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Village-based Hand-crafted Pottery Production in Bannu District, Pakistan:

Ethnographic Observations and Archaeological Implications

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Abstract: Ethnographic studies were made of village-based potters and their workshops in Bannu District, Pakistan in December 1991. We analysed the complex and varied technological, ecological and socio-economic aspects of specialised and highly skilled production of hand-made unglazed pottery for both local consumption and centralised sale in the bazaar in Bannu City. Specific attention was paid to factors such as raw materials, fuels, diverse types of equipment, skills (including gender-specific skills) and their transmission, and the sequence of operations (*chaîne opératoire*) involved in making a range of ceramic products. The village-based potters of Bannu District operate within a complex cash-based market economy, facing competition from alternative products of modern industry and from alternative and more lucrative forms of employment. The impact of such factors on the social reproduction or extinction of potters' lineages is considered. Resilience strategies vary widely, including specialized production of a more limited range of wares, or increased diversity of the wares produced. We outline recent theoretical debates on the meaning, purpose and methodologies of ethnoarchaeology, and briefly examine what lessons, if any, arise from our study for interpreting ceramics and ceramic production in the archaeological record. Although dependent on technological and socio-economic contexts, we suggest that often there will be few directly applicable 'positive' or valid analogies. Our observations and interpretations, however, indicate that archaeological interpretations must bear in mind factors such as synchronous variability in practices and the often highly complex interacting networks, or entanglements, of diverse technological and socio-economic factors, which often extend and ramify way beyond any simple linear *chaîne opératoire* model of pottery production. We conclude by suggesting avenues for future research in Bannu and beyond.

Keywords: Ceramic Ethnoarchaeology, Variable Technologies, Ecological and Economic Contexts, Social Reproduction, Resilience, Innovation.

Introduction

Studies of archaeological ceramics in South Asia have mainly focused on stylistic variation across time and space, with less attention given to technologies of production. Such approaches are perfectly valid and useful, provided that various constraints are recognised and applied, as discussed recently by Santacreu *et al.* (2017) in a critical and nuanced account of the applications, usefulness and problems of typological classifications of archaeological ceramic assemblages.

Archaeometric approaches, such as thin section petrography, compositional analysis and mineral phase analysis, can provide insight into different aspects of the processes and technological choices made in the production, distribution and consumption of ceramics (e.g. Sillar and Tite 2000). In recent years, there have been significant developments in both practical and theoretical approaches to material culture, in particular for the construction and reproduction of social relations and cultural values (Bourdieu 1977; Sillar and Tite 2000).

When producing ceramic vessels, potters make choices at various points during the process, selecting from a range of available raw materials, tools, forming techniques, firing methods, and fuels, as well as the various possible sequences that link actions together to produce a finished ceramic vessel. This production sequence or *chaîne opératoire* (Leroi–Gourhan 1964), takes place within a specific social, economic and

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ideological setting, which provides both a context for the individual actions and a range of potential constraints on those actions (Lemonnier 1993; Tite 1999). Technologies perceived as cultural choices are dependent on functional criteria as well as social, economic and ideological context (Lemonnier 1993). In craft production, such as of ceramics, each technological choice in the process relates to other choices, resulting in a ceramic vessel with required properties and performance characteristics (Tite 1999; Sillar and Tite 2000). Scientific approaches are applied increasingly to studies of ancient ceramics, and Sillar and Tite (2000) emphasise the significance materials science approaches can have, not only for the analysis of technological factors but also for helping reveal cultural, ideological and socio-economic choices. A recent perspective on the study of material culture advocates a shift from prioritising finished artifacts to an understanding of the ecological, social and cultural aspects of the properties of the materials from which they are made (Ingold 2012).

South Asia has been a productive region for 'ethnoarchaeological' research (e.g. Allchin 1994), especially in regard to pottery production as exemplified by Carol Kramer's work in Rajasthan (Kramer 1985; 1991; 1994; 1997). In Pakistan, Khan (1994) has considered the various ways in which recent lifeways in Bannu District and artefacts from the distant past can be compared with one another. The pioneering study of traditional pottery techniques of Pakistan by Rye and Evans (1976) not only produced a record of the diversity of techniques and skills used by potters in various parts of Pakistan, it also established a methodology for future work. Their work demonstrated the huge potential for more detailed regional studies in Pakistan, as shown in the preliminary study of potters in Peshawar District by Knappett (1994) and by Spataro's (2004) study of three pottery making centres in Sindh Province. Here we report some preliminary observations of a range of potters' workshops in five villages in Bannu District, Khyber Pakhtunkhwa, expanding considerably beyond our earlier preliminary analysis (Thomas and Khan 2011).

Records of craft practices are important in their own right as accounts of what are all-too-often declining traditions and skills. They also document the complex economic and social relations of craft production, providing insights into perceptions and practices of divisions of labour (particularly gender-specific ones) and the social reproduction of craft skills, in local and small-scale production systems. We cannot claim to have produced in-depth information about these issues in our short study, but we think it is worthwhile to put on record what we have observed and, in particular, what the various potters have told us.

Methodology

Our observations were made at the villages of Bharat, Mandeo, Nurar, Gandi Khan Khel and Shabaz Azmat Khel in Bannu District (Fig. 1), as well as in the pottery bazaar (Fig. 2a) located outside the then existing, but since demolished, Railway Gate of Bannu City. The study extended over six days from 20th to 25th December 1991, following a season of archaeological fieldwork. We do not claim to have been wholly inclusive or rigorously systematic in our work, selecting which villages and potters to visit using local information, mostly obtained from the shopkeepers in the pottery bazaar in Bannu City. The villages selected (Table 1) were identified as the principal potters' villages in the district at that time. There had once been potters at the villages of Bazaar Ahmad Khan and Sher Ahmed Kala, and the only remaining potter in Mama Khel had died recently. There were still potters in Hawed and one in Nawazabad, who had set up a workshop there having moved there from Mandeo. This was the only example we found of a newly established pottery workshop; otherwise, the pattern was one of numerical decline. At the time of our survey, there were six potters' workshops in Nurar, while previously there had been at least ten. Seven potters' workshops had closed in Shahbaz Azmat Khel, although in Gandi Khan Khel (known locally, and for good reason, as 'the village of the potters') there were still 70 surviving workshops, while previously there had been almost 90.

We visited and recorded a series of examples we believe to be representative of the main

Table 1. Villages in Bannu District recorded as having active potters' workshops in 1991 or in the recent past.

Village	Observations
Bazaar Ahmed Khan	No potters left
Bharat	At least two workshops active
Gandi Khan Khel	Active workshops (more than three)
Hawed	Active workshop, uncertain number
Mama Khel	Last potter died 'recently' (mid-late 1991)
Mandeo	At least one active workshop
Nawazabad	A new workshop (potter moved from Mandeo)
Nurar	6 workshops still working, was 10
Shahbaz Azmat Khel[1]	7 potters closed down but others are working
Sher Ahmed Kala	No potters left

[1]Misidentified as 'Shabaz *Ahmed* Khel' by Rye and Evans (1976)

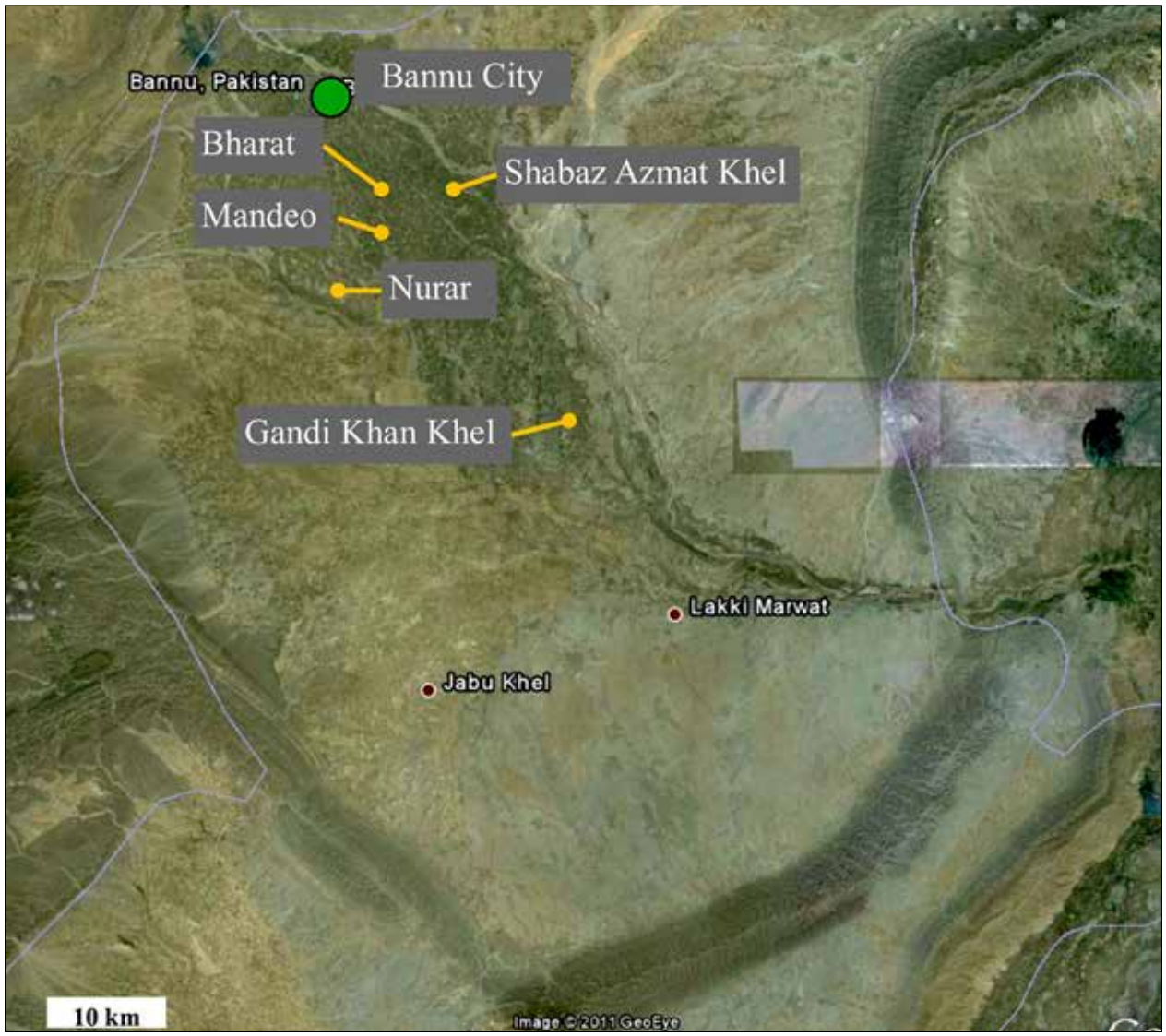

Figure 1. Map of the Bannu basin, north-west Pakistan, showing the locations of Bannu City and of the five villages in Bannu District at which studies were made of potters and their workshops. Base map derived from Google EarthTM.

pottery making traditions in the district (Table 2), and which show the problems faced by potters in an uncertain and changing economic arena. The criteria for selecting which potters to visit and interview were: (a) the type of pot-making technology known to be practised by particular potters and (b) whether there had been a decline in the numbers of potters in a village and, if so, to ascertain what economic or other social factors lay behind this decline.

Observations and questions were focussed on gaining information on the issues considered under the various headings below. In retrospect, we are aware that other questions might have been asked and that our questioning of individual potters did not always conform to a 'structured' format. We would have benefitted from the critical evaluation by Novotny and Dedrick (2018) of qualitative methods in ethnographic fieldwork, and their suggestions for how such studies might be undertaken, but we were 27 years too early. We were, however, fortunate in that most of the potters were enthusiastically cooperative and very forthcoming with information, especially with regard to their personal views on life as village-based potters operating within a market economy. We believe a more formal question-and-answer approach would have stifled the open spontaneity of our sources.

The range of pots and other ceramic products

The principal types of pots produced by most workshops are shown in figures 2a and 2b. Bread is an indispensable component of any meal in Bannu, therefore *thaibi*, trays for cooking *roti* (Fig. 2b.xii, 8), are widely produced in large quantities as breakage during use leads to regular demand for such wares. The types of pottery products shown in figure 2b are traditional forms made in a number of workshops, with only slight variations in size and surface decoration of each type. We consider a range of additional ceramic products, including rice-husking mills, smoking pipes, drainage pipes, and tanur, in greater detail below.

The raw materials for pottery production

Here we consider clays, tempering and pigments; the types of fuels used for firing the pots are discussed later.

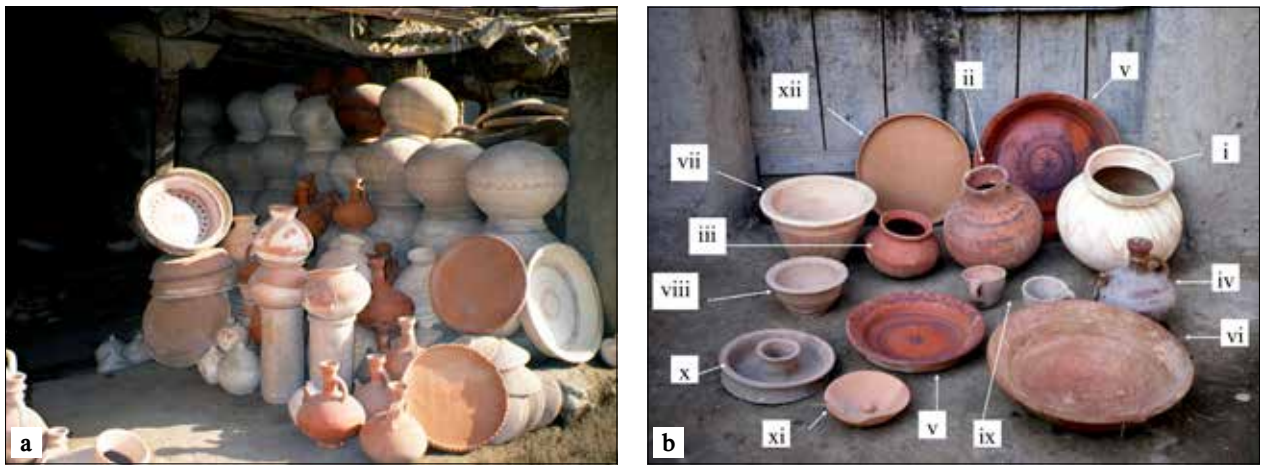

Figure 2. Some products of the Bannu potters' workshops. (a): A range of pots on sale in the pottery bazaar on 21st December 1991, outside the old Railway Gate (since demolished) in Bannu City. (b) The range of ceramic wares produced by Umar Khan's workshop (village Mandeo). (i) Globular water jar (*matteya*); (ii) water pitcher (*garrai*); (iii) small narrow-necked cooking pot (*dagai*); (iv) spouted water vessel (*keeza*); (v) shallow flat-bottomed dishes (*kundail*) for mixing and shaping flat bread (*roti*); (vi) round-bottomed serving dish (*kunali*); (vii) milling bowl (*braghiyeh*); (viii) pounding vessel for spices (*batāl*); (ix) cups with handles (*gadiwa*); (x) 'moated' water vessel (*tasht*), for providing water to chickens or keeping food safe from ants; (xi) lid (*barghala*), produced in various sizes to fit cooking and water storage vessels; (xii) flat baking tray (*thaiba*).

Table 2. The potters interviewed in this survey

Village	Names of potters interviewed	Date of interview
Bharat	Mir Paiyo Dad & Gul Ahmed	25 December 1991
Gandi Khan Khel	Musam Khan & Gul Salam	24 December 1991
Mandeo	Umar Khan	22 December 1991
Nurar	Habibullah Khan, Asrar Ali Khan & Gul Nawaz	22 December 1991
Shahbaz Azmat Khel	Mir Azad Khan & Said Ghani	24 December 1991

The topographical basin within which Bannu District is situated (Fig. 1) is diverse both in its geology (Hemphill and Kidwai 1973; Meissner *et al.* 1975) and geomorphology (Rendell 1986). Rivers and streams flowing from the hills to the west deposit clays, silts, sands, gravels, cobbles and boulders either as riverbed alluvium or in extensive alluvial fans (Petrie and Thomas 2012). These highly variable deposits include a range of resources, including clays for making pottery and sand used as a tempering material in some types of pots (see below). Clay deposits occur throughout most of Bannu District, although potters often have to pay landowners for the clay they require. The banks of rivers such as the Tochi and the Lohra are a source of clay for some potters, while others obtain it by digging in fields (Fig. 3a). Potter Musam Khan (village Gandi Khan Khel) pays Rs. 170 per month for a tractor load of suitably plastic clay from a field a little over one kilometre away. By contrast, the potters of Shahbaz Azmat Khel obtain their clay from a field just outside the village and none reported paying for this vital resource. Clay has to be crushed and soaked in pits in the potters' workshops to make it suitably plastic and ready for working (Fig. 3b).

Coarser minerals used as temper are quite variable in their nature and source. Most potters use clean sand obtained from sandbank deposits in the Tochi or the Lohra rivers. Again, Musam Khan was the only potter to inform us that he has to pay for his supplies of sand: Rs. 170 per month for a tractor load from deposits some 8 km distant. *Thaibi* have particularly high levels of tempering in their fabric (usually more than 50%, by volume). Traditionally, this temper has been of crushed pottery (grog) and pieces of ancient pottery found on the surfaces of archaeological sites are sometimes preferred (especially the fine and well-fired wares found on Bronze Age sites). Mir Paiyo Dad (Bharat) uses *surchi* (brick dust from a nearby brick works) as a temper for *thaibi* (Fig. 3c), but the products are of lower quality (more brittle and with inferior heat transference and retention) than those with crushed pottery tempering. According to a shopkeeper in the pottery bazaar in Bannu City, *thaibi* from Nurar, tempered with ground-up pottery, are of higher quality than those from Bharat, which are brick-dust tempered. No potters mentioned using organic materials, such as plant ash or animal dung, as temper in their traditional pottery wares, although it is used in making *tanur* (see below).

All of the pigments used to decorate vessels (as slips or paints) are naturally occurring minerals, derived from a range of localities within the district or further afield. For example, the bright red pigment used by Umar Khan as a slip on some of his pots (Fig. 2b: ii, iii & v) is an ochreous clay (*srā khaṭṭa*) derived from deposits near Mir Ali, North Waziristan, some 25 kilometres to the west of his village of Mandeo. The potters of village Shahbaz Azmat Khel and Habibullah Khan, of village Nurar, also reported using red and black pigments from Mir Ali. Musam Khan (village Gandi Khan Khel) uses red, white and black pigments to paint his pots. These are all minerals that mostly come from deposits in the hills fringing the east of Bannu District, although black comes from Karbogha (in Kohat District), which Musam Khan obtains when he and a group of fellow potters go on pilgrimage to an important *ziyarat* (saint's tomb).

Figure 3. Raw materials used in the main body of the pottery. (a) Low-lying pool in a field near village Gandi Khan Khel excavated to yield suitably plastic clay for pot making. (b) Clay for making *thaibi* in the workshop of Asrar Ali Khan (village Nurar); (c) clay and brick dust tempering are mixed and sieved in Mir Paiyo Dad's workshop (village Bharat) for making *thaibi*.

Technology of pottery production

Shaping the clay

Most ceramic products are formed on a foot-operated 'kick wheel' (Fig. 4). The wooden structure of the potter's wheel (*dukān*) observed at various workshops in Bannu is almost identical to that described in detail by Rye and Evans (1976, pp. 17-19), who considered the design to be common among potters of Khyber Pakhtunkhwa and the Punjab. The general structure of the apparatus is shown in figure 4a. The wooden structure is placed in a pit, normally 90-110 cm deep and 80-90 cm in diameter. Across the top of the pit is a wooden plank, the cross member, which acts as both the top bearing for the wooden shaft and a seat for the potter (Fig. 4c), although some potters have different seating arrangements (Fig. 4b). A circular flywheel some 60 cm in diameter fits over the lower part of the shaft and a wooden 'wheel head', 30-36 cm in diameter, fits on top of the shaft. The potter works the clay on top of the 'wheel head', which is rotated by the potter kicking the flywheel located down in the pit.

Water storage and cooling jars (*matteya*) are shaped on the wheel, then finished by hand using a dabber (an 'anvil' which is held inside the vessel) and a paddle over a dish of clean coarse sand (Fig. 5a), to thin out and shape the vessel and to incorporate sand into the outer surface to enhance its water cooling properties. Figure 5b shows a range of different shapes and sizes of dabbers and paddles. Umar Khan (village Mandeo) informed us that once formed, these water jars are left to dry in the sun 'for as long as possible' because the better they are dried, the less chance there is of

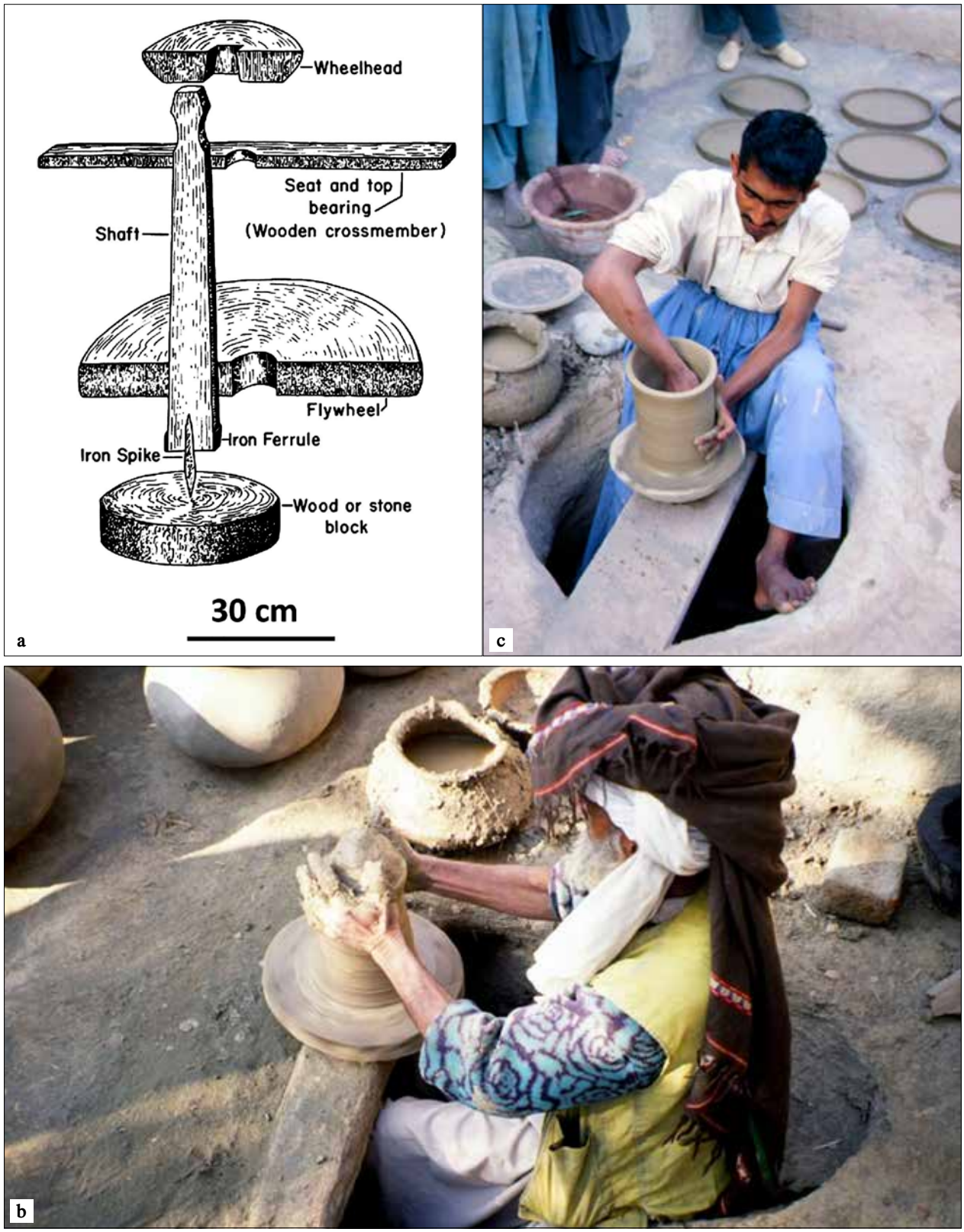

Figure 4. Potters and their wheels. (a) The general structure of a foot/kick-turned potter's wheel (*dukān*) as used widely in Khyber Pakhtunkhwa Province (after Rye and Evans, 1976, fig. 3, p. 19). (b) Musam Khan (village Gandi Khan Khel) at his wheel. (c) Gul Nawaz (village Nurar) throwing a flowerpot on his wheel (note the drying *thaibi* in the background).

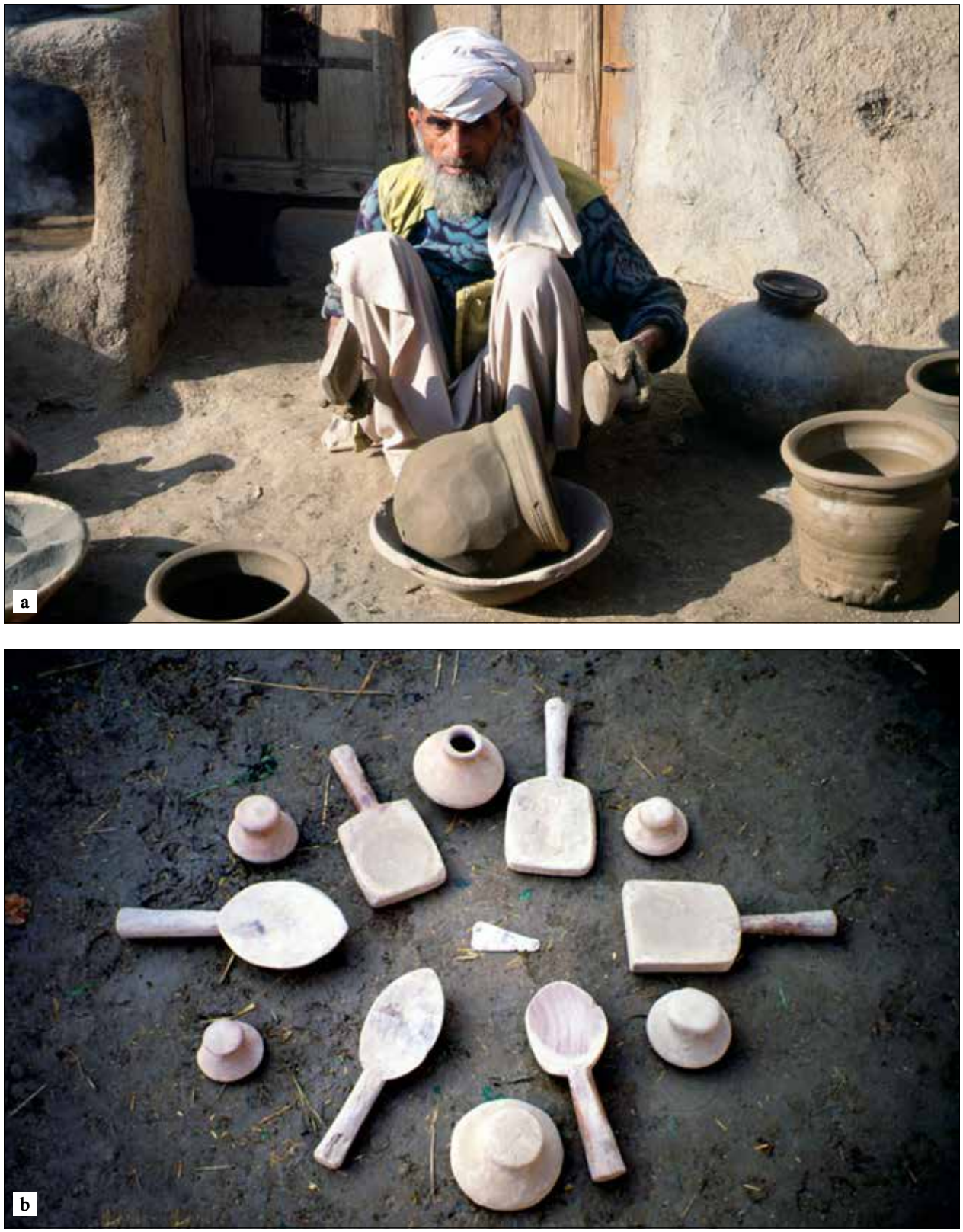

Figure 5. Shaping pots by hand. (a) Musam Khan (village Gandi Khan Khel) beating out and adding coarse clean sand to the surface of a water pot (*matteya*), using a dabber ('anvil') and paddle. (b) A range of dabbers and paddles used by Umar Khan (village Mandeo).

cracking during firing.

Some ceramic products are made without the use of a wheel. For example, *thaibi* are made entirely by hand on a bed of temper on a clean floor. Rice-husking mills (*dhalinā*) are also constructed by hand, as shown in figure 6. *Tanur* are large ceramic ovens (most often used for baking *nān*), the construction and use of which is described in detail by Rye and Evans (1976, pp. 70-72). The body of the *tanur* is hand-built using slabs of clay mixed with sand, chopped dry organic fibres (most often from the wild grass *Saccharum munja*, although Rye and Evans also record the use of goat hair), plant ash, donkey dung, salt and water. *Tanur* are made in a standardised barrel shape (Fig. 14b) and vary in size depending on intended use. A *tanur* for domestic use is usually smaller (60 cm high and 50 cm basal diameter) than one for commercial use in teahouses or by bakers and sellers of *nān*, which can be up to 2 m high with 1 m basal diameter.

Some potters make *tanur* in addition to their normal range of pottery, but only when specifically ordered by a customer. The production of *tanur* differs from pottery production in two major ways: the mixture of materials is quite complex, including organic tempering (not used in pottery), and the *tanur* is not fired by the maker but is delivered in unfired condition. Large ones are built by the potter at the site of intended use, the potter visiting each day to add to the growing walls of the *tanur*. Once installed, the *tanur* is preheated with a small fire to aid drying out and subsequently becomes fired during use.

Firing the clay: the types of fuels used

The principal fuels of choice for firing pottery are either dung cakes (Fig. 7a, b), made with animal dung (from cattle or water buffalo) mixed with chopped straw and dried, or sheaves of the reed mace (*Typha latifolia*), known locally as *deelai* (Fig. 7c), which grows in abundance in marshy or swampy localities in the district. Straw (Fig. 7a) is most often used as kindling for starting the fire, although some potters sometimes use kerosene. The ways in which the fuels are used is described below.

Firing the clay: the types of kilns used

Thaibi are usually fired in simple rectangular and relatively small kilns, such as that of Mir Paiyodad (Fig. 8b), which is built against the wall of his house. This kiln can fire up to 300 *thaibi* at a time. Larger sloping kilns, examples of which are shown in figures 9a and 10a, allow the fire to spread quickly backwards and upwards from its starting place at the entrance of the kiln, ensuring a more even firing of the vessels stacked in the kiln. Such sloping kilns are usually located within the courtyards of the potter's workshop area (Figs. 7b, 9a), although in Gandi Khan Khel the horse-shoe shaped sloping kilns (Fig. 10a) are communal and located in open areas in the village, each being used by some three to five different potters. Some of these kilns can hold up to 600 pots per firing.

The village of Shahbaz Azmat Khel had the most sophisticated kilns encountered in our survey (Figs. 11, 12). Known as *bhatia*, these circular updraft kilns are located outside the enclosed dwelling areas of the potters and their families. The kiln and pottery production system of the potter Mir Shad was described in detail by Rye and Evans (1976, 43-9), who misidentified the village as Shahbaz Ahmed Khel. Figure 11 shows the structure of Mir Shad's kiln.

All the kilns are cylindrical in shape, with walls of mud mixed with chopped straw and covered inside and out with a fine straw and mud plaster. We examined the kilns of Mir Azad Khan and Said Ghani, which are identical in design, although Said Ghani's is smaller. Both kilns are more complex than that of Mir Shad because they have flues within the walls of the kiln as well as in the floor of the firing chamber for efficiently distributing the hot gases of combustion (Fig. 12c, d). The dimensions of the three kilns are given in Table 3.

Loading and firing the kilns

Firing is usually started with dried maize stalks or processing debris from rice (Fig. 7a), although some potters occasionally use kerosene to start the burn. The principal firing fuel in open kilns is dung cakes. The stacking of pots in open kilns is generally as shown in figure 9b. The fuel is

Figure 6. Sequence showing Habibullah Khan (village Nurar) making a rice-husking mill, or *dhalinā*. (a) Preparing the main body into which (b) is made a central hole. (c) A band of clay forms an arch over the central hole, (d) a small hole in made in the top of this arch (to hold the wooden peg around which the finished mill will rotate) and a handle is attached to the outer edge of the main body. (e) When partly dry, numerous diamond-shaped holes incised in a regular pattern into the base of the body produce the milling surface. (f) After firing, the *dhalinā* is ready for use as a rotary husking mill.

Table 3. Dimensions of some circular updraft kilns, village Shahbaz Azmat Khel

	Outer dimensions		Inner dimensions		Volume of kiln
Kiln owner	**Height**	**Diameter**	**Height**	**Diameter**	
Mir Shad *	1.6 m	3.2 m	1.6 m	2.0 m	5.03 m^3
Said Ghani	1.2 m	3.5 m	1.2 m	2.1 m	4.16 m^3
Mir Azad Khan	1.95 m	3.95 m	1.95 m	2.4 m	8.82 m^3

*Recorded by Rye and Evans (1976: p. 47; fig. 11, p. 48; and plate 30, p. 231), who give the height of the kiln as 2.6 m, but it is clear from their figure and plate that it must be 1.6 m.

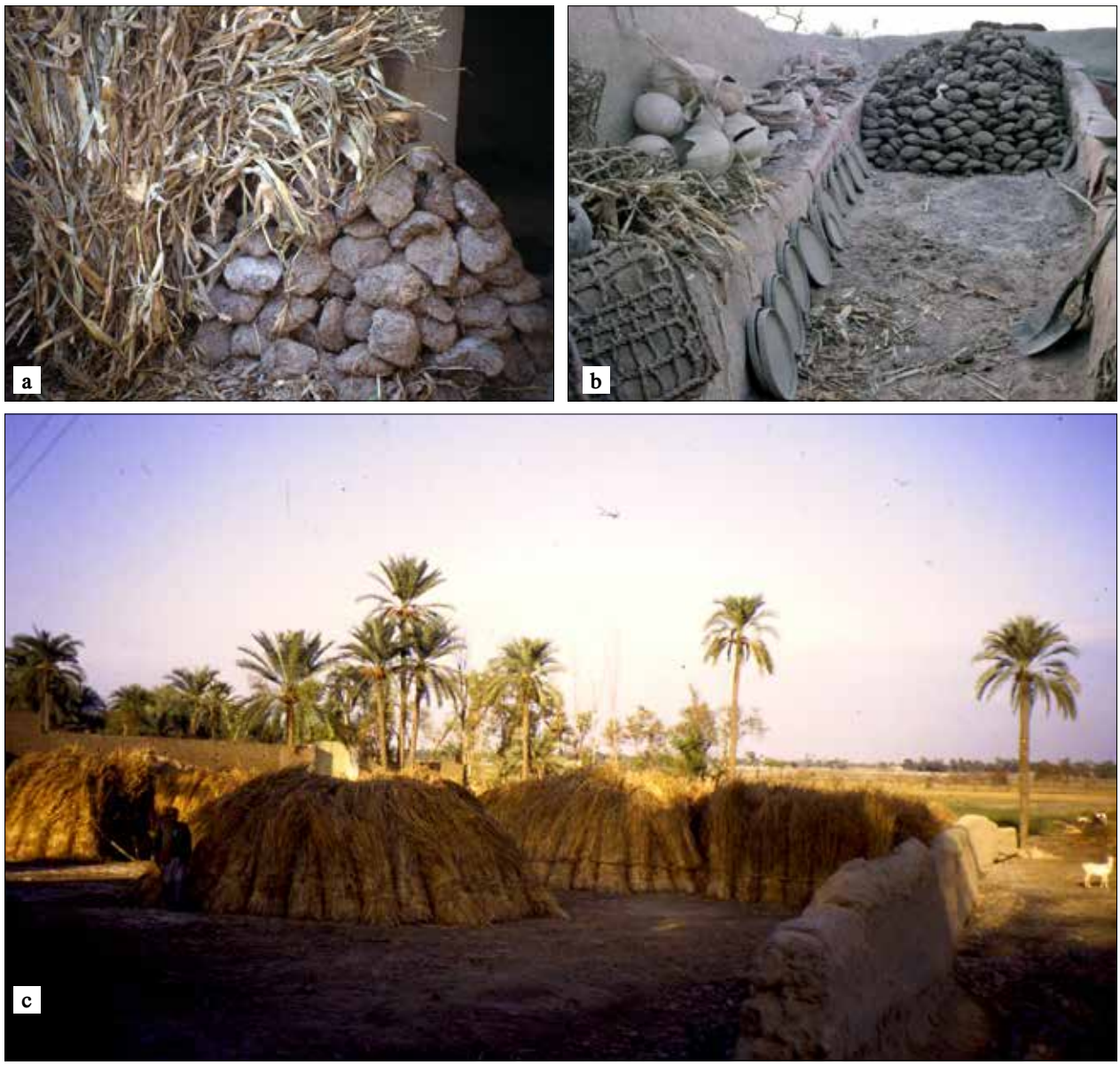

Figure 7. Fuels used for firing pottery kilns. (a) Mir Paiyo Dad (village Bharat) starts the firing using dried maize stalks or straw from the processing of the rice crop, while the main heat is provided by burning dung cakes. (b) Gul Nawaz (village Nurar) makes and stores dung cakes throughout the non-firing season. (c) In village Shahbaz Azmat Khel, bundles of dried *deelai* (the stalks and leaves of the reed mace *Typha latifolia*) constitute the principal fuel for firing the kilns. This wild plant grows in dense stands in swampy ground in low-lying areas of Bannu District.

Figure 8. (a) Flat baking trays (*thaibi*) made in Umar Khan's workshop (village Mandeo) for cooking bread (*roti* and certain types of *nān*). (b) A simple kiln (2.4 x 2.4 m) built against the wall of the house of Mir Paiyo Dad (village Bharat) for firing *thaibi*. (c) *Thaiba* on top of an elaborate cooking hearth (*bāt*), with cooked cornmeal *roti*, in Umar Khan's courtyard (village Mandeo).

Figure 9. Workshop kilns. (a) A double kiln in the courtyard of Gul Nawaz (village Nurar), the larger one (7.8 m long x 3.0 m wide and from 0.4 m to 0.8 m high) is for firing a range of pots, while the smaller one (3.8 long x 2.0 m wide and from 0 m to 0.45 m high) is used for firing *thaibi*. (b) When stacking his dried pots for firing, Umar Khan (village Mandeo) places a layer of dung cakes on the bottom of the kiln with the pots carefully stacked on top, with bits of dung cake packed into the spaces between them. Flat dishes are placed on the top and over these a final layer of straw (note: this was reconstructed as a demonstration, using already fired pots).

carefully packed below, around and on top of the pots to be fired, to help ensure a reasonably even firing throughout. The dung cakes burn fully to ash with a slow, steady smouldering flame. The firing time for open kilns varies between four and nine hours, the kilns and their contents being left to cool for at least 24 hours before the fired pots are removed.

By contrast, the fuel used in the updraft kilns of Shahbaz Azmat Khel is solely of large sheaves (Fig. 7c) of reed mace (*deelai*). Up to 900 spouted water pots are loaded into the firing chamber of the kiln. These are covered with piled-up flat dishes. This is then covered with a layer of deelai and sealed with mud plaster into which numerous holes are punched to allow the hot gases to escape. *Deelai* sheaves (each 2 metre-long bundle weighs approximately 20 kg) are fed continuously through the stoke hole into the fire pit under the kiln. The *deelai* burns with a fast and furious flame, the heat causing an updraft carrying flames, very hot air and combustion gases up through the flues as well as an inflow of air through the stoke hole. The fire is extinguished by blocking the stoke hole after about 13 hours (a minimum of eight hours is needed for a successful firing; 13 hours is considered optimal). Mir Azad Khan estimates the fuel cost for a 13 hour firing, requiring 50 sheaves of *deelai* at Rs. 20 per sheaf, to be Rs. 1,000.

Rates of wastage during firing

The amount of wastage during firing due to breaking, cracking or over-firing, varies according to kiln type, the types of pots being made, the rate of firing (too fast a burn leads to more cracked or over-fired pots) and the weather (very rapid cooling in rainy conditions can lead to heavy losses). *Thaibi* made in simple rectangular level kilns have a wastage rate of some 40-50 in 300. In sloping kilns, 500 or even 600 pots can be fired at a time, with breakage/cracking often ruining some 50 – 100 pots, but the potters say this is unpredictable. More than 900 pots can be fired at a time in the enclosed circular updraft kilns, with breakage rates being variable but usually low (although, rarely, a disastrous firing can lead to 30% wastage). There is a slight correlation between the rates of wastage and the morphology of kilns, especially the volume (cubic capacity) of kilns and the surface area exposed to the elements, such as heavy showers of rain. The relationships between kiln capacity and kiln surface area are shown in Table 4, for the range of kiln types observed in our study. Kilns with a low surface area to volume ratio tend to have lower wastage rates, although many other factors can influence rates of breakage during firing and subsequent cooling.

Not all is total waste: some cracked pots are crushed for use as temper in *thaibi*, while larger pots can be used as construction materials in walls (Figs. 10b, c), including the walls of kilns.

Table 4. Exposed upper surface areas and total inner capacities (volumes) of a range of kiln types used in villages in Bannu District, listed in order of values of S.A. / vol. ratios.

Village / Name of potter / type or shape of kiln used	Upper surface area of kiln m^2	Interior volume of kiln m^3	S.A./ vol. ratio
Nurar/Habibullah Khan/up-sloping	23.4	9.4	2.5
Mandeo/Umar Khan/up-sloping	12.5	5.6	2.2
Bharat/Mir Paiyo Dad/level with ground	5.8	3.2	1.8
Shahbaz Azmat Khel/Said Ghani/circular	3.5	4.2	0.8
Gandi Khan Khel/Gul Salam/up-sloping	27.2	38.0	0.7
Gandi Khan Khel/Musam Khan/up-sloping	26.6	37.2	0.7
Shabaz Azmat Khel/Mir Shad */circular	3.1	5.0	0.6
Shabaz Azmat Khel/Mir Azad Khan/circular	4.5	8.8	0.5

*Basic dimensions recorded by Rye and Evans (1976) – see Table 3.

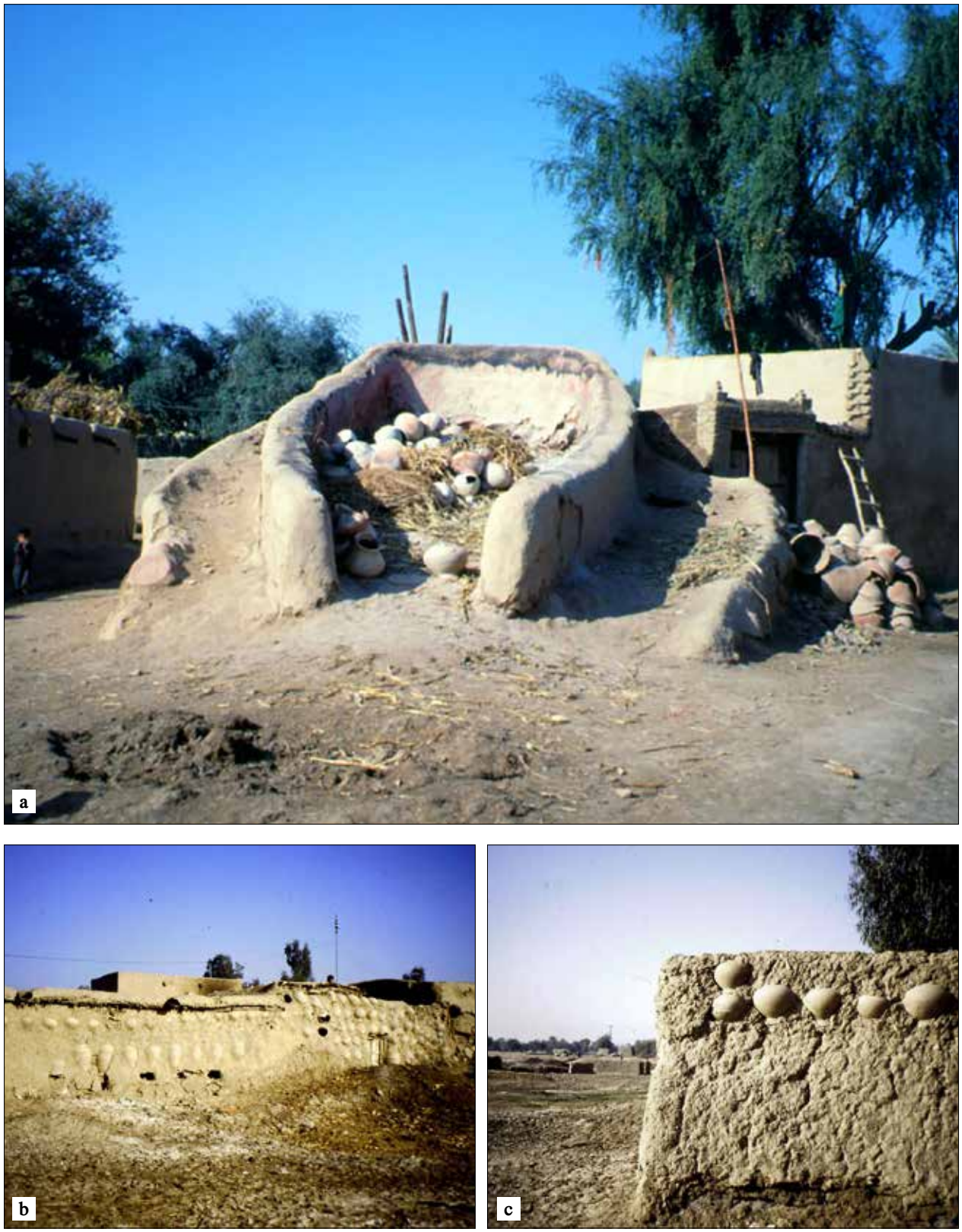

Figure 10. (a) A communal horseshoe shaped sloping kiln (9.5 m long by 2.8 m wide, height ranging from 0.6 to 1.5 m) located in an open space in the village of Gandi Khan Khel. (b), (c) 'Wasters' are not wasted: misfired reject pots are put to use in wall construction (village Gandi Khan Khel).

Contextualising pottery production in Bannu District

The following range of contextual factors are the ones we believe to be especially important for various aspects of pottery production in the district:

- The potters' relationships with local environments and ecosystems
- Seasonal influences on production and products
- Economic enablers and constraints
- Social contexts of production
- Responses and adaptations to change

The potters' hierarchy of ecosystems

The production sequence, or *chaîne opératoire*, of pot making in Bannu District is embedded within a hierarchy of systems, starting with the local natural and human ecology. Many of the inorganic and organic raw materials required are obtained from local geological, sedimentary and biotic environments, and knowledge of the spatial occurrence of raw materials is important, as is access to them (which, as we have seen above, can have financial consequences). Other essential materials, most notably animal dung, straw and chaff for fuel (or for tempering in the case of *tanur*), are closely linked to local wetland ecosystems and/or to agrarian and agro-pastoral ecosystems. As noted by Sillar (2000) in an Andean context, dung has multiple uses: as fuel for firing pottery, as fuel for cooking and as manure for improving soil fertility. For Bannu, we can add dung as an essential component of building materials, especially mud plaster for sealing beaten earth floors and unfired mudbrick walls. Dung is, therefore, a valued resource for which there are numerous competing demands within a potter's household and workshop. Thomas (1983; 1989) discussed the systemic linkages involving animal dung in recent and ancient agro-ecosystems and other techno-production systems in the Bannu region. Entanglement theory, another systems-based approach, has recently been applied by Duistermaat (2017, fig. 9.1) to describe the complex relationships between the basic raw materials required to make pottery and with competing alternative uses of these materials. In our study, the potters of Shahbaz Azmat Khel have been able to break free of some of the entangled requirements of dung by using *deelai* as fuel in their kilns.

Seasonality of production

Two main factors control the times when pots are made:

1. Variable demand for particular types of pots. While many types are needed all year round, including *thaibi* for cooking *roti* and pots for carrying and storing water, others vary in demand. Such varied demand may be dictated by:
    - the religious calendar: at *Eid* times, which of course vary from year to year, different types of large vessels are required for cooking and serving communal meals;
    - the agricultural calendar: for example, milling vessels are required for crop processing; and
    - the social calendar: most marriages occur in the spring season, when larger water pots and large dishes for the preparation and serving of food at wedding feasts are in demand.
2. Seasonal climate and weather: potters seek to avoid firings during rainy periods because it is more difficult to initiate and sustain the firing of a kiln, and breakage and cracking rates are much higher. Umar Khan (village Mandeo) fires pottery twice during the winter, if conditions are dry, and every six weeks in the summer. Demand can also vary in response to seasonal climatic factors, with very large water storage pots being made mainly during March-April prior to the onset of the hot weather.

The economic context: marketing, profitability, competing technologies and alternative sources of income

Potters in the villages of Bannu District produce

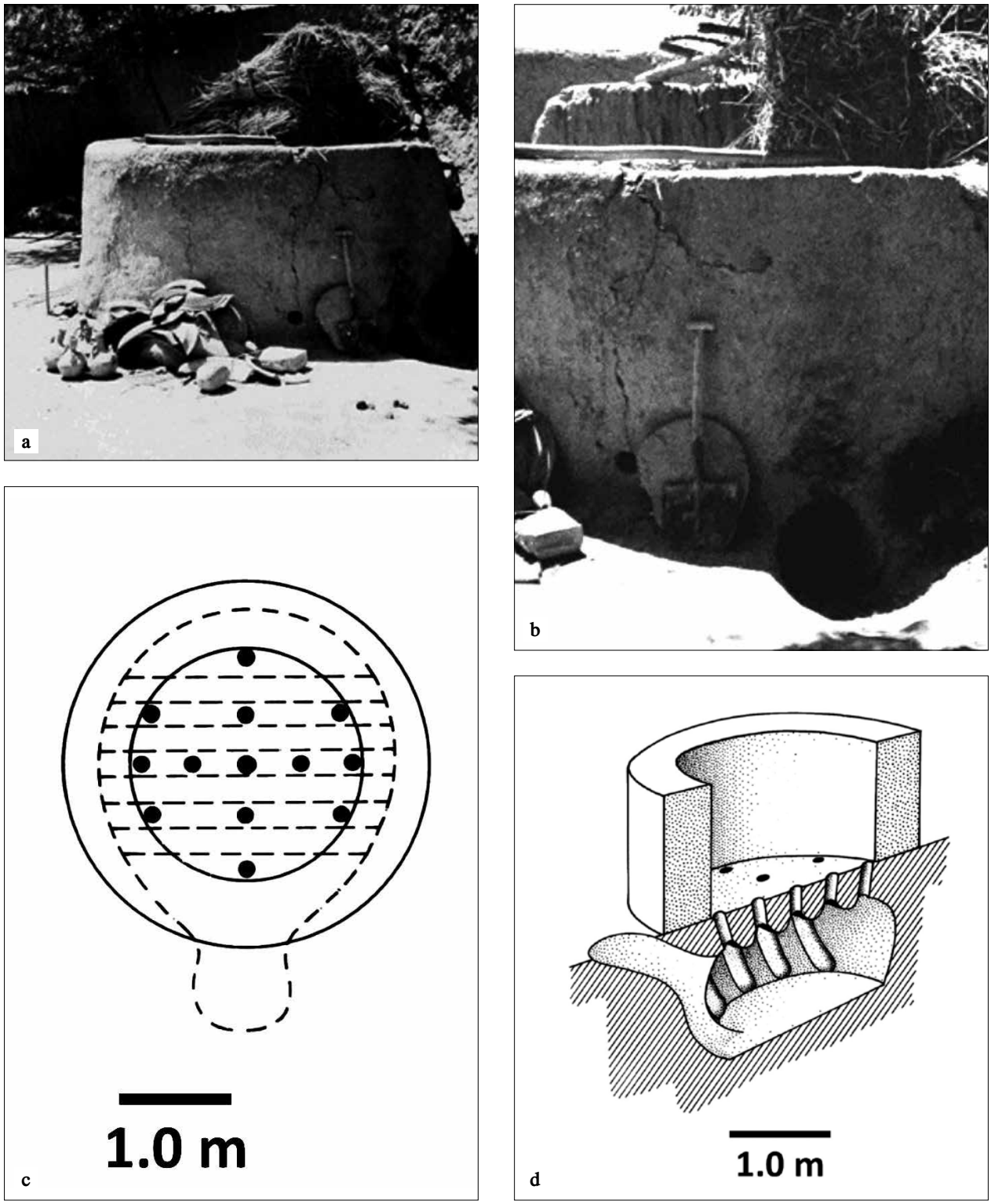

Figure 11. Details of Mir Shad's circular updraft kiln, village Shahbaz Azmat Khel. (a), (b) Views of the kiln from the north, showing the stoke hole and bundles of reeds (*deelai*) stacked on top. (c) Schematic plan of the kiln showing the extent of the fire pit (broken lines) beneath the kiln and the flues (holes) in the floor of the firing chamber, linking it to the fire pit. (d) Perspective diagram showing the connections between the stoke hole, the fire pit and the firing chamber. See Table 3 for the dimensions of this kiln. Our figure has been adapted from Rye and Evans (1976: fig. 11.C & D, p. 48; and plate 30.c & d, p. 231).

their wares partly for local consumption, but mostly for sale in Bannu City. A few have diversified their distribution patterns beyond the local and Bannu, such as Musam Khan (village Gandi Khan Khel) whose wares are also sold to buyers from Lakki, Kohat, Tajori, Mir Ali, Miran Shah, Karak, Thatti and Landiwah. With the exception of the potters in the village of Shahbaz Azmat Khel, all of the potters interviewed claimed that profit levels were very low with the income from sales barely balancing the costs of production. Most said they were in debt but could foresee no way to recover profitability. In contrast, the potters of Shahbaz Azmat Khel reported that they realised a reasonable profit from the sales of every firing. This might be attributed to an array of factors: 1) the larger volume of their kilns, which produce more pots per firing; 2) less wastage from misfiring or cracking due to the design of the kilns which separates the fire from the pots; and 3) the relatively low surface area of the kiln surface exposed to the elements, which reduces losses from excessively rapid cooling during heavy rains.

Sales were also declining because of increased availability of mass-produced goods, such as metal cooking pots and bowls, plastic water containers, and glass beakers. Furthermore, the availability of glazed fine-ware ceramics such as teacups, teapots, and plates, has had a markedly depressive impact on demand for similar but unglazed ceramic vessels. This is because the competing materials are often less liable to break, less heavy, and/or may be perceived as being more attractive, fashionable, hygienic, and efficient. Although more expensive, such ceramic wares require less frequent replacement. They are also perceived as being 'modern' and therefore more desirable than traditional pottery vessels. Despite this, some types of unglazed ceramics remain popular, including *chillum* (hubble-bubble pipes), drainage pipes and flowerpots (Fig. 13). However, it is only a matter of time before alternatives in other materials, such as glazed ceramic smoking pipes or plastic drainage pipes and flower pots, have an impact.

Another factor is the increase in alternative competing sources of income. People in Bannu, as elsewhere, are much more mobile than they once were and the possibility of moving away to find work, and to earn 'good money', is increasingly attractive to the sons of potters. Many who might have learned the potter's craft, and lived a life of relative poverty, have become labourers on roads, canals and building developments. Some become migrant workers, finding work as labourers as far afield as the Gulf States and beyond. They send a proportion of their earnings home to their families in the villages, but none return to learn the potter's craft.

The social context: pottery producers and the social reproduction of knowledge and skills

In most of the villages we visited, pottery production occurs in family workshops within the walled courtyards of dwellings. The village of Gandi Khan Khel is an exception, with 18 kilns located in public spaces, each shared by between three and six families of potters (there being some 70 surviving pot-making workshops in the village at the time of our survey).

Virtually the whole process of pot making in Bannu District is a male preserve, the knowledge being passed down from father to son, although women undertake the forming of *thaibi*, but not usually their firing. In one case we visited a workshop where the father had died before passing on his knowledge and much of his equipment (wheel, paddles and dabbers, mortars for producing pigment powders, etc.) lay unused. The only ceramic production surviving in this household was the making of *thaibi*, undertaken by the women of the family. Pot making is such a family-focussed activity there seems to be no possibility that an untrained son of the family could become apprenticed to another potter to learn the craft that his father could not pass on.

Responding to change: resilience strategies of some Bannu potters

Despite a general picture of decline and indebtedness, some potters showed remarkable resourcefulness and resilience in the face of seemingly inevitable change. Opportunities were perceived and seized upon in two distinctly different ways: through diversifying or

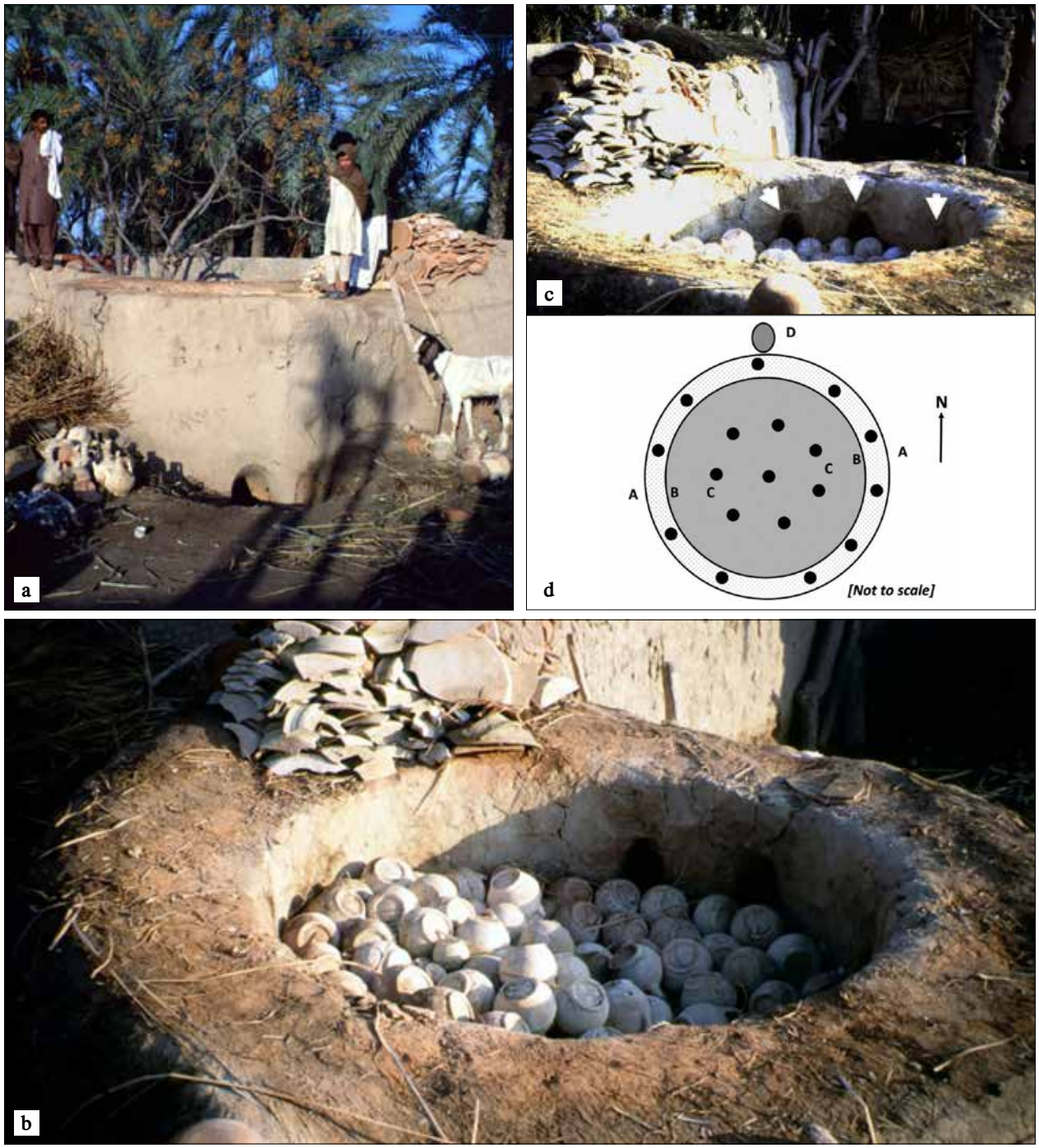

Figure 12. Circular updraft kilns of Said Ghani and Mir Azad Khan (village Shahbaz Azmat Khel); the two kilns are identical in structure although different in size (see Table 3 for dimensions). (a) Side view of Said Ghani's kiln with three outer steps leading to the top. (b) Said Ghani's kiln viewed from the top, loaded with fired water pots. (c) Said Ghani's kiln showing three (of ten) openings (indicated by white arrows) of the within-wall flues near the top of the inner wall. (d) Schematic (i.e. *not to scale*) plan of Mir Azad Khan's updraft kiln. Grey shaded area: the floor of the firing chamber above the fire pit, with 8 flues (holes) connecting them. Light-stippled area: the wall of the kiln in section, showing the 10 vertical flues that run from the fire pit to near the top of the kiln wall. Dark-stippled feature to the north: the stoke hole for fuel, leading into the fire pit beneath the kiln. Dimensions A-A and B-B are given in Table 3. Other dimensions: C-C, diameter of ring of seven flues in the kiln floor = 1.58 m; D, diameter of the stokehole leading to the fire pit beneath the kiln = 50 cm. Diameters of flues: the single central flue in kiln floor = 21 cm; each of the seven flues in a ring in the kiln floor = c. 11 cm; each of the ten vertical flues within the kiln wall = c. 25 cm.

Figure 13. Other popular ceramic items. (a) Habibullah Khan (village Nurar) at his foot/kick wheel throwing the body of a hubble-bubble pipe (*chillum*), finished examples of which are drying behind him. (b) Pottery drainage pipes made by Habibullah Khan. (c) Terracotta flower pots; see also Figure 6(c).

specialising.

There is a high level of conservatism in terms of the range of wares produced by most potters (Fig. 2b) and in only one instance did we observe innovation with 'new' types of ceramic vessels. Musam Khan, of Gandi Khan Khel, had recently added two new types of vessels (Fig. 14a) to his product repertoire, made solely for use by Afghans living in a nearby encampment. One is a jar (*kurtmal*) for churning yogurt and the other is a dish (*jagai*) for preparing yogurt balls (*kurt*). Both vessels are made in the same fabric as his traditional pots and it is fascinating to consider how any future archaeologist might seek to explain the occurrence of such 'new' vessel forms alongside an otherwise well-established ceramic tradition. Another form of diversification is in marketing. Most potters marketed their wares through Bannu City, but Musam Khan makes use of an additional eight marketing centres. A third case of diversification involved relocation of a workshop, although we are aware of only one example in which a potter had relocated from Mandeo to Nawazabad, where there was no competition from other potters.

Specialisation of production, focusing on only one or a few types of ceramic products, was observed in the case of *thaibi* and of *tanur*. Specialized production of *thaibi* usually occurred when a potter died without having passed his skills on to a son, thereby leaving the women in the family to continue their practice of producing *thaibi*. While some potters had for some time made *tanur* on a 'to order' basis, increasing numbers were specializing in their production, either selling them through the Bannu bazaar (Fig. 14b) or fabricating larger ones at the site of use. An increase in demand due to the growing number and size of Afghan settlements and encampments is a contributing factor. In Gandi Khan Khel some workshops have given up making traditional pots and make only *tanur*, which they trade with Afghan settlements in Doaba, Thal and Hangu (in Kohat District) and in Parachinar. There is also increased demand from growing numbers of teahouses and hotels, especially along new road developments, and from bread (*nān*) shops in town and village bazaars. A small *tanur* sells for Rs. 45, while larger ones fetch upwards of Rs. 60, at 1991 prices.

Discussion

Ethnographic analyses of the relationships between people and material culture, and their use as analogies in archaeological interpretation, form the basis of ethnoarchaeology (e.g. David and Kramer 2001). Recent reviews (Fowler 2017; Cunningham 2018) highlight both positive and negative perceptions of scholars to the aims and methods of ethnoarchaeology, in particular contrasting the positivist theoretical positions of ethnoarchaeology with the humanistic and symbolic theoretical approach of material culture studies. A provocative article by Gosselain (2016) exemplifies recent disquiet over the methods and assumptions of ethnoarchaeology. A major hazard is the suggestion, or implication, that the persons and communities studied are, in some ways, vestigial populations resistant to change; 'stuck in the past', one might say. Another pitfall is that the technology possessed by those whose 'real time' archaeology is under study is, from an evolutionary perspective, 'primitive' or 'simple'. Some scholars advocate alternative terms to ethnoarchaeology, such as 'archaeological ethnography' (Hamilakis 2016) or 'the archaeology of the present' (González-Ruibal 2016), to avoid implying the 'ethnographic present' is representative of an 'ethnographic past'.

Our study was not undertaken with any explicit ethnoarchaeological objectives, we simply set out to place on record what we could of a fascinating but endangered craft tradition. Although dependent on technological and socio-economic contexts, we suggest that few directly applicable analogies are likely to be drawn linking our observations to the archaeological record. A major factor for many of the potters we observed and recorded is the sale of their wares through the bazaar in Bannu City. This town was constructed in 1848 by the British in an attempt to establish control over the region. Before this there was no large population centre in what is now Bannu District, only many large fortified villages or extended households (Gazetteer 1883-4). Thus, even in the relatively recent historic past, the economic context for

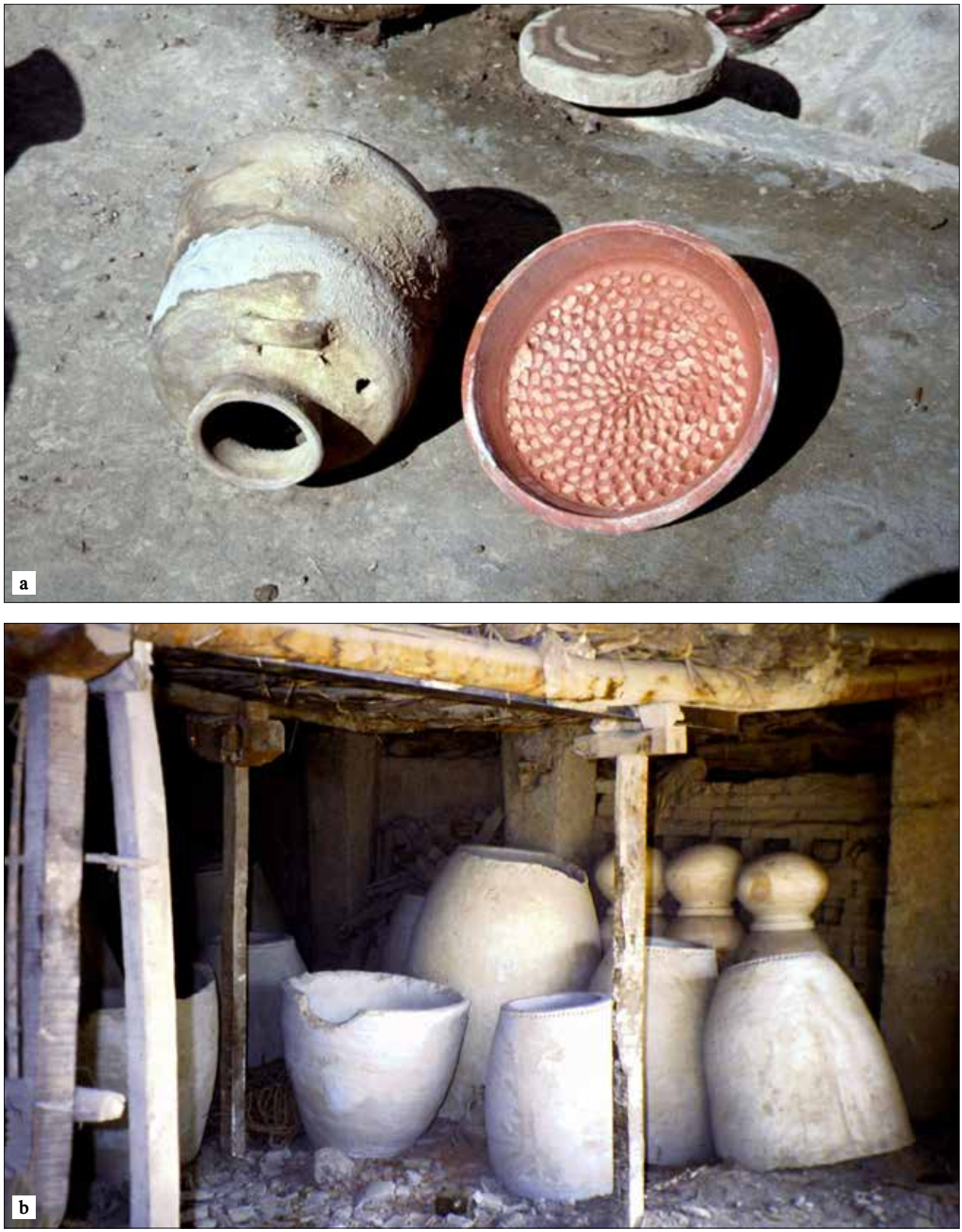

Figure 14. Demand and supply: specialist or 'exotic' ceramic products. (a) Wares (left: *kurtmal*, right: *jagai*) produced by Musam Khan (village Gandi Khan Khel) for sale to Afghans in the nearby encampment. (b) *Tanūr* of different sizes in a shop in the Bannu pottery bazaar.

potters was quite different. Nevertheless, it is feasible that at the time the huge Iron Age site of Akra, some 15 km southwest of Bannu City, was a vibrant population centre (Khan *et al.* 2000), potters working in villages at that time were part of a market economy not dissimilar to that of the present-day.

Our observations and interpretations indicate that archaeological interpretations should bear in mind factors such as synchronous variability in practices and 'fitness for purpose' of materials, fuels and firing installations (kilns). For example, the variation in types of kilns in use at the time of our survey is striking, ranging from small simple level-bottomed rectangular structures, principally for firing *thaibi*, to highly complex and sophisticated updraft kilns for firing a wide range of vessel types. The simpler kilns should not be seen as 'more primitive' than the updraft kilns, rather they should be seen as being 'fit for purpose'. To construct and maintain an updraft kiln solely to produce *thaibi* would be irrational and wasteful when they can be produced more efficiently and economically with a simple open rectangular kiln. As such, we concur with Pool (2000) that synchronous polymorphism in kiln types should be interpreted in terms of performance and requirements rather than as a hierarchy ranging from simple ('primitive') to complex ('advanced').

The potters of Bannu District display considerable virtuosity in their skills and variation in their practices. These often extend and ramify beyond any linear *chaîne opératoire* model of pottery production (see Roux 2017 for a recent critical review), intersecting with a diverse range of social and economic factors, cross-linking between different *chaînes opératoires* (Sillar 2000), and creating complex networks of inter-relationships (Duistermaat 2017) or 'entanglements' (Hodder and Mol 2016). To understand more fully the complex lives of the potters of Bannu District, we need to know much more than how they produce their wares.

Conclusions

By now, our respected reader may be a little disappointed that we have not considered any wider implications our study might have for social, technical and economic dynamics of pottery production in other parts of Pakistan and beyond. Our investigation was deliberately intended to be a multi-level contextual analysis of pottery production in Bannu District. Many of the diverse factors involved were found to be associated, in part, with local environmental, social, and economic contexts as well as specific factors and events. For example, in the same village one pottery workshop might close because of the unfavourable economic environment (perhaps the potter moved to the Gulf States to work as a labourer) while another closed because the potter died before passing on his knowledge and skills to one of his sons. The social dynamics are different in the two cases, but the outcomes the same, making this a very small-scale example of the concept of 'equifinality' (where an observed outcome or phenomenon might result from different processes or trajectories), increasingly seen as important in the historical sciences, including archaeology.

'Specific' and 'local' are key words that underpin the remit, aims, and limits of our study, and we are uncomfortable with the notion that, solely by virtue of having undertaken this focussed study, we should somehow have become enabled or empowered to speculate about any implications it may have on wider geographic, economic or cultural scales. To achieve such broader understanding, we believe that local and temporally-specific studies of the kind we report here should be undertaken elsewhere (see 'What next? Some thoughts about future work', below).

Standing alone, our study will not necessarily illuminate pottery production systems in the districts immediately adjacent to Bannu District, let alone across a country as environmentally and culturally diverse as Pakistan. Further investigations of the kind we undertook could produce comparative data to enable scholars to distinguish the 'specific and local' from the 'general and regional', which might then provide a valid basis for inferring dynamics at various temporal and spatial scales. A rigorous research design, employing a standardised methodology, could yield data suitable for the comparative

evaluation of pottery production systems both within and between individual case studies.

We hope our observations of traditional potters and pot-making techniques in Bannu District have revealed the potential for further systematic study, as well as showing the diversity of techniques and technology used by the highly skilful potters we visited. Sadly, there can be little doubt that the future of the Bannu potters appears bleak. External and internal pressures, outlined above, have caused families to abandon making pots or to specialise in a restricted range of ceramic types. A few have responded to new opportunities by making different, non-traditional, types of ceramics or by moving their workshops to villages that have lost their own potters. All these aspects highlight the need for further work in this area to document more fully the surviving traditions and their social contexts, and to investigate the socio-economic dynamics underlying innovations in pottery production.

What next? Some thoughts about future work

We intended to revisit the villages and potters' workshops in December 2001, to find out how they had fared some 10 years on from our initial study. How many were still in business, what ranges of wares were they producing, and what new challenges were they facing? Sadly, this failed to happen because events in the region following the '9/11' (11th September 2001) attacks in the USA made it impossible for us to resume fieldwork in Bannu District. Now, 28 years on, it is perhaps becoming a matter of urgency that the villages featured in our study are visited and our informants, or their families, interviewed; hopefully it will not be too late for this. We are retired and unable to resume this work, but it would be a highly suitable PhD topic for a research student, perhaps at the University of Peshawar. If such a student were to be found, we would gladly offer advice and help, and also suggest further avenues for extending the research (see below).

There is great potential for comparative studies of pottery production and marketing systems in other cities and districts in Khyber Pakhtunkhwa Province and beyond, in the other provinces of Pakistan. Kohat and Dera Ismail Khan would be suitable starting places for extending the Bannu study. A preliminary study of potters' workshops in D.I. Khan by Rye and Evans (1976, 50) suggested that most of the pottery sold in the city's bazaars was produced in workshops located within the boundaries of the city itself. A more intensive study of those potters and their workshops would provide fascinating comparisons with Bannu, where pottery production occurs in villages distributed through the district. Kohat also has a village-based pottery production system that supplies the bazaars of Kohat City (Evans and Rye 1975, 50), so it would provide a direct comparison with the Bannu case study. As the database of such studies built up it would provide fruitful opportunities to investigate, on various spatial scales, the complex and changing dynamics of pottery production in ways not possible within the limits of a single study. By revealing significant regional and/or contextual causative or systemic factors, such studies could provide insights for modelling the dynamics of ceramic production in the more remote past, as represented in the archaeological record. We should, however, retain an element of scepticism about 'cutting and pasting' present-day narratives onto the past and keep in mind the aphorism of the novelist L.P. Hartley: "The past is a foreign country; they do things differently there" (Hartley, 1953, 1).

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