which proposed a tripartite subdivision system of the Bakun period (The Early, Middle, and Late Bakun). The absence of one well-preserved site with long stratigraphy ranging from the beginning to the end of the Bakun period made the chronological discussion more severe. I reconsidered the stratigraphy and radiocarbon dates of the four Bakun-period sites by reviewing and comparing the description of excavation trenches. As a result, a new chronological relationship of four sites was presented independently of the former tripartite subdivision system.

Second, diachronic changes of the Bakun pottery were not well-studied, excluding painted motifs and vessel forms. There were also few quantitative approaches to pottery changes. Hence, I expanded the number of pottery attributes to be quantitatively and qualitatively analysed, such as wares, rim and base shapes, horizontal design structures, and pottery-making techniques. I also presented unpublished ceramic materials. Consequently, I could present the increase of black-on-buff ware, the gradual shift from an interior-painted open vessel with an interior base band to an exterior-painted one without a body band, and the increased production of large jars.

Third, few studies tackled the whole steps of pottery-making techniques. I separated pottery-making techniques into two portions: the explicit sequence of technical steps from clay acquisition to firing and the degree of technical skills. As a result of the chaîne opératoire analysis, it turned out that technical steps/options in the chaînes opératoires of pottery-making showed few diachronic changes except for minor and rare options. On the other hand, I clarified diachronic changes of technical skills toward successful execution and longer apprenticeship from the analysis of painting errors. I also conducted petrographic analysis using thin-section petrography and geochemical analyses using ICP-OES (inductivity coupled plasma optical emission spectrometer), XRD (X-ray diffraction), and powder XRD. These results provide new information about the technical steps of clay acquisition and preparation.

Fourth, the organisation of pottery production during the Bakun period was investigated by previous researchers to clarify the degree of craft specialisation. I proposed an alternative approach, "relational perspective" to the organisation of craft production through reviewing community of practice, Actor-Network-Theory, and entanglement theory. In this perspective, the organisation of craft production is regarded as numerous relations between things and humans. On the basis of this relational standpoint, I discussed diachronic change in the organisation of pottery production during the Bakun period. After the adoption of black-on-buff ceramics, relations between humans and pottery changed, and the community of pottery making became more fixed and imposed longer apprenticeships over time, thereby generating beautifully and elaborately decorated vessels. The Neolithic lifeworld where social inequality was suppressed through the low variability of the material culture was replaced with the Chalcolithic lifeworld where social inequality was visualised through the high variability of the material culture represented by black-on-buff ceramics.

Acknowledgements

This book is based on my submission to the Free University of Berlin as a PhD dissertation in 2019. It owes much to the advice of professors, colleagues, and institutions. I want to begin by thanking Reinhard Bernbeck, who allowed me to study at Berlin, one of the best places to study west Asian archaeology, and kindly advised me on this work, especially regarding his profound theoretical thought and knowledge about pottery. It was in May 2013 at the international workshop about the 5th millennium BCE Iran held at Berlin that I became acquainted with him for the first time. I also thank the organisers of this workshop, Helen Taylor, Mohammad Karami, and Barbara Helwing for giving me a special opportunity to see him and develop my study.

I express my gratitude to Yoshihiro Nishiaki, who allowed me to study the collection curated in the University Museum, the University of Tokyo. My first encounter with the Bakun pottery curated in the museum was fortunately brought about by him in April 2010. My eleven-year-period exploration of Bakun pottery blossomed into this monograph with his gentle support. His rigorous and professional expertise as a lithic specialist of west Asian archaeology had a great effect on my pottery studies.

I want to thank Susan Pollock who kindly commented on this work with her wonderful scholarship on the Chalcolithic of west Asian archaeology and practice theory. She introduced me to "communities of practice", one of the significant theoretical concepts in this work. This was a major turning point of my theoretical thinking, a takeoff from craft-specialisation studies.

The observation of ceramic materials curated in the Oriental Institute of the University of Chicago was kindly permitted by Abbas Alizadeh. Helen McDonald and James Green kindly arranged my visit to the Oriental Institute, for which I am grateful. I thank Iranian colleagues who supported this study. Mohammad Hossein Azizi Kharanagi generously provided me with the pottery samples from Rahmatabad for the thin-section petrography and geochemical analysis of this study. I also thank Akira Tsuneki and Osamu Maeda to permit the observation of the collection curated in University of Tsukuba.

My interdisciplinary work with petrography and geochemical analysis would have been impossible without the support of professional specialists. Toshiyasu Shinmen, Shuji Ninomiya, Natsuki Murakami, Midori Hamada kindly helped me conduct geochemical analyses. Patrick Quinn taught me the methods of thin-section petrography in an intensive workshop at London. Pamera Fragnoli kindly checked my petrographic classification and gave me advice. Ralf Milke and Sabine Meister allowed me to use the ZEISS polarized microscope with camera for taking pictures of thin sections. I thank these colleagues for their support with professional expertise.

The members of the laboratory of Professor Nishiaki supported this study from Japan. At the colloquium in the University of Tokyo, professors and colleagues gave me comments from the perspective of Japanese archaeology. Their advice from different viewpoints was also fruitful for me. The participants in the colloquium hosted by Reinhard Bernbeck and Susan Pollock in Free University of Berlin gave me stimulating comments and ideas.

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Finally, from a relational perspective, this book is an outcome of numerous relations between me, the colleagues whom I mention above, including archaeologists, non-archaeologists, and other people, and other things which are not mentioned in this acknowledgement. I thank all who contributed to this work.

Takehiro Miki

Part I: Introduction and raising research questions

Chapter 1

Introduction

My research project is intended to elucidate the pottery making, pottery-making communities, and village communities during the Chalcolithic, especially the Bakun period (c. 5000 BCE – 4100 BCE) in the Kur River Basin, Fars province, southwestern Iran. Craft making in the prehistoric period is an interesting topic in which interdisciplinary concerns are crossed, including philosophy, anthropology, psychology, architecture, art, and archaeology.[1] This research was motivated by my incessant interest in what craft making is and was in modern and ancient times. The beautifully decorated Bakun pottery stimulates our imagination of craft making during the 5th millennium BCE and of village life in southwestern Iran. Who made it? How was it made? Why did the producers paint such a complex motif on the surface of the pottery? What did the esoteric motifs represent? Throughout this research, I will introduce the established answers to these questions and cast doubts on them. Below, via various methods, unpublished data, and an alternative theoretical perspective, I will explore pottery making and its communities in the Bakun period.

In this chapter, I will present the general research background of the Bakun period in Fars province in terms of long-term archaeological and geographical context including neighbouring regions. I will then raise four research questions and establish the framework of this research.

1-1. Archaeological and geographical context of the Kur River Basin, Fars province, Iran

Archaeological context of the Kur River Basin, Fars province, Iran

Neolithic: the Mushki period

First, as a general introduction, I will introduce the long-term chronological framework of archaeology in Fars province ranging from the Neolithic to the Chalcolithic periods (c. 6300 BCE – 2700 BCE)(Table 1.1) to position the Bakun period in the history of village communities, drawing attention to subsistence practices, pottery, and social aspects. The earliest farming community (Neolithic) was dated to the Mushki period (c. 6300 BCE – 6100 BCE).[2] Tall-e Mushki is the type-site of this period[3]: architectural remains at Tall-e Mushki suggest short-term and less sedentary habitation than in the following period.[4] Subsistence in the Mushki period was characterised by hunting equids and gazelles.[5] The importance of hunting is also demonstrated by flint tools.[6] Mushki pottery was painted with red slip, burnished surfaces, and geometric black decorations.[7] The presence of vegetal temper (straw and chaff) inside the fabric and macro-botanical remains (einkorn, bread wheat, two-row barley) indirectly indicates that cereal agriculture was conducted in this period.[8]

Table 1.1 Chronology of Fars, Susiana, and Mesopotamia (taken from Petrie 2011: Table 8.1 and Delougaz and Kantor 1996: Table 42 and modified by Miki)

BCE	Fars	Susiana	Mesopotamia
3000	Banesh	Susa III	Late Uruk
3500		Susa II	Early Uruk
	Lapui	Terminal Susiana	Terminal Ubaid
4000	Bakun	Late Susiana/Susa I	Ubaid 4
4500		Middle Susiana	Ubaid 3
5000	Shamsabad	Early Susiana	Ubaid 2
5500			Ubaid 1
	Jari	Archaic Susiana 3	
6000	Bashi	Archaic Susiana 2	Ubaid 0
	Mushki		
6500		Archaic Susiana 1	
		Archaic Susiana 0	
7000		Formative Susiana?	

Neolithic: the Bashi period

The Mushki period is followed by the Bashi period (c. 6100 BCE – 6000 BCE). This short cultural period was named after the type-site Tol-e Bashi.[9] Bashi pottery was buff-slipped and black-painted with vegetal

[1] Ingold 2013.
[2] Alizadeh 2006: 8; Bernbeck 2010; Nishiaki 2010a; Weeks 2013.
[3] Vanden Berghe 1954; Fukai et al. (eds.) 1973.
[4] Fukai et al. 1973; Nishiaki 2010a: 7. Sumner 1977; Hole 1987: 54.
[5] Fukai et al. (eds.) 1973; Mashkour et al. 2006.
[6] Abe 2011.
[7] Fukai et al. (eds.) 1973.
[8] Miller and Kimiaie 2006; Weeks 2013: 101.
[9] Pollock et al. (eds.) 2010; Weeks 2013.

temper and a 'Bashi motif' of high frequency and low variability.[10] Reinhard Bernbeck argues that pottery production in the Bashi period was a seasonal activity and the production amount was limited.[11] The faunal assemblage at Tol-e Bashi showed more focus on herding than that of Tall-e Mushki.[12] Considering the excavated materials and remains at Tol-e Bashi, it seems that production of durable materials was limited and that durable materials were not possessed but shared, as durable objects were regarded as a threat to social relations and a step toward social inequality.[13]

Neolithic: the Jari period

The Jari period (c. 6000 BCE – 5500 BCE) follows the Bashi period.[14] This period was previously poorly known because only a brief excavation report of the type-site Tall-e Jari B had been published.[15] However, since the 2000s, excavation data, especially pottery, lithics, architecture, animal bones, and botanical samples, have been reanalysed.[16] Archaeologists contrasted its subsistence with the Mushki period and showed a shift from hunted animals to domesticates, such as cattle, goats, and sheep, the replacement of hunting tools by sickle elements, and the presence of sedentary buildings.[17] Jari pottery was characterised by buff-slipped ware with vegetal temper and black decoration. The major motif of the paint decoration was the diagonal ladder motif with short slashes.[18] Yoshihiro Nishiaki argues that the rapid cultural changes from the Mushki to the Bashi and Jari periods were related to an 8.2 ka climatic deterioration event and the subsequent amelioration.[19]

Neolithic: the Shamsabad period

The final Neolithic period is called the Shamsabad period (c. 5400 BCE – 5200 BCE) [20] and was originally confirmed in Level BI of Tall-e Bakun B[21] but named the Shamsabad period by William Sumner after the surface survey of the locality.[22] Unpainted thick, coarse, vegetal-tempered pottery is the characteristic of this cultural period. Although the subsistence is not well understood, Sumner reported that the number of the Shamsabad-period sites in the Kur River Basin increased from 50 (the Jari-period sites) to 108, implying the development of agriculture.[23]

Chalcolithic: the Bakun period

Here, to make a comparison to the Neolithic periods and the other Chalcolithic periods, I will cover some general information on the Bakun period in the Chalcolithic. I limit the explanation to the existing representative studies about the subsistence, pottery production, and social organisation of the Bakun period; details and problems of the previous studies will be explained in the next chapter. The cultural period is called the Bakun period after the first excavated site, Tall-e Bakun A. Beautifully painted fine pottery appeared after the plain vegetal-tempered coarse ceramics. This black-on-buff fine ware culture, which used high-temperature facilities such as pottery kilns, was a new technology from Mesopotamia and Khuzestan.[24] From a broader point of view, this period is contemporaneous to the Ubaid period in Mesopotamia, the Middle-Late Susiana period in Khuzestan, and the Transitional Chalcolithic in the Iranian Central Plateau.[25] Whereas the black-on-buff ceramics were also observed in Mesopotamia and Khuzestan, black-on-red ceramics were distributed in the Iranian Central Plateau.

Recent excavation at Tall-e Bakun A collected animal bones and botanical samples, contributing to our knowledge of the subsistence economy of the Bakun period.[26] The predominant proportion of goat and sheep in the faunal assemblage was distinctive in comparison to the Neolithic animal exploitation. Domesticated botanical species such as barley, bread wheat, and einkorn were confirmed. As for the social organisation and subsistence economy of the Bakun period, two main arguments exist. On one hand, William Sumner investigated the transformation of the Bakun society and analysed changes in regional demography and settlement patterns to understand changes in land use and organisational patterns. The number of sites increased distinctively in the Bakun period. He concluded that population growth based on sedentary villages, interregional integration, increases in scale, and growth of productive specialisation led the development of a centralized control system in the Bakun period.[27]

On the other hand, Abbas Alizadeh analysed stone stamp seals and sealings from Tall-e Bakun A and insists that limited numbers of people conducted administrative

[10] Bernbeck 2010.
[11] Bernbeck 2010.
[12] Mashkour and Bailon 2010.
[13] Pollock and Bernbeck 2010.
[14] Vanden Berghe 1954; Nishiaki 2010a; Sumner 1972; Bernbeck 2010; Weeks 2013.
[15] Egami 1967.
[16] Hori and Maeda 1984; Maeda 1986; Hori 1989; Alizadeh 2004; Alizadeh et al. 2004; Alizadeh 2006; Nishiaki 2003; Nishiaki 2010a, b.
[17] Mashkour et al. 2006; Nishiaki 2010b; Abe 2011.
[18] Hori and Maeda 1984; Nishiaki 2010b.
[19] Nishiaki 2010a: 9.
[20] Alizadeh 2006: 10.
[21] Schmidt 1939: 124; McCown 1942: 23. Sumner 1977: 300.
[22] Sumner 1994; Voigt and Dyson 1992: 138.
[23] Sumner 1994.
[24] Alizadeh 2006; Weeks et al. 2010; Mutin 2012.
[25] Carter and Phillip (eds.) 2010; Delougaz and Kantor 2008; Vidale et al. 2018.
[26] Mashkour et al. 2006; Miller and Kimiaie 2006.
[27] Sumner 1994.

activities there.[28] On the basis of the result and an ethnography of modern nomadic tribes, he argued that the nomadic elites did exist, dominated the site, and stimulated the development of economic complexity at Tall-e Bakun A. Sumner and Alizadeh differ in their assessments of the economic base of the development of Bakun society; Sumner emphasises farming and land use as the economic base, whereas Alizadeh emphasises economic activities with a focus on nomads.

As for the organisation of pottery production in the Bakun period, there are two main interpretations. Both Sumner and Alizadeh have proposed models in which a small group controlled the production of the Bakun ceramics by attached specialists.[29] In contrast to Sumner and Alizadeh, Fraser argues that the production of the Bakun pottery may not have been limited to specific production centres and that pottery making was not necessarily an élite-controlled activity. He suggests that goods (including ceramics) were produced at a household level in a heterarchy of extended households.[30]

Chalcolithic: the Lapui period

After the Bakun period, a new cultural period called the Lapui (c. 4100 – 3500 BCE) appeared.[31] The type-site Lapui was not excavated but was surveyed by Sumner.[32] At present, archaeological contexts of the Lapui period are confirmed at Tall-e Nokhodi, Tol-e Spid, Tol-e Nurabad, and Tappeh Mehr Ali.[33] In contrast to the Bakun period, plain red-burnished fine ware and grit-tempered common ware are typical of this period.[34] Petrie has suggested the presence of low-speed wheels for pottery production, and geochemical analysis indicates that the Lapui fine wares were produced at specific locations and then distributed to other settlements while the coarse wares were locally produced and consumed.[35] Regarding settlement patterns and subsistence, whereas Sumner argued that the number of sites decreased in the Lapui period, Alizadeh did not think so.[36] In the faunal assemblages at Tol-e Spid, Tol-e Nurabad, and Tappeh Mehr Ali, sheep and goat were dominant, followed by cattle, in line with examples from Tall-e Bakun A.[37] Charred plant remains at Tol-e Spid and Tol-e Nurabad also showed similarity to Tall-e Bakun A, though those from Tappeh Mehr Ali presented a large proportion of almond and pistachio.[38]

[28] Alizadeh 1988, 2006.
[29] Alizadeh 1988; Sumner 1994.
[30] Fraser 2008: 15.
[31] Alizadeh 2006; Petrie 2011: 173.
[32] Sumner 1972.
[33] Goff 1963, 1964; Petrie et al. 2013; Sardari 2013.
[34] Sumner 1988; Petrie et al. 2013.
[35] Petrie et al. 2013: 187.
[36] Sumner 1972, 1994; Alizadeh 2003, 2006.
[37] Petrie et al. 2013; Sardari 2013.
[38] Petrie et al. 2013; Sardari 2013.

Chalcolithic: the Banesh period

I will close this long-term overview of archaeological contexts in the Kur River Basin with the Banesh period (c. 3400 – 2700 BCE).[39] First, the most remarkable aspect of this period is the emergence of a quite a large site, Tal-e Malyan. John Alden estimates the occupation area of Tal-e Malyan in the Middle Banesh phase to be between 23 ha and 75 ha (median: 50 ha). This size is distinguished from contemporaneous villages (1-2 ha) and mean site areas in the Shamsabad and Bakun periods.[40] In the Late Banesh phase, the Malyan city wall[41] was constructed at this site. Second, it is argued that the Banesh grit-tempered ware and vegetal-tempered ware were produced at specific production sites. Alden argues for the existence of itinerant specialist potters based on the geochemical analysis of potters' tools.[42] Third, the archaeological evidence showing administrative activity, such as Proto-Elamite tablets, sealings, and bullae were confirmed in the Banesh period. Fourth, as for animal exploitation, sheep and goats were predominant in the faunal assemblage.[43] In addition, specialised systems of meat distribution at Tal-e Malyan have been suggested based on the intra-site difference of preserved parts of animal bones. Fifth, Sumner and Alden have proposed that seasonally mobile pastoralism played a great role in the development of socio-political organisation during the Banesh period, sometimes called 'Proto-Elamite civilization'.[44]

Above, I briefly reviewed the long-term history of village communities from the Neolithic to the Chalcolithic (c. 6300 BCE – 2700 BCE) periods by describing subsistence practices, pottery, and social organisation. This long-term perspective induces readers to interpret the village history in the Kur River Basin as a unilinear developmental sequence from simpler villages to complex cities. As village life became established in the Neolithic period (the Mushki, Bashi, Jari, and Shamsabad) after the adoption of agriculture and animal husbandry and the origin of urbanism in the Kur River Basin was clearly confirmed in the Banesh period, it is valid to deduce that the Bakun period, being sandwiched between the Neolithic and the Banesh periods, was a period of increasing social complexity and craft specialisation. Throughout this research, I am critical of this kind of top-down approach, which makes a priori assumptions about Bakun society. Rather, I will reconsider communities in the Bakun period through bottom-up approaches.

[39] Sumner 1986; Zeder 1991; Alden 2013.
[40] Sumner 1986: Table 3; Alden 2013: Fig. 12.9.
[41] Sumner 1986: 206.
[42] Alden and Minc 2016.
[43] Zeder 1991.
[44] Sumner 1986.

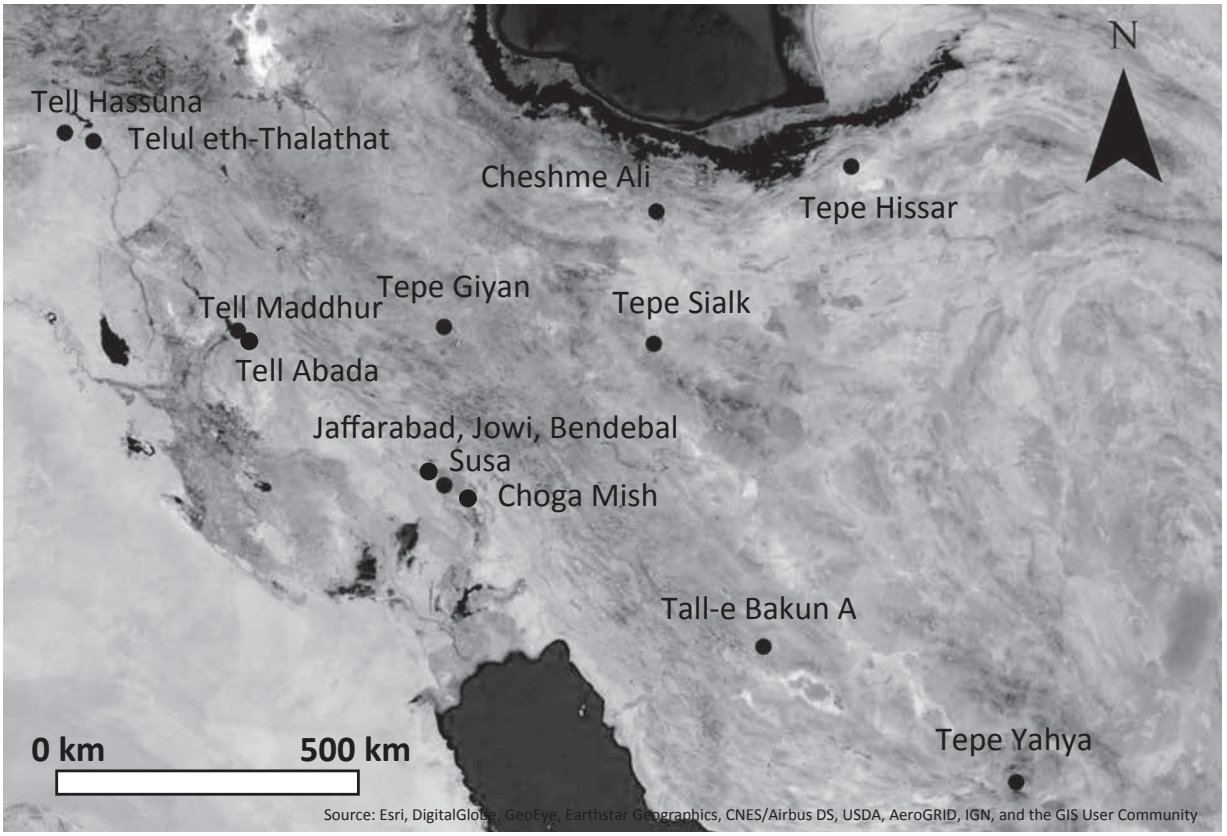

Figure 1.1 Map of West Asia and prehistoric sites mentioned in this thesis (Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community)

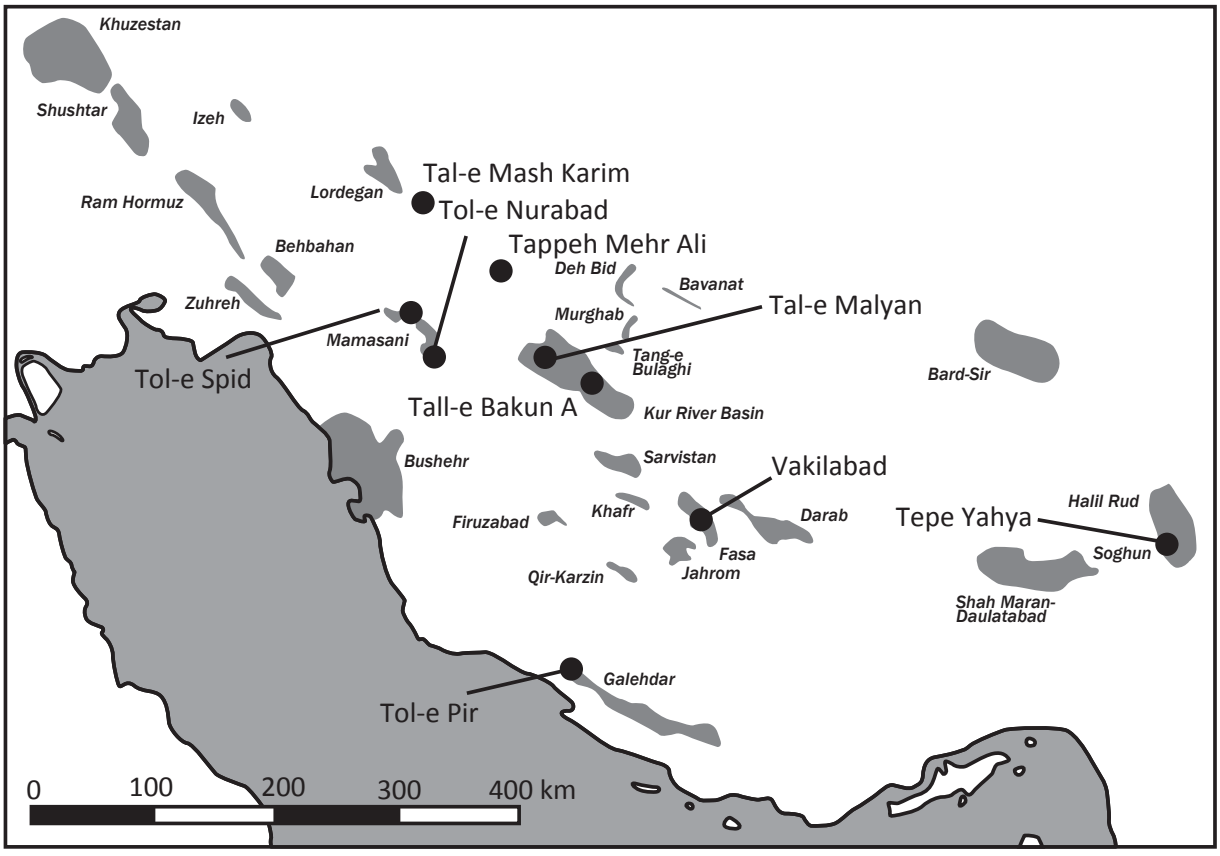

Figure 1.2 Map of intermontane valleys and prehistoric sites in southern Iran
(traced from Petrie 2011: Figure 8.1 and modified by Miki)

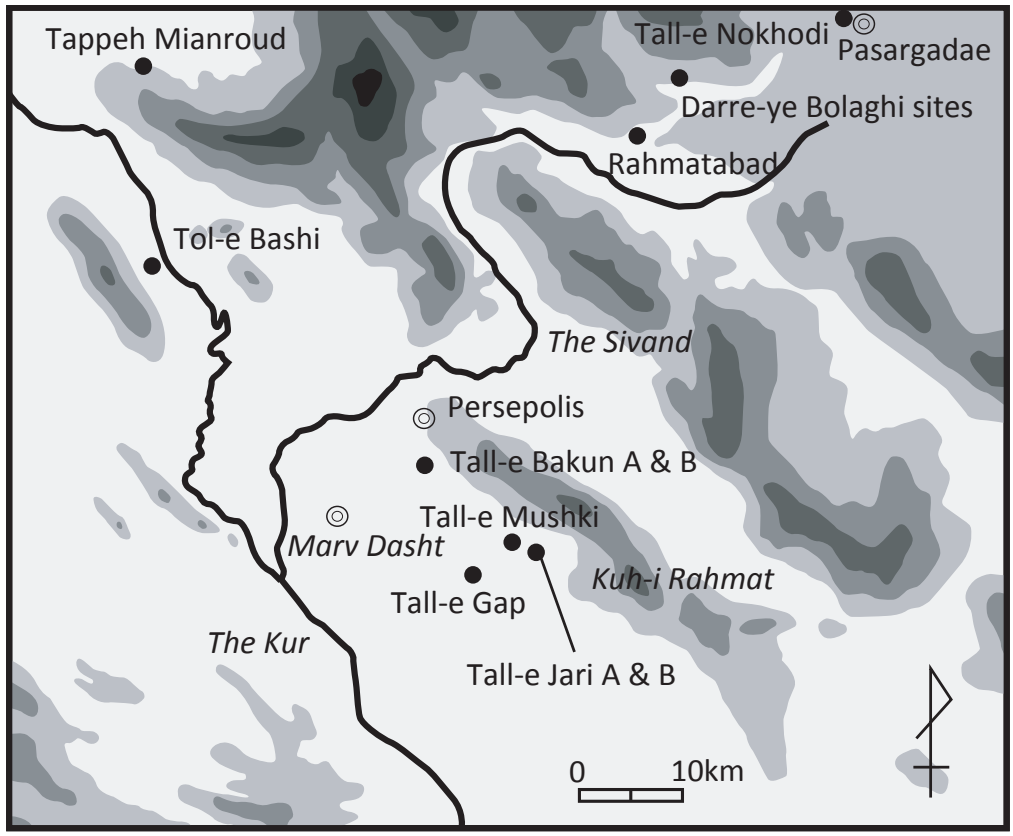

Figure 1.3 Map of the Kur River Basin and prehistoric and historic sites

Geographic context of the Kur River Basin, Fars province, Iran

Geographic context

From a macroscopic geographic perspective, southwestern Iran is located between the Persian Gulf and the Zagros Mountains, which contact southern Iran in a northwest-southeast direction. The Zagros fold and thrust belt was formed by the collision between the Arabian Plate and the Eurasian Plate; this created geographic contrasts to the alluvial large-sized plains of southern Mesopotamia in the form of small, separated intermontane valleys, plains, and basins (Figs. 1.1, 1.2). Although these intermontane valleys are connected by paths and roads, inter-valley communications were restrained by this topography. The Kur River Basin (Figs. 1.2, 1.3) is one of the largest endorheic basins in southwest Iran.[45] The area is about 3,600 km^2 and the elevation is 1,600 m above sea level.[46] In addition, this basin was surrounded by other intermontane valleys, such as the Mamasani Plain, the Kamin Plain, and the Plain of Sarvistan. Unlike the Plain of Bushehr and Plain of Galedar, the other isolated large intermontane valleys, its location played a great role in developing the prehistoric villages in the Kur River Basin.

The Kur River Basin

The four main sites discussed in this research (Tall-e Jari A, Tall-e Bakun A, Tall-e Bakun B, and Tall-e Gap) were distributed in the eastern part of the Kur River Basin (Fig. 1.3). The nearest modern town is Marv Dasht. The famous Persepolis attracted both ancient people and modern archaeologists, leading to the first discovery of the Bakun site, Tall-e Bakun A. Two main rivers, the Kur and the Sivand (Pulvar), flow in the Kur River Basin. These rivers incise the alluvial plain to depths of 5 to 20 m.[47] The four sites are closer to the left bank of the Sivand than the Kur, lying in the southern piedmont of the Kuh-i Rahmat and covered by the Daryan and Sarvak Formations of limestone. The annual rainfall in the Kur River Basin is 334-340 mm on average, concentrated in the term from December to March.[48]

The geographic regions surrounding Fars Province in the Chalcolithic period

Next, I will briefly explain the geographic and archaeological contexts of the regions surrounding

[45] The Kur River Basin is also called the Marv Dasht Plain mainly by Japanese archaeologists (Egami and Sono 1962; Egami and Masuda 1962; Alizadeh 2006; Nishiaki 2010). In this research, I use the Kur River Basin.
[46] Alizadeh 2006: 29.
[47] Alizadeh 2006: 29; Heydari and Bernbeck 2010: 14.
[48] Alizadeh 2006: 29; Heydari and Bernbeck 2010: 15.

Fars Province in the Chalcolithic period: Khuzestan and southeastern Iran, especially the regions where black-on-buff ceramics were present. First, the Susiana Plain (2280 km^2)[49], located west of Fars Province, is the largest alluvial plain in Khuzestan Province. In addition, Susiana Plain has a close relationship with the large alluvial plains of southern Mesopotamia, where black-on-buff ceramics were also present as early as the seventh millennium BCE.[50] Delougaz and Kantor subdivided the Susiana chronology of the Neolithic and Chalcolithic as follows: Formative Susiana, Archaic Susiana 0-3, Early Susiana, Middle Susiana, Late Susiana/Susa I/Susa A, Terminal Susiana, Susa II and Susa III.[51] Among these, Middle Susiana, Late Susiana/Susa I/Susa A were contemporaneous with the Bakun period in Fars Province. The representative contemporaneous sites are as follows: Susa, Choga Mish, Bendebal, Jowi, and Jaffarabad.[52] Some researchers argue that black-on-buff ceramics spread from the Khuzestan region to Fars.[53] The production of black-on-buff ceramics, especially at the stage of Susa I, has been studied in terms of painted decoration and geochemical composition.[54] Judith Berman suggests that the funeral pottery found at Susa Necropole had several provenances, meaning that these locally produced ceramics were imported to the necropolis.[55] A survey analysis conducted by Johnson and Wright suggests that there was a complex chiefdom in the Middle and Late Susiana period.[56] One of the interesting architectural features at Susa is the large foundation or platform, possibly used as a religious centre.[57] Evidence of administration has also been confirmed in Khuzestan in the form of stamp seals from the Susa A period. These pieces of evidence show clear differences in the social complexity of Susiana and Fars Province.

Around the Susiana Plain and Fars Province lie several smaller intermontane valleys, including the regions of Deh Luran, Ram Hormuz, Zuhreh, Behbahan and Bakhtiari. The Deh Luran Plain (940 km^2) is located approximately 60 km to the west of Susa; its geographic character is similar to Susiana as it is the piedmont of the Zagros Mountains.[58] The long chronological sequence of the Deh Luran Plain, ranging from the Neolithic to the Chalcolithic, was established following excavations of Ali Kosh, Chaga Sefid, Tepe Sabz, Farukhabad and Musiyan. Black-on-buff ceramics appeared in the Sabz phase, parallel to the Early Susiana period. The change in pottery in the Deh Luran Plain shows a trend similar to that of the Susiana Plain. It is also similar to that of the Ram Hormuz Plain (445-620 km^2), south of the Susiana Plain, where black-on-buff ceramics were clearly confirmed to date from Late Middle Susiana following the excavation of Tall-e Geser.[59] While Tepe Sohz (13 ha) is the largest site in the Behbahan Plain of the fifth millennium BCE, Tol-e Chega Sofla (20 ha) is the largest site in the Zuhreh Plain from the end of the fifth millennium BCE. This fact provides indirect evidence that these areas had more social complexity than Fars Province.[60]

Black-on-buff ceramics also extends beyond Fars Province toward the east. The excavation of Tepe Yahya in the Soghun Valley and Tal-i Iblis in the Baldsir Plain of Kerman Province, approximately 400 km to the east of the Kur River Basin, reveals the presence of black-on-buff ceramics in the later fifth millennium BCE. Benjamin Mutin suggests the possibility that Lapui red burnished ware appeared in Kerman earlier than in Fars. In Tepe Yahya, black-on-buff ceramics appeared together with Lapui red burnished ware during Period VC.[61] There are also sites with pottery similar to black-on-buff ceramics near the modern boundary between Iran and Pakistan, for example in Miri Qalat and Shahi-Tump of the Kech Valley, Kech-Makran.[62] One should bear in mind that the following chapters explore only a small part of Chalcolithic Iran and its diverse geographic, environmental and cultural characteristics.

1-2. Research questions

An overview of the broad background of the Bakun period and pottery within the archaeological framework of the Neolithic and the Chalcolithic periods in Fars province reveals problems concerning the Bakun period and its pottery production. Below, I present four research questions that concern pottery production during the 5th millennium in southwestern Iran:

Research Question No. 1: '*Chronological relations of the Bakun-period sites: Where in the chronological sequence of the Bakun period do Bakun period sites fall*?'

To what period can the main Bakun-period sites for this research (Tall-e Jari A, Tall-e Gap, and Tall-e Bakun A and B) be dated? As reviewed in Chapter 2, the chronology of the Bakun period is still debated. Why is there still a problem with the chronology? What exactly is the problem of the Bakun chronology? How did previous

[49] Johnson 1973; Wright and Johnson 1975.
[50] Le Breton 1957; Wright and Johnson 1975; Wright 1984; Dollfus 1978; Hole 1987; Delougaz and Kantor 1996.
[51] Alizadeh 1992, 2008; Delougaz and Kantor 1996.
[52] Pottier et al. 1912; Le Breton 1957; Dyson 1966; Dollfus 1971, 1975, 1978, 1983; Delougaz and Kantor 1996; Alizadeh 2008; Bridey 2011; Moghaddam 2012.
[53] Alizadeh 2006; Weeks et al. 2010; Petrie 2011; Mutin 2012.
[54] Pollock 1983; Hole 1984, 2010a; Berman 1987, 1994.
[55] Berman 1987.
[56] Wright and Johnson 1975.
[57] Hole 2010b.
[58] Hole et al. 1969; Hole 1977, 1987.
[59] Alizadeh et al. 2014.
[60] Dittmann 1984; Moghaddam 2018, 2020, Pollock and Moghaddam 2018; Ruschel 2020.
[61] Lamberg-Karlovsky and Beale 1986; Caldwell 1967; Mutin 2012: 166-169.
[62] Besenval 1994; Besenval et al. 2005.

researchers attempt to solve these problems? How can we establish a better chronology?

Research Question No. 2: '*When and how were black-on-buff ceramics adopted and developed in the Bakun period?***'**

Black-on-buff ceramics initially appeared in the Bakun period at the Kur River Basin, Fars province, southwestern Iran. This pottery required knowledge of a new type of firing in a pottery kiln, different from the Late Neolithic plain vegetal-tempered coarse ceramics that previously existed in that region. It is argued that this technological innovation came from western regions, such as Mesopotamia and Khuzestan. When and how were black-on-buff ceramics adopted by villagers in the Kur River Basin? How were unpainted vegetal-tempered coarse ceramics replaced with black-on-buff painted ceramics? Next, in the process of this pottery permeating village life of the Kur River Basin, when and how were black-on-buff ceramics developed? In attempts to answer these questions, how have previous researchers discussed the adoption and development of black-on-buff ceramics? What are the problems with the previous approaches to this topic? What are better solutions for revealing the adoption and development process of black-on-buff ceramics?

Research Question No. 3: '*How were black-on-buff ceramics and other pottery produced?*'

There are two types of questions regarding pottery-making techniques: questions related to technique and those related to skill. On one hand, how many technical steps were there in pottery making? What kind of technical options were available? On the other hand, in what degrees of quality and dexterity were black-on-buff ceramics produced? Can we find mistakes or differences of skill among archaeological materials?

Research Question No. 4: '*How was pottery production organised during the Bakun period?*'

As I quickly reviewed in the former section, there are several views regarding the organisation of pottery production in the Bakun period, especially taking craft specialisation into consideration. Why did these previous researchers discuss the organisation of pottery production in terms of craft specialisation? How did they develop their arguments and establish the organisation of pottery production in the broader social organisation of the Bakun period? Where do problems lie in these studies, either in their evidence or their theoretical frameworks (or both)? What are better approaches to discussing the organisation of pottery production?

1-3. Framework

This research, which is intended to answer these main research questions, comprises four parts:

- Part I: introduction and raising research questions (this chapter)
- Part II: reviewing previous studies and presenting theoretical frameworks and methodology (Chapters 2-4)
- Part III: analyses (Chapters 5-7)
- Part IV: discussion and conclusion (Chapters 8 and 9)

Below, I briefly explain the contents of each chapter.

In Chapter 2, to make the four research questions I raised in this chapter (chronology, diachronic change of pottery, pottery-making technique, and organisation of pottery production) clearer, especially the extent of existing research, I will overview previous studies in chronological order and find their problems, which will be presented at the end of the chapter.

In Chapter 3, I will explain the theoretical framework of this research, focusing especially on the organisation of pottery production. In the first half of this chapter, I will review the history of the concept of craft specialisation to find the problems with this concept and the systemic perspective behind it. In the second half of this chapter, I will introduce an alternative approach for craft-production studies; a relational perspective referring to Lave and Wenger's community of practice, a concept of skill proposed by Ingold, Latour's actor-network-theory, and Hodder's entanglement theory.

In Chapter 4, methodology, I will present terminology and analytical methods of wares, vessel forms, painted decoration, pottery-making techniques, thin-section petrography, and geochemical analysis. Especially in pottery-making techniques, methods of approaching the explicit sequence of technical steps (what was done: technique) and those of approaching the degree of technical skills (how it was done: skill) will be explained. I will provide the foundation for analysis of this research in Chapters 2, 3, and 4 (Part II).

I will conduct analyses of pottery and sites from Chapters 5 to 10 (Part III). In Chapter 5, I will describe the stratigraphy, architectural remains, and radiocarbon dates found at Tall-e Jari A, Tall-e Bakun B, Tall-e Gap, and Tall-e Bakun A. I will tackle **Research Question No. 1** (chronology) and explain the approach to the reconstruction of stratigraphy from the collection curated by the University Museum at the University of Tokyo (UMUT). I will also mention architecture and mobile artefacts related to pottery production, such as pottery kilns, pottery kiln-related artefacts, and misfired ceramics.

In Chapter 6, the main research question is, '*When and how were black-on-buff ceramics adopted and developed in the Bakun period?*' (**Research Question No. 2**). Here, I will introduce the analysed ceramic materials curated

by UMUT and University of Tsukuba. I will conduct quantitative analyses of wares, vessel forms, rim and base shapes, and vessel sizes and approach diachronic changes of these attributes through the comparison of ceramic assemblages in each level at each site and the inter-site comparison.

Then, to pursue other aspects of pottery changes, I will move on to the diachronic change of painted decoration. I will discuss horizontal design structures of painted decoration from published reports and unpublished drawings and classify several horizontal design-structure patterns, followed by a comparison of the inter-site horizontal design-structure patterns.

In Chapter 7, I will analyse pottery-making techniques. The main question in this chapter is 'How were black-on-buff ceramics and other pottery produced?' (**Research Question No. 3)**. I will begin with an observation of technical traces on the well-preserved materials from Tall-e Bakun A curated by the Oriental Institute of Chicago (OIC). Then, I will move on to the observation of potsherds from Tall-e Jari A, Tall-e Bakun B, and Tall-e Gap curated in UMUT. In this chapter, I will separate pottery-making techniques into two sections: a sequence of technical steps and a degree of technical skill. As for the former portion (technique), I will analyse the chaîne opératoire of pottery making from clay acquisition to firing. Regarding the latter portion (skill), I will conduct skill-score analysis as a quantitative method and a qualitative observation of painting traces.

In the next section of Chapter 7, I will address the rest of the chaîne opératoire of pottery making, such as the technical steps of acquiring clay and tempering and preparing clay, using thin-section petrography. I will classify 60 thin-section samples from five sites, including Rahmatabad, into fabric types from a petrographic perspective. I will also conduct an inter-site comparison of these fabric types and explore the provenances of the clay and minerals.

Furthermore, I will conduct geochemical analyses using ICP-OES (inductivity coupled plasma optical emission spectrometer), XRD (X-ray diffraction), and powder XRD to supplement the petrographic analysis concerning provenance studies and to investigate firing temperatures of pottery. I will discuss geochemical compositions of pottery using hierarchical cluster analysis, principal component analysis, and linear discriminant analysis. As for XRD, I will compare the results with the previous study at Rahmatabad.

Finally, I will develop the discussion about organisation of pottery production in Part IV (Chapters 8 and 9). In Chapter 8, I will integrate the results from Chapters 5-7 using tanglegrams to reassemble and discuss communities of pottery making and village entanglement in each site. Next, I will discuss diachronic changes of communities of pottery making and village entanglement by comparing tanglegrams from Tall-e Jari A to Tall-e Bakun B, from Tall-e Bakun B to Tall-e Gap, and from Tall-e Gap to Tall-e Bakun A. The new interpretation will be compared to the systemic perspective representative of craft-specialisation studies. In the last conclusion chapter (Chapter 9), I will summarise each chapter by answering four main research questions and present relevance, limits, and future studies.

In the next chapter, I begin the process of problem-finding in the previous studies.