Appendix One

The ceramic fabrics of Northeast Thailand

A.1 The petrology of Ban Na Di "whole" vessels

A total of 147 vessels have been examined (chapter seven). Detailed descriptions of the different fabrics identified are set out below.

A.2 Mortuary Phase One fabrics

(a) local wares

Fabric groups 1 to 4 inclusive are categorised primarily in terms of *technological* variations in temper. Fabric group 3 is considered to comprise a blended mixture of a plastic with a short clay. Clay preparation of this kind, in a sense, is a form of tempering. It acts to increase the proportion of nonplastics in the mixture.

Fabric group 1.

The parent matrix is comprised of a clay petrographically consistent with Nong Kham Din (sample 10, chapter five). Its most distinctive features include a moderately micaceous matrix, few nonplastics, and numerous sponge spicules.

Fabric group 1 is tempered with "orthodox" grog (figures 6.1 and A.1) below. It is usually comprised of the same constituents as the parent ceramic body, although it may often be free of large inclusions. The matrix of both often appears argillaceous in thin-section. Orthodox grog is angular to subrounded in shape. It ranges in size from very fine to very coarse sand. Coarser nonplastics often tend to be concentrated within a central core, a narrow portion of which is often reduced, at times heavily. The fabric is usually oxidised to a shallow depth (about 1 mm), in from vessel surfaces. These areas are dominated by finer particles, an artefact of paddle and anvil construction. Any oxidised micaceous particles display a characteristic sheen. These particles, when randomly mixed, give a distinctive "cross-hatched" effect. Voids are rare.

In contrast with the fabric group 12 "bleb" temper discussed below, "orthodox" grog does not incorporate rice husk. In many Khorat Plateau fabrics, including strictly sand-tempered wares, it is common for isolated fragments of rice husk occur. These are considered "incidental", because they were probably not added deliberately. Orthodox grog may, in very rare instances, display husk impressions to exterior surfaces.

Fabric group 2.

Mineralogically, this group appears the same as fabric group 1. Three variations, however, set it apart ceramically. In addition to orthodox grog, plant material is also present in varying amounts. Isolated rice husk impressions to the exterior surface of grog fragments, rare husk remains within the parent fabric, and numerous to abundant rice phytoliths are all indicative of its presence. This addition of rice remains distinguishes fabric group 2 from fabric group 1.

In overall composition, fabric groups 1, 2, and 4 form a continuum. The principal variables are grog and a plant material, probably rice straw and husk. Husk is mainly represented by remnant impressions. Two factors mitigate against defining sharp boundaries between each fabric, and each can be very difficult to differentiate.

First, rice was probably present throughout the sequence at Ban Na Di and Ban Chiang (McGovern *et al.* 1985:110). Further, a particular tempering material is only likely to be selected if its availability is highly reliable. It is important to note that phytoliths are ubiquitous in Sakon Nakhon Basin wares. Although common to many grasses, the abundance of phytoliths consistent with rice strongly suggests this plant formed a key subsistence component from the first occupation of the basin. Given that rice was environmentally more-or-less ubiquitous it would be almost impossible to exclude its by-products, even if desired, from potting clay.

Second, the same exclusion problem effects clay lumps in the potters manufacturing environment. Such lumps can be difficult to discriminate from grog particles in thin-section (Whitbread 1985). Fabric group 4, for example, which features abundant voids and some plant material, probably comprising rice husk and straw, also includes a few grog-like particles.

The colour of fabric groups 2 and 4 is a dark charcoal grey. Generally only external surfaces are oxidised to a minute depth. Such surficial oxidation indicates the atmosphere was not reducing when firing was completed (Shepard 1971). The internal fabric colour is most probably due to a very high proportion of carbonaceous particles derived from combusted plant material.

Fabric group 3.

A 50/50 blend of Nong Kham Din clay with either of the two Ban Na Di clays would give a nonplastic to clay matrix ratio consistent with fabric group 3 (figure 7.22 and Table 5.1 chapter five). All of the minerals noted for clays 10, 13 and 14, are present in varying amounts. Plagioclase feldspar is rare. Fabric group 3 probably represents a two-stage, or blended, mixture. It is postulated that the plastic Nong Kham Din clay was first mixed with the short Ban Na Di clay. This mixture was then tempered as for fabric group 1.

Fabric group 4.

A relative abundance of voids, probably representing the vacated sites of plant material, and a paucity of grog set this fabric group apart. It is closely related to fabric group 2, but has much less grog. Rice phytoliths are prominent, but husk impressions are not obvious which suggests mainly straw was added. Only two vessels are involved.

Comment

The above four fabric groups are closely related. It must be stressed that, fabric group 3 apart, the variations noted are often slight. Because of this, variations within vessels were sought, and pot 37 was sectioned in three places to check fabric homogeneity. Although a degree of variation was apparent, it appeared less than the variation between fabric groups. Hence it was decided to separate fabric groups 1, 2 and 4. Because potting clay preparations are not completely homogeneous some overlapping between these three fabric groups is possible.

(b) exotic wares.

(i) Sakon Nakhon Basin fabrics.

Fabric group 5.

This fabric group consists of a rice-tempered material which is mineralogically compatible with clay from Nong Sung (sample 6, chapter five). In contrast with Ban Na Di MP1 fabrics, the rice husk is distinctive and free of straw. In addition, the fabric is fully oxidised, and dense, apart from a few voids or inclusions representing combusted or remnant carbonized husk. Plagioclase feldspar is present as rare, very fine sand grains. Nong Sung lies within the plagioclase feldspar zone (figure 5.3).

Fabric group 6.

This fabric group is dense, and mainly fully oxidised. It is comprised of a sandy clay which has been tempered with orthodox grog. The clay has a relatively high quartz content. Compaction, a relatively high clay density, and oxidation combine to mask the grog in thin-section. In hand specimens, however, cut and moistened surfaces readily reveal its presence. None of the Sakon Nakhon Basin clays sampled matches the fabric group 6 mineralogy precisely. The association of a micaceous matrix, few spicules or ferruginous minerals, plagioclase feldspar, and weathered quartzarenite rock fragments suggest a source to the east near the Phu Phan Piedmont. The rock fragments comprise diagnostic chert-cemented monocrystalline quartz grains. The presence of coarse silt-sized plagioclase feldspar suggests it originates either from or near Ban Lao Suan Kluai (clay 11, chapter five).

Fabric group 8.

Fabric group 8 has close mineralogical and textural similarities with clays 2 and 4 (chapter five). This suggests a source near or within the upper catchment of the Songkhram river. The fabric is fully oxidised, and very dense. This makes any argillaceous inclusions difficult to detect in thin-section. When cut surfaces are moistened, however, grog is visible under a hand lens. Two nearly identical vessels, of outstanding quality, are the sole representatives of this fabric. Because of their quality and rarity extra care was taken when removing tabs for thin-sectioning. Although each vessel has the same orthodox grog-tempered fabric, differences are apparent. Thus pot 95 includes several fragments of rice husk. Pot 94, however, has no obvious husk, but phytoliths and several ferruginous pellets, absent from pot 95, are present. These differences are probably due to sampling variations.

Fabric group 9.

Very distinctive isotropic, or partially isotropic, grains, of either argillaceous rock fragments or orthodox grog, characterise this fabric group. Its parent matrix compares mineralogically with clay 2 (chapter five). The argillaceous inclusions are of coarse sand to granule dimension, usually sub-rounded to rounded, but occasionally angular. In plane polarized light they often merge completely with the surrounding matrix. Some contain abundant microfossils. Diatoms, spicules and phytoliths are present in a broad range of highly variable combinations. In many, however, microfossils are often absent or poorly represented. In some mudstones, such as shales, microfossil variability typically results from rhythmic laminations which characterise lacustrine sedimention (Tucker 1981:92).

Even when non-plastics are entirely absent, the isotropic charcteristics are maintained. Thus in plane polarized light no morphological or textural variation is discernible between the area occupied by the inclusions and the surrounding matrix. Yet under crossed polars they become prominent with clearly defined boundaries. Their isotropic characteristics vary from

almost complete to moderately birefringent. This could result from the preferential orientation of clay minerals as artefacts of a prepared grog. When the fragments are orientated in thin-section so that they are viewed parallel to the C crystallographic axis of the mineral constituents (i.e. the section is cut normal to the C axis), the isotropism, or near isotropism, is explained (Grim 1968:426-428), Williams *et al* 1982:321-324).

Solheim (1964), reports a grog variety which is derived from crushed and sieved pre-fired clay balls. Fissility may be imparted during clay preparation to these balls. If so, they would probably tend to shear preferentially along the "bedding" lines. This would create grog elongate in the "bedding" direction. Sorting within the confines of vessel walls during paddle and anvil construction would favour a longitudinal grain orientation. Thus the internal grog stratification would lie normal to the thin-section plane.

Alternatively, the inclusions may represent fragments of shale weathered from the Phu Kradung Formation. A clear understanding of the origin of these inclusions requires information regarding their nature. It seems unlikely that this can be established without samples of either raw clays or fabrics of known composition for comparison.

Fabric group 10.

Abundant rice husk and straw characterise this fabric group. Mineralogically it shows a close similarity with clay 3 (chapter five). The clay matrix is micaceous, and ferruginous minerals and chert are present.

Fabric group 11.

Mineralogically, the constituents of fabric group 11 are very close to those of clay 6 (chapter five). It is slightly more micaceous, however, and lightly tempered with orthodox grog. Incidental rice husk is also present.

"Eastern" Sakon Nakhon Basin fabrics.

Each of the following fabric groups has a micaceous clay matrix, spicules are always rare, and their overall mineralogies suggest they originate in, or close to, the eastern micaceous zone (figure 5.3). Thus either clays 2, 3, or 4, or some similar unsampled material may be involved. A detailed investigation of each micaceous fabric group is beyond the scope of the present study. A major difficulty is that rocks of the same Formations outcrop both to the west and east of the northern basin. An intensive analysis, such as that undertaken on the Sakon Nakhon Basin clays (chapter five), is required before proveniences for these fabrics can be suggested with confidence. The current assessment is based on a comparison of potting clays and fabrics from several northeastern sites. It is considered sufficient for our present purposes, therefore, to place only those fabrics which are considered to have affinities with the micaceous zone described. Some adjustments may be necessary in the light of future investigations. Fabric groups 8, 9, and 10 discussed above, and some "Om Kaeo"-style pottery (chapter ten) also fall into this group.

Fabric group 13.

This fabric group is characterised by an orthodox grog temper contained within a distinctive ceramic body. The parent material contains iron-rich inclusions. These are either ooid-like or angular. Spicules are often prominent within the grog. Mineralogically, the parent matrix is compatible with clay 3 (chapter five).

Fabric group 15.

Iron-rich, ooid-like, coarse sand-sized inclusions are again present, but in this instance they are less prominent than in fabric group 13. The matrix, which is only moderately micaceous,

suggests a source near to clay 3. This, and an orthodox grog temper, characterises fabric group 15.

(ii) non-Sakon Nakhon Basin fabrics.

Fabric group 7.

Close associations with ceramics of the Petchabun peidmont are suggested by a highly micaceous matrix and igneous minerals. This fabric group is composed of a sandy clay which has been lightly tempered with orthodox grog. The igneous minerals clearly place it outside the Sakon Nakhon Basin. Measurements of the plagioclase feldspar using the Michel-Levy method suggest a basic igneous source (Vincent 1984b). Plagioclase feldspar is represented by a few individual grains, and rare rock fragments. Comparative sherds, from sites both deep within and bordering the Petchabun Range, have also been examined. Micaceous sandy fabrics from Nong Non Chik are very similar petrographically.

Compared to the Sakon Nakhon Basin clays, fabric group 7 has a more prominent feldspar representation. Potassium feldspar is more numerous, and generally fresher and larger. It measures up to coarse sand size. Plagioclase feldspar occurs with orthoclase in what appear to be highly altered volcanic rock fragments. Although strained monocrystalline quartz dominates, some sand grains are quartzo-feldspathic, and others feature quartz with weathered brown mica inclusions. A pale green hornblende also occurs as fine sand-sized detritus. These latter minerals suggest a granitic source may be involved. Volcanic and plutonic rocks are extensively exposed upstream of Nong Non Chik in the northern Central Highlands.

Reworked sedimentary minerals are also present in small quantities. Some quartz grains display overgrowths. A few very fine sand-sized grains of mosaic chert grains are present. They are subrounded. Freshwater sponge spicules and phytoliths are rare. Similarities with Non Nong Chik fabrics, coupled with the presence of minerals common to sedimentary terrain, make it reasonable to postulate that this fabric originated from the western margins of the Sakon Nakhon Basin, possibly in a zone intermediate between the Petchbun Piedmont and the basin *sensu stricto*.

Fabric group 14.

For sourcing purposes, the constituents of this fabric are geologically non-specific. Its principle characteristics in thin-section are an orthodox grog temper and a moderate amount of rice husk. There are few nonplastics, which never exceed fine sand size. They are dominated by monocrystalline quartz which is often strained. Unsutured polycrystalline quartz, of fine sand size, potassium feldspar, mosaic chert, and detrital tourmaline, each of very fine sand size, and spicules, are rare. Phytoliths are numerous.

In hand specimen the fabric is texturally the same as rice tempered pottery from Ban Suai and Ban Prasat. Welch (1985:203), reports that grog-tempered pottery dominates the early Tamyae tradition. Fabric group 14, therefore, may represent local Phimai clays tempered with orthodox grog, and possibly rice husk. The Phimai region is cloaked with Quaternary to Recent alluvium and eluvium, (Javanaphet 1969), therefore an indistinct mineralogy is predictable. Fabric group 14 is heavily reduced throughout. The construction details of the single vessel which represents this fabric, such as a low helix angle cord twist and a non-moulded forming process, also set it apart from Ban Na Di local wares. Until a more detailed petrographic study of Phimai pottery has been undertaken this fabric can only be accorded provisional status.

A.3 Mortuary Phase Two fabrics

Fabric group 12.

A highly distinctive grog characterises this fabric group. In thin-section, it ranges in shape from sharply angular to bleb-like. This descriptive term has been used previously (Vincent 1984b). The grog has been manufactured by crushing fired clay balls which have been heavily impregnated with rice husk. Rice not combusted may be disaggregated during the crushing process. A modern example from Ban Pluai (clay 2, chapter five), is included for comparison with prehistoric blebs (figure A.2 below). Figures A.3 and A.4 illustrate prehistoric blebs in hand specimen. Figure A.5 showns rice husk within a bleb grog fragment in thin-section.

In their most distinctive *form*, blebs closely parallel the arcuate shards of glass in typical vitroclastic textures such as those of vitric tuffs (Williams *et al.* 1982:263 fig 9-2. A). These latter shards are also the result of comminution. They derive from vesiculated vitric ash. It is this connotation which is alluded to in the descriptive term employed, because in a sense, the rice husk forms small bubbles in the clay. When crushed, the clay balls tend to fracture along vesical planes formed by the combusted rice. Thus, in this respect, the processes involved in manufacturing this artificial temper are effectively analogous to natural processes. Arcuate and corrugated faces, due to rice husk impressions and fracture planes, are common. Many grains have an amoebic-like shape in thin-section. Their *distribution* within the ceramic fabric is probably best described as poikiloblastic (Williams *et al.* 1982:440, fig 16-1. C), a term considered appropriate because pottery is in a sense a metamorphic rock. Bleb temper of course refers specifically to a technological process, and many different fabrics feature them. Its presence, without specific geological or distribution evidence, provides no direct sourcing information. In this case, of the clays sampled, the parent body of fabric group 12 is composed of material consistent with clay from Nong Sung (clay 6, chapter five).

Fabric group 16.

The parent matrix of this fabric group is compatible with Nong Sung clay (sample 6, chapter five). It is tempered with orthodox grog. The fabric is dense and includes few nonplastics. These are mainly spicules, quartzose grains or ferrugenous opaques. The major constituents have been point-counted and compared with MP1 fabric group 1 and MP2 fabric group 12 (see Table 7.3 chapter seven). Although the temper is consistent with MP1 Ban Na Di local wares, fabric group 16 occurs in level 7 and 5 anvils during MP1 and MP2 (Table A.13 below).

A.4 Whole Vessel fabrics

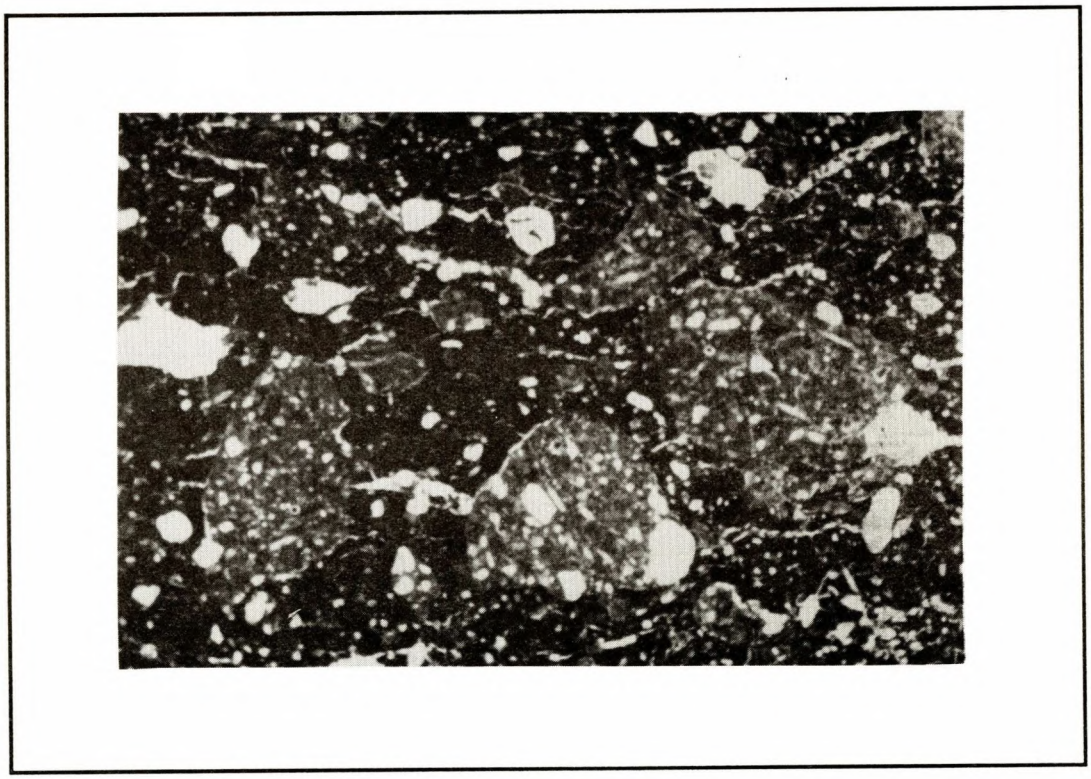

FIGURE A.1: ORTHODOX GROG IN THIN-SECTION. 125x magnification.

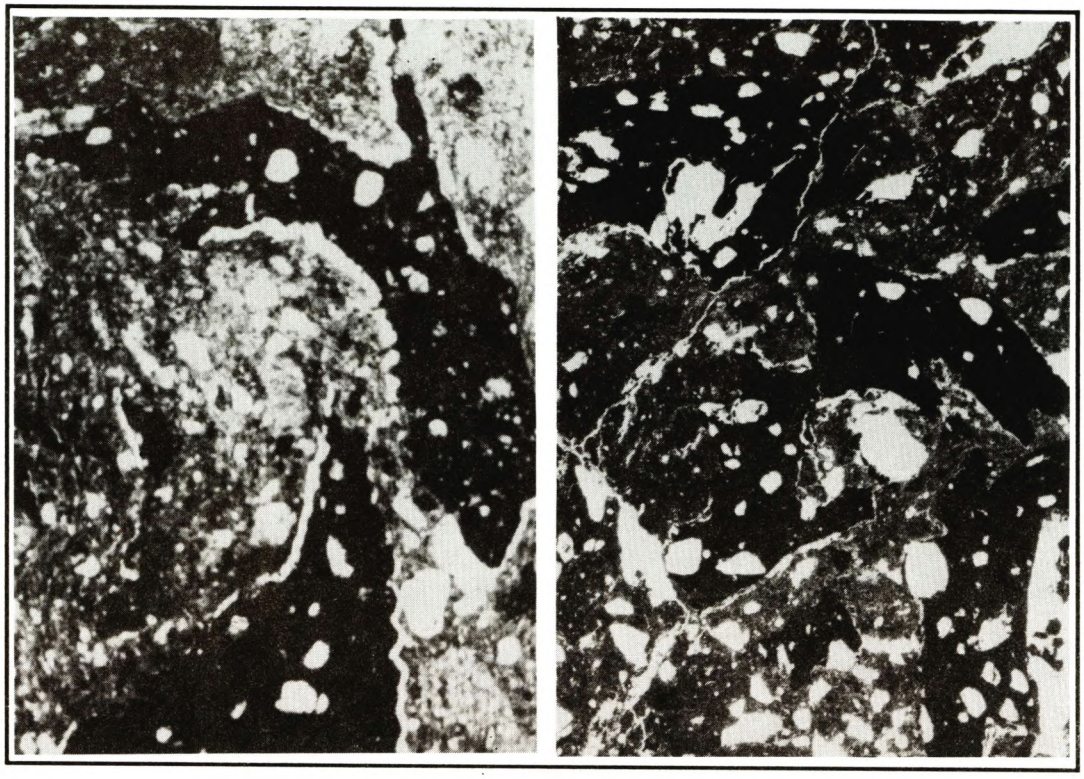

FIGURE A.2: MODERN (left) AND PREHISTORIC BLEBS (right) IN THIN-SECTION. 125x magnification.

FIGURE A.3: PREHISTORIC BLEBS IN HAND SPECIMEN.

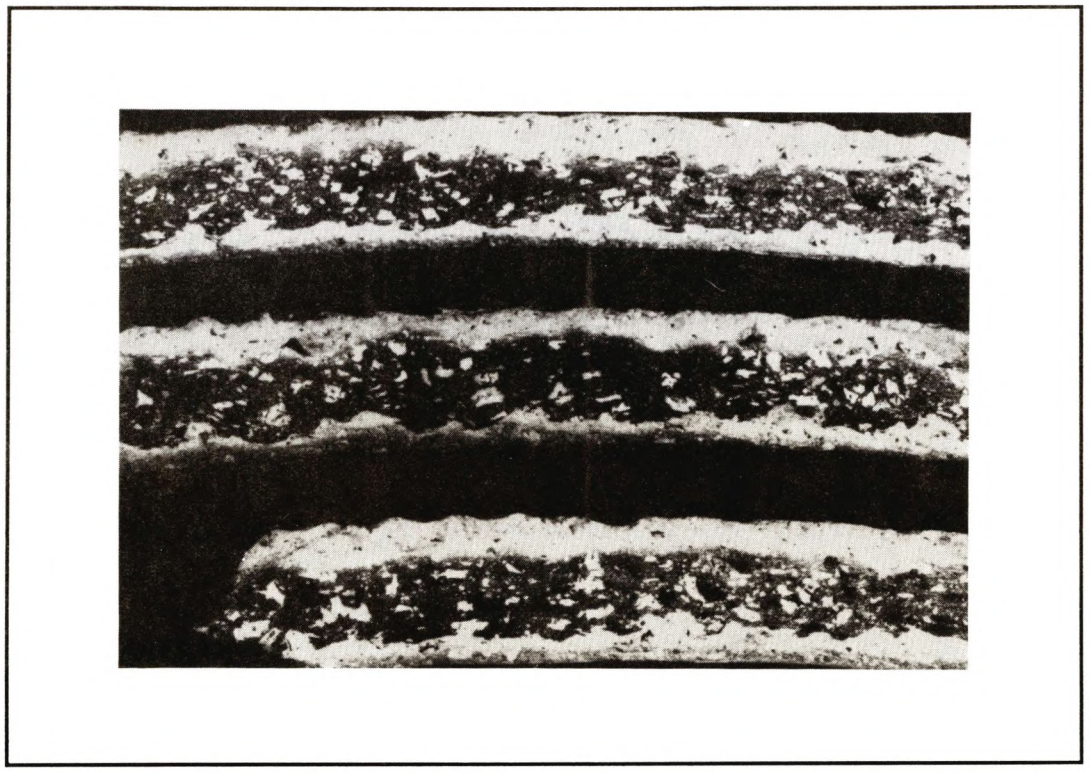

FIGURE A.4: PREHISTORIC BLEBS IN HAND SPECIMEN.

FIGURE A.5: PREHISTORIC BLEBS WITH RICE IN THIN-SECTION.
100x magnification.

TABLE A.1: Ban Na Di "whole" vessel fabrics.

Pot No.	fabric	form ++	phase/level	suggested source +
1	3	1a	1a	Ban Na Di
2	1	1a	1a	Ban Na Di
3	13	1a	1a	Ban Nong Than
4	1	1a	1a	Ban Na Di
5	1	1a	1a	Ban Na Di
6	1	1c	1b	Ban Na Di
7	1	1c	1b	Ban Na Di
8	1	1b	1b	Ban Na Di
9	1	1b	1b	Ban Na Di
10	1	1b	1b	Ban Na Di
11	1	1c	1b	Ban Na Di
12	1	1c	1b	Ban Na Di
13	2	1c	1b	Ban Na Di
14	2	1c	1b	Ban Na Di
15	1	1b	1b	Ban Na Di
16	1	1a	1b	Ban Na Di
17	2	2	1c	Ban Na Di
18	1	1c	1c	Ban Na Di
19	1	2	1c	Ban Na Di
20	10	2	1c	Sakon Nakhon Basin
21	15	1c	1c	Sakon Nakhon Basin
22	1	2	1b	Ban Na Di
23	1	1c	1b	Ban Na Di
24	1	2	1b	Ban Na Di
25	1	1a	1a	Ban Na Di
26	1	1a	1b	Ban Na Di
27	2	1b	1b	Ban Na Di
28	2	1c	1c	Ban Na Di
29	1	1c	1c	Ban Na Di
30	1	2	1c	Ban Na Di
31	1	2	L7	Ban Na Di
32	15	1a	L8	Sakon Nakhon Basin
33	1	1b	L5	Ban Na Di
33 lid	2	-	L5	Ban Na Di
34	1	1c	1c	Ban Na Di
35	3	1b	1b	Ban Na Di
36	2	1c	1c	Ban Na Di
37	2	14b	1b	Ban Na Di
38	2	14b	1b	Ban Na Di
39	2	14a	1b	Ban Na Di
40	1	14a	1b	Ban Na Di
41	2	14b	1b	Ban Na Di

TABLE.1 continued: The Ban Na Di "whole" vessel fabrics.

Pot No.	fabric	form ++	phase/level	suggested source +
42	2	14b	1c	Ban Na Di
43	2	14b	1c	Ban Na Di
44	2	14c	1c	Ban Na Di
45	2	14b	1c	Ban Na Di
46	2	14b	1b	Ban Na Di
47	note a	14c	1c	uncertain provenance
48	10	14c	1c	Sakon Nakhon Basin
49	2	14b	1b	Ban Na Di
50	2	14b	1c	Ban Na Di
51	2	14b	1c	Ban Na Di
52	2	14a	1a	Ban Na Di
53	2	14a	1a	Ban Na Di
54	2	14b	1c	Ban Na Di
55	2	14b	1c	Ban Na Di
56	2	14b	L7	Ban Na Di
57	3	4	1c	Ban Na Di
58	1	4	1c	Ban Na Di
59	1	4	1c	Ban Na Di
60	2	4	1c	Ban Na Di
61	2	4	1c	Ban Na Di
62	7	1a	1c	Petchabun Piedmont?
63	1	1b	1c	Ban Na Di
64	7	1b	1b	Petchabun Piedmont?
65	14	2	1c	Phimai
66	2	14b	1b	Ban Na Di
67	4	14b	1b	Ban Na Di
68	4	14b	1b	Ban Na Di
69	1	14b	1c	Ban Na Di
70	2	14b	1c	Ban Na Di
71	2	14b	1c	Ban Na Di
72	1	14b	L8	Ban Na Di
73	2	14b	1c	Ban Na Di
74	2	4	1b	Ban Na Di
75	2	4	1b	Ban Na Di
75 lid	1	-	1b	Ban Na Di
76	2	4	1c	Ban Na Di
77	2	4	1c	Ban Na Di
78	3	4	1c	Ban Na Di
79	3	4	1c	Ban Na Di
80	1	4	1c	Ban Na Di
81	2	4	1c	Ban Na Di
82	3	4	1b	Ban Na Di
83	1	4	1c	Ban Na Di

TABLE.1 continued: The Ban Na Di "whole" vessel fabrics.

Pot No.	fabric	form ++	phase/level	suggested source +
84	10	15	1c	Sakon Nakhon Basin
85	1	15	1c	Ban Na Di
86	1	15	1b	Ban Na Di
87	1	9	1b	Ban Na Di
88	1	9	1c	Ban Na Di
89	11	9	1c	Sakon Nakhon Basin
90	1	9	1b	Ban Na Di
91	1	9	1c	Ban Na Di
92	1	17	1c	Ban Na Di
93	1	9	1b	Ban Na Di
94	8	5	1c	Sakon Nakhon Basin
95	8	5	1b	Sakon Nakhon Basin
96	11	7	1c	Sakon Nakhon Basin
97	6	6	1b	Sakon Nakhon Basin
98	6	6	1c	Sakon Nakhon Basin
99	2	10	1c	Ban Na Di
100	1	1b	1c	Ban Na Di
101	1	1b	1c	Ban Na Di
102	1	1b	1c	Ban Na Di
103	1	4	1c	Ban Na Di
104	1	1b	1c	Ban Na Di
105	3	1b	L7	Ban Na Di
106	1	4	1b	Ban Na Di
107	2	3	1b	Ban Na Di
108	3	3	L8	Ban Na Di
109	6	6	L7	Sakon Nakhon Basin
110	2	3	1a	Ban Na Di
111	1	3	L8	Ban Na Di
112	1	4	1c	Ban Na Di
113	1	19	2	Ban Na Di
113 lid	12	-	2	Ban Na Di
114	12	19	2	Ban Na Di
114 lid	12	-	2	Ban Na Di
115	12	19	2	Ban Na Di
115 lid	12	-	2	Ban Na Di
116	16	20	2	Sakon Nakhon Basin
116 lid	16	-	2	Sakon Nakhon Basin
117	12	21	2	Ban Na Di
117 lid	12	-	2	Ban Na Di
118	1	3	1a	Ban Na Di
119	10	9	1b	Sakon Nakhon Basin
120	3	4	1b	Ban Na Di
121	3	4	1b	Ban Na Di

TABLE.1 continued: The Ban Na Di "whole" vessel fabrics.

Pot No.	fabric	form ++	phase/level	suggested source +
122	5	12	1b	Sakon Nakhon Basin
123	1	18	1b	Ban Na Di
124	1	4	L7	Ban Na Di
125	1	11	L7	Ban Na Di
126	1	4	1b	Ban Na Di
127	1	13	1c	Ban Na Di
128	1	16	1b	Ban Na Di
129	1	1a	1a	Ban Na Di
130	1	4	1b	Ban Na Di
131	9	8	1c	Sakon Nakhon Basin
132	1	4	1c	Ban Na Di
133	3	2	1c	Ban Na Di
134	1	4	1c	Ban Na Di
135	1	4	1c	Ban Na Di
136	1	4	1c	Ban Na Di
137	2	14b	1c	Ban Na Di
138	1	4	1c	Ban Na Di
139	12	-	2	Ban Na Di
140	1	9	L7	Ban Na Di

Notes: + The sources listed accord with the fabric descriptions set out above.

++ see chapter seven for a discussion of form categories.

note a: Pot 47 cannot be readily associated with a particular source. Although it has similarities with fabric group 7, it requires further detailed analysis to substantiate this. It can, however, be considered exotic to Ban Na Di.

TABLE A.2: The chronological distribution of "whole" vessel fabrics.

		fabrics									
level	phase	1	2	3	4	5	6	7	8	9	n
8		2	-	1	-	-	-	-	-	-	3
7		4	1	1	-	-	1	-	-	-	7
	1a:	6	3	1	-	-	-	-	-	-	10
	1b:	24	13	4	2	1	1	1	1	-	47
	1c:	27	21	4	-	-	1	1	1	1	56
5		1	1	-	-	-	-	-	-	-	2
	2:	-	-	-	-	-	-	-	-	-	-
Totals:		64	39	11	2	1	3	2	2	1	125

TABLE.2 continued: The chronological distribution of "whole" vessel fabrics.

		fabrics							
level	phase	10	11	12	13	14	15	16	n
8		-	-	-	-	-	1	-	1
	1a:	-	-	-	1	-	-	-	1
	1b:	1	-	-	-	-	-	-	1
	1c:	3	2	-	-	1	1	-	7
	2:	-	-	9	-	-	-	2	11
Totals:		4	2	9	1	1	2	2	21

Note: Fabric groups 1 to 4 inclusive are MP 1a to 1c local wares.
Fabric group 12 is a mortuary phase 2 local ware.

TABLE A.3: The mortuary phase 1a to 1c whole vessel fabrics.

MP1 whole pots: % of local vs exotic fabrics.			
LOCAL fabrics:	no. of pots	% of total	% of local
1	64	47.05	55.17
2	39	28.67	33.62
3	11	8.08	9.48
4	2	1.42	1.72
Subtotals:	116	85.22	99.99

TABLE A.4: The mortuary phase 1a to 1c whole vessel fabrics.

EXOTIC fabrics:	no. of pots	% of total	% of exotic
Sakon Nakhon	17	12.50	85.00
Petchabun	2	1.47	10.00
Khorat Basin	1	0.73	5.00
Subtotals:	20	14.70	100.00

A.4 Cord-marks on vessels

The cordmarking twist terms used in Table A.5 below, follow Osborne and Osborne (1954). The exterior walls on moulded pots are cordmarked vertically, or near vertically, and then partially smoothed. This is particularly noticable at the base. Interior surfaces below the equator are cordmarked with positive impressions. Above the equator they are smooth. Below the equator the interior surfaces are even, above they are undulating. These undulations usually follow parallel lines which suggest that the upper portion of the vessels have been added as sequential rings. The interior cordmarks are usually obvious, although some vessels are eroded making assessments difficult. Often a clear equatorial join suggests that the lower hemisphere of such vessels have been moulded.

TABLE A.5: The cordmarks on Ban Na Di "whole" vessels.

pot	twist	. width (mm)	application	interior/exterior
1	Z	2.5	vertical	exterior only
2	Z	2-3	horizontal*	exterior only
3	Z	1.2++	vertical and horizontal	exterior only
4	Z	1.2	vertical and horizontal*	exterior only
5	Z	1.2++	vertical and horizontal*	both +++
6	Z	1.2	vertical*	both
7	Z	0.6	cross-hatched all over	exterior only
8	S	1.0	special - see note 1	both
9	Z	1.0	cross-hatched all over+	exterior only
10	Z	1.0	vertical and horizontal*	both
11	S	0.8	vertical or diagonal*	both
12	S	0.8/1.5++	vertical and horizontal+	both
13	Z	0.75	vertical and diagonal*	both
14	Z	1.0	diagonal*	exterior only
15	Z	1.2/2++	vertical and horizontal*	both
16	Z	1.0	vertical and horizontal*	both
17	Z	0.8	vertical*	both
18	Z	1.2	vertical* (see note 2)	both
19	Z	0.6	vertical and diagonal*	exterior only
20	Z	1.0	vertical and diagonal*	exterior only
21	Z	1.0	vertical*	exterior only
22	Z	1.2	vertical and diagonal*	exterior only
23	S	1.2	vertical/horizontal/diagonal*	both
24	Z	1.2	vertical	exterior only
25	Z	2.0*	vertical/diagonal/spiral	both (note 3)
26	Z	1.2	vertical and diagonal*	both
27	Z	1.2	vertical/horizontal/diagonal*	both
28	Z	1.0	vertical to diagonal*	both
29	S	1.0	vertical and diagonal*	both

TABLE.5 continued: The cordmarks on Ban Na Di "whole" vessels.

30	Z	1.0	vertical*	both
31	Z	0.8/0.5	vertical	both
32	Z	1.2	vertical and diagonal	exterior only
33	Z	1.2	diagonal (smoothed over)	exterior only
34	Z	0.8	vertical to diagonal*	both
35	Z	1.2	vertical and diagonal*	both
36	Z	1.0	vertical to diagonal*	both
37**	Z	1.0	vertical and diagonal*	both
38**	Z	1.0	vert to diagonal (smoothed)	both
39**	Z	1.8++	horizontal and vertical	exterior only
40**	Z	1.8	horizontal to diagonal	both
41**	S	1.2/1.5	vertical and diagonal*	both
42**	Z	1.0	vertical*	exterior only
43**	Z	0.8	vertical	both
44**	S	1.0	vertical	both
45**	Z?	0.8	vertical (smoothed)	exterior only
46**	Z	0.8	cross-hatched	both
47**	Z	1.0	diagonal (smoothed)	both
48**	Z	1.2	vertical	exterior only
49**	Z	1.0	vertical	exterior only
50**	Z	1.2	cross-hatched	both
51**	Z	0.8	vertical	both
52**	Z	1.0	vertical and horizontal*	both
53**	Z	1.0/2.0	vertical and horizontal	both
54**	Z	1 to 2	cross-hatched	both
55**	Z	0.8/3.0	cross-hatched	both
56**	Z	1.0	vertical	both
57	Z	1.0	vertical and diagonal*	both
58	Z	1.0	vertical/horizontal/diagonal*	both
59	Z	1.0	vertical*	both
60	Z	1.0	vertical*	both
61	Z	1.0	vertical	incomplete
62	Z	0.8	diagonal*	exterior only
63	Z	1.2	diagonal*	exterior only
64	Z	0.8	diagonal*	exterior only
65	Z	1.0	vertical** exterior only	
66**		no data	- base only available	
67**			as for 66	
68**	Z	1.0	vertical and diagonal	both
69**	Z	0.8	base only	
70**			as for 66	
71**	Z	1.0	vert.(ext) x-hatched (int)	both

TABLE.5 continued: The cordmarks on Ban Na Di "whole" vessels.

72**	Z	1.2	base only	
73**		no data	- top of bowl only	
74	Z	0.6++/1.5	vertical and diagonal	both
75	Z	0.8/2.0	vertical and diagonal	exterior only
75a		no data	- small fragment	interior only
76	Z	1.0	vertical	both
77	Z	0.6	cross-hatched	both
78	Z	0.8	vertical	both
79	Z	0.8	vertical*	exterior only
80	S	0.8 and 1.5	cross hatched diamond pattern	both
81	Z	0.8/1.5	vertical and horizontal*	both
82	Z	1.0	vertical	both
83	Z	1.0	vertical	both
84***	Z	1.2	vertical	exterior only
85***	Z	0.6	vertical and diagonal*	exterior only
86***	Z	1.0	vertical to diagonal	exterior only
92**	Z	1.0	vertical	exterior only
93	Z		remnants only 0.2/0.8	
96	Z	1.0	vertical (partly smoothed)	exterior only
97	Z	1.0	horizontal to diagonal	exterior only
98	Z	1.5	diagonal	exterior only
99	Z	1.5	vertical to diagonal	exterior only
100	S	1.2	vertical and diagonal crossed	both
101	Z	1.0	vertical (base missing)	exterior only
102	S	0.8	near vertical (base missing)	exterior only
103	Z	1.0	vertical (base missing)	exterior only
104	Z	1.0	vertical (base missing)	exterior only
105	Z	1.2	vertical	exterior only
106	Z	1.0	vertical (base missing)	exterior only
107	Z	2.0/4.0	cross-hatched both	
108	Z	1.5/1.5	horizontal and near vertical	exterior only
109	Z	1.2	vertical (partly smoothed)	exterior only
110	Z	1.0	vertical and near horizontal	exterior only
111	Z	2.0/1.0	vertical and near horizontal	exterior only
112	Z	1.3	near vertical	both
113	Z	2.0	vertical (partly smoothed)	exterior only
113a	Z	2.0	vertical (113 lid)	exterior only
114	Z	2.5/0.5	vertical (partly smoothed)	exterior only
114a	Z	2.0/1.0	vertical (114 lid)	exterior only
115	Z	2.0/1.0	vertical (partly smoothed)	exterior only
115a	Z	2.0/0.4	vertical (115 lid)	exterior only
116	Z	2.0/1.0	diagonal (partly smoothed)	exterior only

TABLE.5 continued: The cordmarks on Ban Na Di "whole" vessels.

116a	Z	1.5/0.5	vertical (partly smoothed)	exterior only
117		no data	- vessel eroded	exterior only
117a	Z	1.5/0.8	vertical	exterior only
118	Z	1.2	vert. and diag. (base missing)	exterior only
120	Z	1.2/1.5	vertical and diagonal crossed	both
121	Z	0.7/2.0	vertical and diagonal*	both
124	Z	0.7	vertical/few diagonal	exterior only
126	Z	1.2 and 1.5	special - see note 4	both
128	Z	1.2	vertical	both
129	S	2 to 4	cross-hatched	exterior only
131	Z	1.2?	vertical (heavily smoothed)	exterior only
132	Z	1.2 and 1.0	vertical* special-see note 4	both
133	Z	1.2	vertical	both
134	Z	1.0/1.5	vertical (base missing)	exterior only
135	Z	0.8/1.0	vertical (base missing)	exterior only
136	Z	0.4	vertical and diagonal*	both
137**	Z	1.0	vertical	both
138	Z	1.3/2.0	vertical (base missing)	exterior only

Notes: * denotes exterior basal region displays random or "cross-hatched" cordmarking.

++ denotes average width.

+++ denotes interior cordmarks extend from base to rim/body junction.

+ denotes cordmarks are mainly vertical at and/or above equator.

** denotes vessel is a goblet, and, unless specified, only the bowl portion is discussed.

*** denotes miniature goblet.

note 1: The spaces between cord impressions are unusual in that they exceed the maximum diameter of the cordmarks. Most cordmarking features spaces between cordmarks which are equal to, or less than, the cord diameter. On pot 8 the spaces measure approximately 4 mm on average. Cordmarks below the equator are either vertical or horizontal, but above are cross-hatched. Subsequent examples of width between cordmark spacings are indicated thus: cord diameter/space diameter.

note 2: For pot 18 the distribution and orientation of the cordmarks is the same, or very similar, to both interior and exterior surfaces. As this vessel was partly moulded, it is likely that the same potter constructed both mould and pot.

note 3: Cord diameters to internal and external surfaces for pot 25 are identical and notably wide. As with pot 18 this suggests the same potter constructed both mould and vessel.

note 4: Two different cord mark patterns are present. This suggests two different paddles were used.

TABLE A.6: The Ban Na Di burial figurines.

provenance	level/phase	cat.	form	fabric
F6 Burial 40	1a	1438	cattle	clay 13 *
F6 Burial 40	1a	1439	cattle	clay 13 *
F6 Burial 40	1a	1440	cattle	clay 13 *
F6 Burial 45	1a	1383	cattle + ^	local clay **
F6 Burial 45	1a	1384	cattle +	local clay **
F6 Burial 45	1a	1387	cattle	clay 13 *
F6 Burial 46	1a	1437	cattle	clay 13 *
F6 Burial 47	1a	1418	cattle	clay 13 *
F6 Burial 47	1a	1405	elephant	clay 13 *
F6 Burial 47	1a	1401	cattle	clay 13 *
F6 Burial 47	1a	1396	cattle +	clay 13 *
F6 spit 12	7	1270	cattle	clay 13 *
F6 Burial 47	1a	1388	cattle +	local clay **
F6 Burial 47	1a	1389	cattle +	local clay **
F6 Burial 47	1a	1396	cattle	local clay **
F6 Burial 47	1a	1397	cattle +	local clay **
F6 Burial 47	1a	1399	cattle +	local clay **
F6 Burial 47	1a	1401	cattle +	local clay **
F6 Burial 38	1b	1419a	cattle +	local clay **

Notes: * thin-sectioned
** hand specimen
+ red paint
^ resin ?

A.6 Ban Na Di rimform fabrics

The rimform fabric tables set out in the following pages relate to both the Sakon Nakhon Basin potting clays, an analysis of which is detailed in chapters four and five, and the various ceramic fabric groups discussed above in this appendix. Further discussions of potting clays and ceramic fabrics are to be found throughout the main body of the report, and in appendices two and three. Appendix two includes surface collected Sakon Nakhon Basin fabrics, Ban Muang Phruk rimform fabrics, and illustrations of the Ban Muang Phruk rimforms. Each of these sections should be read in conjunction with the evidence set out in the above chapters.

TABLE A.7: The Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 18	8	684	*	BND ? plagioclase zone
		685	3	Ban Na Di
		686	3	Ban Na Di
		687	*	BND ? plagioclase zone
US 19	8	hand specimen	3?	Ban Na Di
US 20	8	676	*	BND ? plagioclase zone
		677	*	clay 7
		678	*	BND ? plagioclase zone
US 21	8	679	*	BND ? plagioclase zone
		688	3	Ban Na Di
		689	3	Ban Na Di
		690	3	Ban Na Di
US 22	8	680	*	clay 7
US 23	8	682	13	East Sakon Nakhon Basin
US 24	8	683	1	Ban Na Di
US 25	8	681	*	BND ? plagioclase zone
level 7:				
US 18	7	709	1	Ban Na Di
	7	710	10	clay 3
	7	711	1	Ban Na Di
US 19	7	691	11	clay 6
	7	692	13	clay 3
	7	693	13	clay 3
US 20	7	721	*	BND ? plagioclase zone
	7	735	1	Ban Na Di
US 21	7	699	*	BND ? plagioclase zone
	7	708	*	BND ? plagioclase zone
US 23	7	694	13	clay 3
US 26	7	715	6	clay 11 ?
	7	716	6	clay 11 ?
	7	717	6	clay 11 ?
	7	904	6	clay 11 ?
US 27	7	713	9	clay 2 ?
	7	903	9	clay 2 ?

Notes: * orthodox grog.

The fabric * BND? plagioclase zone, may represent an early adaptation of local clays, or derive from a nearby non-local source. Its core is heavily reduced and open with numerous phytoliths suggesting plant material, and some rice husk is present.

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 28	7	712	*	see O 27 uncertain provenance
	7	714	6	clay 11 ?
	7	897	rice	see O 28 uncertain provenance
US 29	7	734	blebs	Ban Chiang Hian ? L IX
US 30	7	733	1	Ban Na Di
US 31	7	hand specimen	1 ?	Ban Na Di ?
US 32	7	hand specimen	* Fe ARF's	uncertain provenance
US 33	7	hand specimen	*	uncertain provenance
US 34	7	hand specimen	*	Ban Na Di ?
US 35	7	695	1	Ban Na Di
	7	696	1	Ban Na Di
	7	724	*	BND ? plagioclase zone
	7	725	*	BND ? plagioclase zone
	7	738	1	Ban Na Di
US 36	7	700	1	Ban Na Di
	7	701	1	Ban Na Di
	7	703	1	Ban Na Di
US 37	7	702	1	Ban Na Di
US 38	7	732	*	uncertain provenance
	7	898	*	uncertain provenance
US 39	7	hand specimen	rice ?	uncertain provenance
US 40	7	740	3	Ban Na Di
	7	896	3	Ban Na Di
US 41	7	719	9	clay 2 ?
US 42	7	720	9	clay 2 ?
US 43	7	718	9	clay 2 ?
US 44	7	895	10	clay 3
US 45	7	698	1	Ban Na Di
US 46	7	704	1	Ban Na Di
	7	705	1	Ban Na Di
US 47	7	hand specimen	*	Ban Na Di ?
US 48	7	723	blebs	Ban Chiang Hian ? L IX
US 49	7	hand specimen	*	Ban Na Di ?
US 50	7	hand specimen	rice	uncertain provenance
US 51	7	hand specimen	*	Ban Na Di ?

Notes: * orthodox grog.
The fabric * BND? plagioclase zone, may represent an early adaptation of local clays, or derive from a nearby non-local source. Its core is heavily reduced and open with numerous phytoliths suggesting plant material, and some rice husk is present.
For further details regarding 'O' series fabrics see chapter ten and Tables C.1 and C.2 (appendix three).

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

level 6: rimform	level	section	fabric	suggested source
US 52	7	728	1	Ban Na Di
	7	729	1	Ban Na Di
	7	730	1	Ban Na Di
	7	731	1	Ban Na Di
	7	737	*	clay 7
level 6:				
US 18	6	754	10	clay 3
	6	811	3	Ban Na Di
	6	812	3	Ban Na Di
	6	814	1	Ban Na Di
	6	815	3	Ban Na Di
US 19	6	hand specimen	*	Ban Na Di ?
US 20	6	768	1	Ban Na Di
US 26	6	909	6	clay 11 ?
US 27	6	908	rice	see O 28 uncertain provenance
	6	910	6?	see also O 16
US 28	6	911	6?	see also O 16
US 30	6	793	plant material	clay 7?
US 35	6	772	6	clay 11 ?
US 36	6	790	3	Ban Na Di
US 37	6	762	1	Ban Na Di
US 41	6	912	rice-micaceous	Eastern Sakon Nakhon Basin?
US 42	6	hand specimen	*	Ban Na Di ?
US 43	6	907	9	Eastern Sakon Nakhon Basin?
US 47	6	962	*	clay 7?
US 48	6	965	10	clay 3
	6	994	1	Ban Na Di
US 51	6	976	1	Ban Na Di
US 52	6	hand specimen	*	Ban Na Di ?
US 53	6	964	1	Ban Na Di
	6	801	1	Ban Na Di
	6	824	3	Ban Na Di

Note: * orthodox grog.
For further details regarding 'O' series fabrics see chapter ten and Tables C.1 and C.2 (appendix three).

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 54	6	963	1	Ban Na Di
US 55	6	906	6	clay 11 ?
Non Chai	Minor			
type 5	6	995	blebs	Chi Valley
US 56	6	992	blebs	see O 32
US 57	6	979	*	clay 7?
US 58	6	980	blebs	Chi Valley
	6	803	3	Ban Na Di
US 59	6	984	12	clay 6
US 60	6	993	rice	see O 33 (fabric 5?)
US 61	6	961	rice	see O 33 (fabric 5?)
US 62	6	800	12	clay 6
US 63	6	hand specimen	*	Ban Na Di ?
US 64	6	823	12	clay 6
US 65	6	797	1	Ban Na Di
US 66	6	989	11	clay 6
US 67	6	975	12	clay 6?
US 68	6	794	*	clay 7?
US 69	6	820	9	Eastern Sakon Nakhon Valley?
US 70	6	974	blebs	Chi Valley
US 71	6	821	rice	see O 33 (fabric 5?)
US 72	6	818	3	Ban Na Di
	6	819	1	Ban Na Di
US 73	6	977	12	clay 6
US 74	6	982	12	clay 6
US 75	6	hand specimen	*	Ban Na Di ?
US 76	6	985	3	Ban Na Di
US 77	6	987	*	clay 7?
US 78	6	hand specimen	rice	(as for fabric 10?)
US 79	6	807	3	Ban Na Di
US 80	6	990	3	Ban Na Di
US 81	6	973	*	Eastern Sakon Nakhon Basin?
US 82	6	981	12	clay 6
US 83	6	986	10	clay 3
US 84	6	762	3	Ban Na Di
	6	970	12	clay 6
US 85	6	967	"Nong Bua Red"	Loei Region
US 86	6	971	6	clay 11 ?

Note: * orthodox grog.
For further details regarding 'O' series fabrics see chapter ten and Tables C.1 and C.2 (appendix three).

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 87	6	968	*	Sakon Nakhon Basin
	6	816	1	Ban Na Di
US 88	6	988	12	clay 6
US 89	6	966	10	clay 3
US 90	6	969	rice	see O 6 and O 13
level 5:				
US 35	5	845	1	Ban Na Di
US 37	5	hand specimen	*	uncertain provenance
US 43	5	835	9	clay 2 ?
	5	836	9	clay 2 ?
	5	837	9	clay 2 ?
US 47	5	880	*	Sakon Nakhon Basin
	5	881	11	clay 6
US 52	5	864	1	Ban Na Di
US 56	5	876	12	clay 6
US 57	5	878	blebs	Chi Valley?
	5	879	*	Chi Valley?
US 58	5	875	12	clay 6
	5	877	*	Chi Valley?
US 62	5	848	blebs	Chi Valley?
	5	849	blebs	Chi Valley
	5	850	12	clay 6
US 63	5	893	*	uncertain provenance
US 73	5	883	12	clay 6
	5	884	*	uncertain provenance
	5	885	12	clay 6**
US 78	5	871	10	clay 3
US 83	5	hand specimen	rice	provenance uncertain
	5	1295	12?	clay 6?
US 84	5	1291	blebs	Chi Valley
	5	1292	12	clay 6?
	5	hand specimen	*	uncertain provenance
US 86	5	1287	1	Ban Na Di
US 87	5	1288	11	clay 6

Note: * orthodox grog.
** grog is different to parent body.
For further details regarding 'O' series fabrics see chapter ten and Tables C.1 and C.2 (appendix three).

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 87	5	1289	12	clay 6?
	5	1298	12	clay 6?**
US 88	5	888	*	Sakon Nakhon Basin?
	5	890	12	clay 6?
US 91	5	1294	12	clay 6?
US 92	5	hand specimen	*	uncertain provenance
US 93	5	hand specimen	blebs	uncertain provenance
US 94	5	1290	blebs	Chi Valley
US 95	5	hand specimen	*	uncertain provenance
US 96	5	840	12	clay 6
US 97	5	833	12	clay 6***
Non Chai				
type AA	5	hand specimen	blebs	Chi Valley?
US 98	5	838	12	clay 6
	5	843	12	clay 6
	5	hand specimen	rice	Sakon Nakhon Basin?
US 99	5	hand specimen	blebs	Sakon Nakhon Basin?
US 100	5	844	*	BND ? plagioclase zone
US 101	5	842	12	clay 6
US 102	5	855	*	Ban Na Di?
	5	856	*	Ba Na Di?
	5	857	1	Ban Na Di
US 103	5	hand specimen	blebs	Sakon Nakhon Basin?
US 104	5	860	12	clay 6
US 105	5	851	1	Ban Na Di
US 106	5	hand specimen	blebs	Sakon Nakhon Basin?
US 107	5	hand specimen	blebs	Sakon Nakhon Basin?
US 108	5	hand specimen	blebs	Sakon Nakhon Basin?
US 109	5	hand specimen	rice	Sakon Nakhon Basin?
	5	hand specimen	blebs	Sakon Nakhon Basin?
US 110	5	852	rice	see O 33
US 111	5	hand specimen	blebs	Sakon Nakhon Basin?
US 112	5	hand specimen	blebs	Sakon Nakhon Basin?
Non Chai				
type 2 AA	5	867	*	Chi Valley

Note: * orthodox grog.

** grog is a different clay to the parent body.

*** grog is probably either clay 13 or 14.

The fabric * BND? plagioclase zone, may represent an early adaptation of local clays, or derive from a nearby non-local source. Its core is heavily reduced and open with numerous phytoliths suggesting plant material, and some rice husk is present.

For further details regarding 'O' series fabrics see chapter ten and Tables C.1 and C.2 (appendix three).

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 113	5	hand specimen	*	uncertain provenance
US 114	5	hand specimen	*	Sakon Nakhon Basin?
US 115	5	hand specimen	blebs	Sakon Nakhon Basin?
US 116	5	hand specimen	*	Sakon Nakhon Basin?
US 117	5	hand specimen	blebs	Sakon Nakhon Basin?
US 118	5	hand specimen	*	Sakon Nakhon Basin?
US 119	5	hand specimen	blebs	Sakon Nakhon Basin?
US 120	5	hand specimen	blebs	Sakon Nakhon Basin?
US 121	5	hand specimen	blebs	Sakon Nakhon Basin?
US 122	5	hand specimen	*	Sakon Nakhon Basin?
US 123	5	hand specimen	*	Sakon Nakhon Basin?
US 124	5	hand specimen	blebs	Sakon Nakhon Basin?
US 125	5	hand specimen	blebs	Sakon Nakhon Basin?
US 126	5	hand specimen	*	Sakon Nakhon Basin?
US 127	5	hand specimen	*	Sakon Nakhon Basin?
US 128	5	hand specimen	rice	uncertain provenance
US 129	5	hand specimen	blebs	Sakon Nakhon Basin?
US 130	5	hand specimen	blebs	Sakon Nakhon Basin?
US 131	5	hand specimen	blebs	Sakon Nakhon Basin?
US 132	5	hand specimen	blebs	Sakon Nakhon Basin?
US 133	5	hand specimen	*	Sakon Nakhon Basin?
US 134	5	hand specimen	blebs	Sakon Nakhon Basin?
US 135	5	hand specimen	*	Sakon Nakhon Basin?
US 136	5	hand specimen	*	Sakon Nakhon Basin?
US 137	5	hand specimen	*	Sakon Nakhon Basin?
US 138	5	hand specimen	*	Sakon Nakhon Basin?
US 139	5	861	12	clay 6
	5	862	12	clay 6
Non Chai type 22	5	hand specimen	blebs	uncertain provenance
US 140	5	865	12	clay 6?
level 4:				
US 28	4	1081	*	clay 7?
	4	1082	*	clay 7?
US 35	4	1043	*	Sakon Nakhon Basin?
	4	1044	*	Sakon Nakhon Basin?
	4	1111	*	Sakon Nakhon Basin?

Note: * orthodox grog.

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 36	4	1085	1	Ban Na Di
	4	1113	13	clay 3
	4	1110	* 1?	Ban Na Di ?
US 37	4	1086	1	Ban Na Di
	4	1087	1	Ban Na Di
US 41	4	1049	9	clay 2?
US 56	4	1114	12	clay 6
	4	1116	12	clay 6
US 62	4	1118	*	clay 7?
	4	1038	12	clay 6
US 71	4	1103	12	clay 6
US 73	4	1041	blebs	Chi Valley?
	4	1046	12	clay 6
US 78	4	1074	10	clay 3
	4	1075	11?	clay 6?
	4	1076	10	clay 3
	4	1077	rice	BCH (1151) LVI
US 83	4	1098	*	clay 6?
	4	1100	blebs	Chi Valley
	4	1101	12	clay 6
	4	1102	12	clay 6***
US 87	4	1094	12	clay 6
US 88	4	1045	12	clay 6***
US 91	4	1088	12	clay 6***
	4	1089	12	clay 6***
	4	1090	12	clay 6***
US 97	4	1066	12	clay 6
US 107	4	hand specimen	blebs	uncertain provenance
US 108	4	1106	12	clay 6?
	4	1107	12	clay 6
	4	1108	blebs	Sakon Nakhon Basin?
	4	1119	*	clay 7? ++
US 109	4	hand specimen	blebs	uncertain provenance
	4	1057	10?	Sakon Nakhon Basin?
	4	1058	rice	Phimai (C5) +

Note: * orthodox grog.
*** grog is either clay 13 or 14.
+ Phimai (C5), and Ban Chiang Hian (BCH 1151) LVI fabrics are similar in thin-section to this fabric.
++ a Ban Chiang Hian LVII fabric (BCH 1129) is similar in thin-section to this fabric.
numbers within brackets are thin-section references.

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 110	4	1105	10	clay 3
US 111	4	1050	12	clay 6***
	4	1051	blebs	Chi Valley +++
	4	1052	rice	Chi Valley?
US 114	4	1061	1	see pot 18, and US 82 rims
US 119	4	1059	12	clay 6
	4	1060	12	clay 6
US 141	4	1095	*	clay 6?
	4	1096	rice	Petchabun? **
US 142	4	hand specimen	*	provenance uncertain
US 143	4	1072	12	clay 6?
US 144	4	1069	*	Sakon Nakhon Basin
	4	1070	12	clay 6?
US 145	4	1024	*	Sakon Nakhon Basin?
	4	1021	*	Sakon Nakhon Basin?
US 146	4	1025	*	Sakon Nakhon Basin?
US 147	4	1031	12	clay 6
	4	1032	12	clay 6
US 148	4	hand specimen	rice	provenance uncertain
US 149	4	hand specimen	blebs	provenance uncertain
US 150	4	hand specimen	blebs	provenance uncertain
US 151	4	1037	12	clay 6
US 152	4	hand specimen	blebs	provenance uncertain
US 153	4	1078	rice	Phimai (C4)
	4	1079	rice	Phimai (C4)
	4	1080	rice	Phimai (C4)
US 154	4	hand specimen	rice	provenance uncertain
US 155	4	1104	12	clay 6
US 156	4	1065	12	clay 6?
US 157	4	hand specimen	blebs	provenance uncertain
US 158	4	hand specimen	*	provenance uncertain
US 159	4	hand specimen	blebs	provenance uncertain
US 160	4	hand specimen	*	provenance uncertain
US 161	4	1027	blebs	Chi Valley
	4	1029	blebs	Chi Valley

Note: * orthodox grog.
** matrix is similar to a late Nong Nok Chik sherd.
*** grog is probably clay 13 or 14.
+++ as for Non Chai layer 3 blebs, and BCH (1011) LIX fabric.
numbers within brackets are thin-section references.

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 161	4	1030	blebs	Chi Valley
	4	1063	rice	Phimai (C4)
US 162	4	hand specimen	blebs	provenance uncertain
US 163	4	1064	blebs	Chi Valley
US 164	4	hand specimen	blebs	provenance uncertain
US 165	4	1062	12	clay 6
US 166	4	hand specimen	*	provenance uncertain
US 167	4	hand specimen	blebs	provenance uncertain
US 168	4	hand specimen	blebs	provenance uncertain
US 169	4	hand specimen	blebs	provenance uncertain
US 170	4	1084	12	clay 6?
US 171	4	1034	*	clay 7?
	4	1035	rice	Phimai (C4)
US 172	4	1023	6?	Sakon Nakhon Basin
US 173	4	1047	12	clay 6
US 174	4	1067	rice	Phimai (C4)
US 175	4	1083	blebs	Chi Valley
US 176	4	hand specimen	blebs	provenance uncertain
US 177	4	hand specimen	blebs	provenance uncertain
US 178	4	1109	*	BCH fabric 4
level 3:				
US 58	3	1254	blebs	Chi Valley?
US 62	3	1236	12	clay 6?
	3	1237	12	clay 6?
US 78	3	1203	*	BCH (925) LXI
	3	1256	rice	BCH (1151) LVI?
US 83	3	1249	blebs	Chi Valley?
US 87	3	hand specimen	rice	provenance uncertain
	3	hand specimen	blebs	provenance uncertain
US 107	3	1218	12	clay 6?
US 108	3	1214	*	provenance uncertain
	3	1241	blebs	Chi Valley?
	3	1243	12	clay 6?
	3	1245	12	clay 6?
US 109	3	1190	*	BCH (1129)? LVII
	3	1192	blebs	Sakon Nakhon Basin?

Note: * orthodox grog.
numbers in brackets are thin-section references.

TABLE.7 continued: Ban Na Di occupation level rimform fabrics.

rimform	level	section	fabric	suggested source
US 110	3	1238	rice	uncertain provenance
	3	1239	rice	Phimai?
	3	1240	rice	Phimai? (also BCH 1145)
US 111	3	1183	*	BCH (1129) LVII
	3	1184	12	clay 6?
	3	1185	blebs	uncertain provenance
Non Chai type 2AA	3	1210	blebs	Chi Valley?
US 120	3	1250	*	Sakon Nakhon Basin?
	3	1252	*	Sakon Nakhon Basin?
US 147	3	1230	*	Sakon Nakhon Basin?
	3	hand specimen	blebs	provenance uncertain
US 148	3	1199	rice	Phimai?
	3	1200	rice	Phimai?
	3	1201	rice	Phimai?
US 149	3	1193	12	clay 6?
US 161	3	1211	blebs	clay 2?
	3	1213	blebs	clay 2?
US 162	3	1209	12	clay 6?
	3	1228	blebs	clay 2?
	3	1229	*	Sakon Nakhon Basin?
US 164	3	1217	*	Sakon Nakhon Basin?
US 168	3	1195	12	clay 6?
	3	1196	blebs	clay 2?
	3	1198	blebs	clay 2?
	3	1220	blebs	clay 6?
US 174	3	1186	rice	uncertain provenance
	3	1187	rice	uncertain provenance
	3	1259	rice	uncertain provenance
US 178	3	1207	blebs	clay 2?
US 179	3	hand specimen	blebs	uncertain provenance
US 180	3	hand specimen	blebs	uncertain provenance
US 181	3	hand specimen	rice	provenance uncertain
US 182	3	1205	12	clay 6?
US 183	3	hand specimen	blebs	provenance uncertain
US 184	3	1202	*	Sakon Nakhon Basin?
US 185	3	1189	rice	Phimai?
US 186	3	1188	rice	Phimai?

Note: * orthodox grog.
numbers in brackets are thin-section references.

TABLE A.8: The distribution of BND occupation level rimform fabrics.*

level	MP1 wares +	MP2 wares ++	exotic	total
8	6	-	3	8
7	16	-	16	32
6	21	9	32	56
5	6	16	49	70
4	3	21	33	60
3	-	8	22	29

Notes: + fabrics 1 to 4 inclusive.
++ fabric 12.

TABLE A.9: The distribution of exotic Ban Na Di rimform fabrics.*

Level	S.Nakhon	%	Chi	%	Mun	%	Petchabun	%	Total
8	3	100.00	-	-	-	-	-	-	3
7	14	87.50	2	12.50	-	-	-	-	16
6	28	87.50	3	9.37	-	-	1	3.12	32
5	41	83.67	8	16.32	-	-	-	-	49
4	18	54.54	9	27.27	5	15.15	1	3.03	33
3	11	47.82	8	34.78	4	17.39	-	-	23

TABLE A.10: The distribution of Ban Na Di rimform grog tempers.*

	Ban Na Di		Sakon Nakhon		Khorat	
Level	orthodox	blebs	orthodox	blebs	orthodox	blebs
8	6	-	3	-	-	-
7	16	-	14	-	-	2
6	21	9	28	-	-	3
5	6	16	21	20	3	5
4	3	21	17	1	-	6
3	-	8	4	4	3	4

* see notes below A.11.

TABLE A.11: The distribution of Ban Na Di rimform rice tempers.+

level	Sakon Nakhon	Khorat	Petchabun	uncertain	total
8	-	-	-	-	0
7	3	-	-	2	5
6	11	-	-	-	11
5	4	-	-	2	6
4	3	7	1	2	13
3	-	4	-	2	8

+ Notes to Tables A.8 to A.11:

Level 8: One form has local and Sakon Nakhon Basin (SN) fabrics.

Level 7: Five forms are of uncertain provenance. Two forms have local and SN fabrics. One form has two SN fabrics and another has three.

Level 6: Four forms have local and SN fabrics. One has local and Chi valley, and one form has two SN sources.

Level 5: Fourteen SN orthodox grog, and twenty bleb fabrics are hand specimen assessments. Seven orthodox grog, two rice, and two bleb hand specimens are of uncertain origin.

Level 4: Two rice tempered hand specimen forms are of uncertain provenance. Five forms have local and SN fabrics. One form has Petchbun and SN fabrics. Three forms have local and Chi Valley fabrics. Four forms have SN and Khorat Basin fabrics. Fourteen bleb and four orthodox grog tempered forms are of uncertain provenance.

Level 3: Two forms have local and Chi Valley fabrics, and one form has SN and Chi valley fabrics. Four rice, six bleb and one orthodox grog tempered forms are of uncertain provenance.

A.7 Ban Na Di bow pellet, anvil and crucible fabrics

TABLE A.12: The Ban Na Di bow pellet fabrics.

level	fabric	catalogue	provenance
7	BND clay	1083	A4 33
6	BND clay	295	A3 17
6	BND clay	409	A2 23
6	BND clay	638	A2 23
5	BND clay	224	A4 15
5	BND clay	247	A3 15
4	*	144	A4 11
4	++	1542	A3 10
3	BND clay	49	A4 5
3	12	746	A1 7
2	BND clay	1613	A1 1
2	BND clay	1623	A2 4

Notes: * orthodox grog, non-local fabric.
++ fabric may be an untempered blend of clays 10 and 13.

TABLE A.13: The Ban Na Di ceramic anvil fabrics.

level	fabric	catalogue	provenance
7	1	507	A4 25
7	1	1851	A2 37
7	10	1850	A4 35
7	1	1447	A4 35
7	1	760	A1 32
7	1	1217	F6 10
7	16	858	F6 1
6	1	557	A1 21
6	1	623	A2 25
6	1	1238	A1/A2 25
6	* ++	683	A2 24
6	* ++	605	A2 23
6	* SN (?)	556	A3 17
5	16	156	A3 13
5	1	268	A4 17
5	16	180	A4 14
4	12	464	A2 17
4	12	421	A2 16
4	blebs +++	387	A4 12
4	12	137	A2 13
2	rice+	50	A1 4

Notes: * orthodox grog.
+ probably clay 6.
++ probably clay 3 region
+++ probably Chi Valley.
SN (?) probably from the western Sakon Nakhon Basin margins.

TABLE A.14: The Ban Na Di crucible fabrics.

level	fabric	catalogue	provenance	metal/slag present
8	* clay 6? +	1186	A4 39	yes ++
8	* (note a)	1230	A4 40	no
8	* (note b)	1173	A4 37	yes ++
8	rice clay 6?	1313	A2/A3 38	yes +++
8	* clay 6?	1314	A2/A3 39	no
8	* clay 6?	1064	A3 42	yes
8	* clay 6?	905	A2 46	no
8	* clay 6?	1434	A3/A4 40	yes
8	* clay 6?	1056	A3 41	no
8	1 (note b)	1226	A4 39	yes
7	* (note a)	901	A4 30	no
7	* clay 6?	989	A3 38	no
7	* clay 6?	-	A3/A4 24	yes
7	sand (note c)	1371	A3/A4 30	no
7	2	11 8	F6 11	no
7	* clay 6?	1097	F6 11	yes **
7	rice clay 6?	1294	A2/A3 34	yes +++
7	1 (note b)	1360	A2/A3 36	yes
7	2 (note b)	756	A1 32	yes
6	2	1779	A3/A4 22	no
6	rice (note d)	-	A2 24	no
5	BND clay ***	403	A1 19	yes
5	BND clay ***	532	A1 18	no
5	13	1730	A3 16	no

Notes: * orthodox grog + this fabric is composed of either clay 6 or a material of similar composition. ++ a fine to medium-sized sand of quartzose composition is sandwiched between the bronze detritus and crucible body. +++ the quartzose sand is intermingled with detritus, mullite and other unidentified mineral phases. This suggests that the hot metal has partly replaced the ceramic fabric. ** carbonised rice husk is also encapsulated within the detritus *** untempered.

(a) the fabric "* BND? plagioclase zone" is as for the material identified in level 8 rimforms.

(b) the presence of mullite indicates that this fabric was heat affected. Although it lacks many early local ware characteristics spicules are abundant and surviving nonplastics suggest fabric group 1 or 2.

(c) this fabric is heavily tempered with an angular, fine to medium sized, and well sorted, sand comprising mainly mono- and polycrystalline quartz. Chert is also prominent, mostly as mosaic, but also as composite and mammillated grains. Potassium feldspar and plagioclase feldspar are also well represented. Zircon and ferruginous opaques occur as accessory minerals. This assemblage strongly suggests a source within the plagioclase zone close to the Phu Phan Range (see chapter five).

(d) an unknown fabric, possibly derived from local clay.

Appendix Two

"A great variety of inclusions have been found in prehistoric pottery ...., the material used depending both upon the custom of the potter and what was afforded by her environment."

Shepard (1936:405).

B.1 Introduction

Particular emphasis is given to technological evidence. Excavated and surface collected pottery from several related sites both within and beyond the Khorat Plateau has been examined (figs. 1.1, 8.1 and 8.2). Most are located within the plateau *sensu stricto*. Table B.1 summarizes their archaeological status and methods of data treatments.

Site numbers follow Kijngam *et al.* (1980) for Kumphawapi and Mahasarakham regions, and Bayard (1980) for the Pa Mong region. Capital letters refer to sites not previously codified.

B.2 Catalogue of Sites

The following tables list prehistoric and modern sites both within the Khorat Plateau and the Central Highlands. In addition the Khok Phanom Di ceramic assemblage has also been considered. For a preliminary statement on the fabrics from the latter site refer to the ceramic section contributed by the writer in Higham *et al.* (1987).