THE FORM AND FUNCTION OF SUBTERRANEAN FOOD STORAGE STRUCTURES: AN ETHNOARCHEOLOGICAL STUDY OF THE SOCIAL AND ENVIRONMENTAL DETERMINANTS OF PIT STORAGE

A THESIS

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ABSTRACT

This study identifies the principal factors affecting the selection and use of food storage pits through a cross-cultural examination of a worldwide sample of pit using societies. Three reasons why subterranean facilities were used for storage are identified: (1) concealment; (2) preservation; and (3) processing. Three authors, DeBoer (1988), Gilman (1983, 1987), and Ward (1985), suggest that food storage pits are usually used for concealment and that societies that used subterranean storage will usually have a low degree of reliance in agriculture and a residential mobility strategy. This research throws these authors hypothesis into doubt. This study shows that storage pits are used for preservation as often as for concealment. Additionally, the degree of agricultural dependence seems to play little part in delineating which groups will use pit storage for concealment and strongly suggests that seasonal settlement abandonment is not always associated with a need to hide food.

Several conditions are apparently always present when pit storage is selected for concealment. First, the condition that triggers a need for concealment and the subsequent selection of pit storage to solve this need is the presence of human predation. Second, there is always

a relatively high diversity of commodities stored in pits by groups that use subteranean facilities for concealment and pit storage is often the main storage technique practiced by these groups.

Several conditions are apparently frequently, but not always, associated with the use of pit storage for preservation. With one notable exception, the use of pits for preservation usually entails a lower diversity of goods that are stored in pits and a lesser importance for pit storage in the overall subsistence economy. Many groups that used pits for preservation also relied heavily on above ground storage facilities.

This study shows that the socioeconomic conditions associated with the use of subterranean storage are highly diverse, and very complex. Consequently, it is very difficult to delineate the necessary conditions associated with the use of these facilities. Furthermore, the sufficient conditions that have been described in this paper would usually not be archeologically visible.

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CHAPTER I

INTRODUCTION

This study was triggered by my curiosity regarding the form and function of refuse-filled pits on archeological sites. These ubiquitous features are often interpreted as subterranean food storage facilities, based on certain normative ideas of their form and function. Recent studies suggest that pits with a low surface-to-volume ratio and a bell-shaped or deep cylindrical profile can be interpreted as storage facilities (DeBoer 1988; Dickens 1985; Schroedl 1983, 1986; Siegel 1982; Stewart 1977). Many scholars make the assumption that the main function of subterranean storage is to conceal food surpluses from human predation (DeBoer 1988; Gilman 1987; Gotthilf 1982; Ward 1985). My study of the ethnographic literature on pit storage suggests that these common assumptions of the use and morphology of pits are much too simple. The literature

that I have examined suggests that subterranean facilities are used for a variety of reasons and that their forms are highly variable.

Goals and Research Strategy

My cross-cultural examination of a worldwide sample of pit-using societies should enable us to gain a better perspective on the role of pit storage in prehistoric economies. The goal of this research is to identify the principal factors affecting the selection and use of subterranean facilities for food storage as recorded in the ethnographic literature, which should aid in the interpretation of archeological pit features.

This study examines the question of why subterranean facilities are selected and used for food storage. Ethnographic material from around the world was utilized to investigate this question. The ethnographic record can provide an understanding of the conditions that promote the use of pit storage. According to Gilman (1987: 540), cross-cultural ethnographic data may show how the social and environmental conditions that correlate with the use of facilities such as food storage structures will vary.

My examination of ethnographic data amassed from the Human Relations Area File and the Ethnographic Atlas suggests that subterranean storage was selected for two reasons: to conceal food surpluses from human predators

and to provide efficient long-term preservation of particular food types from the adverse effects of the environment.

Models of Storage Pit Function

Three recent studies have explored the conditions surrounding the use of subterranean food storage. They suggest that pit storage is often selected because of a need to conceal food. They hold that the need for concealment arises in societies with some degree of residential mobility (at least seasonal movement) and a relatively low reliance on agriculture (DeBoer 1988; Gilman 1983, 1987; Ward 1985). This scenario presupposes that long-term storage is required to level out seasons of scarcity and abundance.

DeBoer (1988)

DeBoer (1988) hypothesizes that pits are primarily selected as storage containers in order to hide food. He suggests that the presence of storage pits on archeological sites is a marker of the seasonal abandonment of settlements, and conversely, that the disappearance of pit features marks the adoption of a more sedentary lifestyle. He bases these suggestions on an examination of ethnohistoric evidence of pit use and an examination of archeological literature that deals with the question of pit storage. DeBoer examines ethnohistoric evidence from

North America in order to consider the conditions under which pit storage has been used by Native American groups. He also examines the archeological literature dealing with pit storage in order to examine experimental studies of storage pit use and discussions of typical storage pit morphology.

The ethnohistorical literature he reviews suggests that subterranean storage is usually used for concealment. It is used to hide food from depredations by outsiders and sometimes by neighbors within the community. DeBoer (1988: 2) cites the example of the Delaware who apparently concealed the locations of their pits from their neighbors in order to reduce requests for food by needy neighbors. The question of the use of concealment to hide food surpluses will be addressed in Chapter V. DeBoer (1988: 3) concludes that the ethnohistoric literature "indicates one clear pattern in which subterranean storage serves primarily to conceal foodstuffs from foreign pillagers, particularly during periods of village abandonment."

The archeological literature that DeBoer reviews suggests some predictions regarding the typical morphology of subterranean storage facilities. DeBoer suggests that in order to minimize food decomposition, the surface-to-volume ratio of food storage pits should be kept low. The ideal pit should approach a buried sphere connected to the ground surface by a cylindrical opening

just large enough to permit access. DeBoer notes that the more common morphology present in the ethnographic literature is pits with a deep cylindrical or bell-shaped profile, and, of course, a low surface-to-volume ratio. Several other studies (most notably Siegel 1982) also suggest that storage structures will exhibit this morphology.

DeBoer uses the model of pit morphology and pit function derived from these data to examine the possible correlations of concealment, pit use, and seasonal settlement abandonment in three archeological datasets: the Normandy Archeological Project in Tennessee, the FAI-270 Project in the American Bottom, and a study of archeological data from the Middle Missouri region of North and South Dakota. He concludes that pit use correlates with seasonal settlement abandonment in the Normandy area and in the Middle Missouri, but suggests that pit storage in the American Bottom may be associated with the concealment of surpluses from tribute demands from elites, since all of the evidence in the American Bottom suggests that Late Woodland and Mississippian peoples in this region were sedentary, intensive agriculturists.

Ward (1985)

Ward (1985) contrasts the pit features found at the Warren Wilson and the Upper Saratown sites in the Piedmont Region of the southeastern United States, and reaches essentially the same conclusions as DeBoer. He presupposes that pits were used to hide food and suggests that Upper Saratown, which contained large numbers of deep pits, was abandoned in the fall and winter while its inhabitants were engaged in seasonal deer hunts. The Warren Wilson Site, which contained very few pits of any sort, is interpreted as a sedentary village. Ward (1985) suggests that the inhabitants of Upper Saratown were less reliant on agriculture than those who resided at Warren Wilson. He implies that a lower degree of reliance on agricultural products is related to the degree of sedentariness, which in turn affects the need to hide food.

Gilman (1983; 1987)

Gilman (1983: 67-78; 1987: 558) explicitly examines the relationship between subterranean storage, seasonal residential mobility, and the degree of reliance on agriculture. She looks at these relationships within the larger framework of her study of the pithouse to pueblo transition in the southwestern United States. Gilman's research is concerned with the causes of architectural change -- in particular, how changes in architectural forms

are related to changes in the environmental and cultural factors of population size, subsistence strategy, settlement pattern, and food storage. She hopes this study will help us to "gain an understanding of what kinds of adaptations different architectural forms signify" (Gilman 1987: 538).

Gilman used two sources of data in her examination of the causes of the pithouse to pueblo transition: ethnographic literature from around the world and archeological data from northern Black Mesa, Arizona. First, she examined a worldwide sample of ethnographic examples of the use of pithouses and pueblos. The ethnographic literature was used to gain an understanding of the conditions that affect the use of these structures as dwellings. Second, she used the information collected from the ethnographic literature to generate a predictive model of the necessary environmental and cultural conditions associated with the use of pithouses and pueblos. Finally, she used this model to examine the change from pithouses to pueblos in the Black Mesa archeological data.

One of the conditions that Gilman found to be always associated with the use of pithouses and pueblos was a reliance on stored food during the seasons when the pithouses and pueblos were occupied. Based on this observation, Gilman (1983: 63) used ethnographic data from

the Southwest to examine the "relationship between population density, the subsistence system, and the types of storage systems." She examined groups' storage strategies in relation to their degree of agricultural dependence.

Groups with a relatively low degree of agricultural dependence (0-15 percent) were essentially residentially mobile hunter-gatherers during much of the season. However, during the winter, when vegetal production ceased, they subsisted on stored foods and wintered near their food caches. Their food supplies were frequently stored in outside pits, which enabled them to conceal their food surpluses from human predation when they were away from their winter habitations.

Groups with a 26 to 55 percent degree of agricultural dependence exhibited markedly different patterns of mobility and food storage. Because they relied on increasing amounts of agricultural products, these groups "resided near their crops for longer periods of the year. Storage areas were larger, and goods were stored for longer periods of time (Gilman 1983: 75)." The higher agricultural dependence of these groups encouraged them to be more sedentary, and thus they no longer needed to conceal their foods in pits.

There was a marked increase in the use of large, above ground storage facilities by groups with a relatively high

degree of dependence on agriculture. These were usually located near their dwellings. Storage pits were still used, but they were not concealed (e.g., the Maricopa covered their pits with gabled roofs), and they were used for the storage of a limited diversity of foods, i.e., pumpkins and melons, that preserved well in pit facilities. Gilman (1983: 130) concludes that "storage in outside pits near the winter dwelling is quite limited or nonexistant under conditions of increasing agriculture in the ethnographic Southwest."

Gilman's examination of the ethnographic literature led her to construct a model of the relationships between pit storage, residential mobility strategies, and the degree of agricultural dependence. Like DeBoer (1988) and Ward (1985), she emphasizes the concealment function of storage pits in her analysis (Gilman 1987: 558). Based on her examination of the ethnographic literature, she hypothesizes that pit storage will be selected by groups with a low degree of agricultural dependence and a high degree of residential mobility. These groups spend much of their seasonal round in hunting and gathering activities, and are thus only sedentary during the season when they consume their stored foods. These factors encourage them to hide their stored commodities.

According to Gilman (1987: 558), groups with a high degree of agricultural dependence are generally more

sedentary, and spend much of the year at the location of their stored commodities. Pit use, therefore, declines, because they no longer need to conceal their stored goods in the same way, because they do not spend long periods away from their stores, and above ground storage becomes feasible.

Gilman uses data from Black Mesa, Arizona as an archeological example of the change in storage facilities associated with increasing sedentism and increasing agricultural dependence. She plots the occurrence of pits at Black Mesa with respect to time and architectural location (whether outside or inside the structures) and finds that the average number of outside pits per structure "drops dramatically from the Basketmaker II period through the Pueblo II period" (Gilman 1987: 559, Figure 8). She concludes that this drop is associated with a shift from concealed, below ground storage to unconcealed, above ground storage. She suggests that the change to above ground storage is caused by increased agricultural dependence and sedentism present in Pueblo II times. Gilman's model will be used as a base line in my examination of the conditions affecting pit use.

Gilman's predictive model of the relationship between agricultural dependence, mobility strategies, and the use of subterranean food storage has one weakness: it fails to recognize the consequences of the unconcealed pit storage

that she found associated with certain groups that had a relatively high degree of agricultural dependence, that were relatively sedentary, and that practiced large scale above ground storage. Her model does not take into account that the mere presence of these pits weakens its interpretive power. How is one to know whether the extramural pits present on a particular archeological site represent concealed storage by seasonally mobile hunter-gatherers or unconcealed storage for preservation by sedentary agriculturists? The consequences of this problem for the interpretation of the socioeconomic patterns associated with pit storage in the archeological record will be discussed in greater detail in Chapters III and IV.

Organization of the Thesis

Chapter I has presented the basic goals of this study. Chapter II will discuss the ethnographic data bases that form the foundation of this study and will present the methods that I used to select certain pit using societies for concentrated analysis. Chapter III will evaluate the model of pit use presented in the introduction in light of the ethnographic data used in this research. Chapter IV will explicitly examine the role of concealment and preservation in the selection and use of subterranean storage facilities. Chapter V will present my general conclusions regarding the principal conditions that

structure the selection and use of subterranean facilities for food storage and how this information will aid in the interpretation of archeological pit features.

CHAPTER II

SAMPLE SELECTION AND METHODOLOGY

This analysis is based on ethnographic data compiled from the Human Relations Area File and Murdock's (1967) Ethnographic Atlas. These data sets provide a worldwide sample of contemporary pit using societies for a study of the conditions associated with the selection and use of subterranean storage facilities.

Human Relations Area File

Data Collection and Quality

Two hundred and ninety-nine groups in the Human Relations Area File (HRAF) were surveyed for any evidence of below ground storage. Seventy-nine examples of pit using societies were discovered. These include nine societies from Asia, five from Europe, nine from Africa, six from the Middle East, twenty-eight from North America, four from South America, thirteen from Oceania, and six from the Soviet Union. Table 1 lists all of the pit-using societies that were found in my examination of the HRAF file.

Table 1. Corresponding Human Relations Area File (HRAF) and Ethnographic Atlas group names and codes. The underscored groups in the HRAF column are those for which the critical variable of pit function could be inferred.

HRAF	Ethnographic Atlas
Korea (AA1)	Koreans (Ed1)
Okayama (AB43)	
Miao (AE5)	Miao (Ed4)
Sinkiang (AI1)	
West Tibetans (AJ4)	Tibetans (Ec4)
Dard (AV3)	Dard (Ee5)
Bihar (AW2)	
Tamil (AW16)	Tamil (Eg2)
Andamans (AZ2)	Andamanese (Eh1)
Yugoslavia (EF1)	
Sarakatsani (EH14)	
Lapps (EP4)	Lapps (Cg4)
Rural Irish (ER6)	
Malta (EZ6)	
Katab (FF38)	Katab (Cg4)
Tiv (FF57)	Tiv (Ah3)
Ngonde (FN17)	Ngonde (Ad16)
Rundi (FO42)	Rundi (Ae8)
Ngoni (FR5)	Ngoni (Ac9)
Bushmen (FX10)	
Hottentot (FX13)	
Lovedu (FX14)	Lovedu (AB14)
Zulu (FX20)	Zulu (Ab12)
Rwala (MD4)	Rwala (Cj2)
Somali (MO4)	Somali (Ca2)
Kanuri (MS14)	Kanuri (Cb19)
Tuareg (MS25)	Ahaggaren (CC9)
Libyan Bedouin (MT9)	
Rif (MX3)	Riffians (Cd3)
Tlingit (NA12)	Tlingit (Nb22)
Hare (ND9)	
Bellacoola (NE6)	Bellacoola (Nb9)
Blackfoot (NF6)	Blackfoot (Ne12)
Ojibwa (NG6)	Eastern Ojibwa (Na39); Chippewa (NA36)
Delaware (NM7)	Delaware (Ng6)
Iroquois (NM9)	Iroquois (Ng10)
Cherokee (NN8)	Cherokee (Ng5)
Fox (NP5)	Fox (Nf7)
Dhegiha (NQ12)	Omaha (Nf3)
Mandan (NQ17)	Mandan (Ne6)
Pawnee (NQ18)	Pawnee (Nf6)
Klamath (NR10	Klamath (Nc8)

Table 1. Continued.

HRAF	Ethnographic Atlas
Northern Paiute (NR13)	Kidutokado (Nd24)
	Kuyuidokado (Nd27)
	Wadadokado (Nd22)
Southeast Salish (NR19)	Coeur d'Alene (Nd14)
	Sinkaietk (Nd15)
Pomo (NS18)	Northern Pomo (Nc17)
Tubatulabal (NS22)	Tubatulabal (Nc2)
Eastern Apache (NT8)	
Navajo (NT13)	Navaho (Nh3)
River Yumans (NT15)	Yuma (Nh22)
Southern Paiute (NT16)	Shivwits (Nd52)
	Kaibab (Nd53)
	San Juan (Nd56)
	Antarianunts (Nd49)
	Chemehuevi (Nd54)
Ute (NT19)	Uintah (Nd58)
	Uncompagre (Nd62)
Washo (NT20)	Washo (Nd6)
Western Apache (NT21)	Western Apache (Nh17)
Western Shoshone (NT22)	Gosiute (Nd48)
Jicarilla (NT26)	Jicarilla (Nh16)
Mohave (NT28)	Mohave (Nh21)
Papago (NU28)	Pima (Ni6)
	Papago (Ni2)
Yucatec Maya (NV10)	Yucatec Maya (Sa6)
Murngin (OI17)	
Lau (OO6)	Lau (Ih4)
Marshalls (OR11)	Majuro (If3)
Truk (OR19)	Trukese (If2)
Woleai (OR21)	Ifaluk (If4)
Yap (OR22)	Yapese (If6)
Tikopia (OT11)	Tikopia ((Ii2)
Samoa (OU8)	Samoans (Ii1)
Tonga (OU9)	Tongans (Ii12)
Marquesas (OX6)	Marquesans (Ij3)
Easter Islanders (OY2)	Easter (Ij9)
Pukapuka (OZ11)	Pukapukans (Ii3)
Ukraine (RD1)	Ukrainians (Ch7
Turkestan (RL1)	
Siberia (RR1)	
Chukchee (RY2)	Chukchee (Ec3)
Kamchadal (RY3)	
Koryak (RY4)	Koryak (Ec5)
Mosquito (SA15)	Miskito (Sa9)
Caingang (SM3)	
Tucano (SQ19)	
Yaruro (SS19)	Yaruro (Sc2)

Six categories of information were gathered from the HRAF:

1. Why were pits used?
2. What products were stored in pits?
3. What is the pit morphology?
4. Where are the subsurface storage pits located?
5. What above ground storage methods, if any, were used?
6. What is the the importance of pit storage in a given subsistence economy?

This information is presented in Tables 3 through 5 and in Appendix A.

The quality of data on pit use that is presented in the Human Relations Area File is highly variable, ranging from simple statements that pits are present to detailed observations of how and why subterranean storage is used by a given society. Appendix A lists the information on pit using societies that I obtained from the HRAF File.

For the purposes of this study, the most critical variable is the question of why pits were selected as storage receptacles. Therefore, it is essential that the selection criteria be thoroughly described, both by definitions and by examples. The other five variables are self-evident descriptions and will not be discussed further. There was sufficient information on forty-five of

the seventy-nine pit using groups to determine why pits are used. These forty-five cases are enumerated in Table 1.

Why Pits Are Selected as Storage Receptacles

I believe that subterranean food storage facilities are selected for three reasons: concealment, preservation, and processing. Pit storage appears to be used for concealment in order to hide critical food resources from human predation. Pits are apparently used for preservation because this form of storage frequently represents the most efficient method for the long term preservation of particular commodities in a given environmental setting. Subterranean facilities are also used for processing, that is, they are used to prepare food for long term storage.

The use of pits to process food for storage usually involves some form of fermentation or pickling. Once food is processed in pits, it is either left in the processing pit for long term storage or it is transferred to another above ground or below ground storage receptacle. Processing pits are included in this analysis because they are commonly indistinguishable morphologically from food storage pits and because the processing of food in pits by fermentation or pickling is commonly an integral part of subterranean food storage.

Two assumptions are of critical importance when considering the concealment or preservation functions of

storage pits in any given society. I assume that when pits are used for concealment, the preservation qualities of these facilities are of secondary importance. In contrast, it seems likely that many, but not necessarily all, groups classified as using pits primarily for preservation select pit storage because it is the best method of storing their particular produce.

Pit using groups were assigned to one of these categories based on three reasons: explicit statements in the primary data on why pits were used; inferences drawn from studying pit morphology and pit location (whether or not pits were hidden); and in two cases, the location of above ground storage structures used in addition to pits (See Table 2 and Appendix A for a listing of the references used in this process and information on how pit use was determined).

Preservation and Concealment

The Navajo and Pawnee are excellent examples of explicit statements in the primary literature on why pits were used. Both of these groups used pit storage for concealment. Weltfish (1965: 68) strongly stresses the concealment function of Pawnee pit storage, and Hill (1938: 43) describes the care with which the Navajo obliterated all signs that might show the location of their storage pits.

Table 2. References from the Human Relations Area File that were used to determine the storage pit function for each group. The groups in this table are in the same order as in Tables 3 through 5. Groups that appear in more than one of these tablesare listed in the first table in which they occur.

A. Groups that used storage pits for concealment:

Yucatec Maya (NV10)
Gotthilf 1982: 150-160

Zulu (FX20)
Grout 1864: 103-104
Krige 1965: 44
Bryant 1949: 303
Reader 1966: 35
Tyler 1891: 42
Raum 1973: 145

Ute (NT19)
Powell 1971: 49
Smith 1974: 67

Blackfoot (NF6)
Forde 1952: 63-64
Wissler 1910: 97

Tuareg (MS25)
Lhote 1944: 82-83

Iroquois (NM9)
Morgan 1901: 22, 31

Yaruro (SS19)
Pertrullo 1939: 201, 214

Katab (FF38)
Meek 1931: 45-46

Kanuri (MS14)
Cohen 1960: 215, 241

Ngoni (FR5)
Read 1956: 137
Read 1960: 140-141

Southern Paiute (NT16)
Steward 1941: 231-333

Table 2. Continued

Western Shoshone (NT22)
Steward 1938: 73
Steward 1941: 231

Northern Paiute (NR13)
Stewart 1941: 231

Delaware (NM7)
Herman 1950: 53
Lindestrom 1925: 253
Newcomb 1956: 19

Navajo (NT13)
Brewer 1937: 58
Bailey 1940: 290
Hill 1938: 43

Dhegiha (NQ12)
Dorsey 1884: 285
Fletcher and LaFlesche 1911: 98

Mandan (NQ17)
Deland 1908: 322, 609

Papago (NU28)
Castetter and Bell 1942: 184, 206-207

Pawnee (NQ18)
Smith 1852: 90-91
Wedel 1936: 51-54
Weltfish 1965: 68

Dard (AV3)
Biddulph 1880: 84
Leitner 1893: 39-40

Lovedu (FX14)
Krige and Krige 1943: 19

B. Groups that used storage pits for preservation

Tiv (FF57)
Bohannan 1954: 18
Bohannan and Bohannan 1958: 15-16

Table 2. Continued

Mohave (NT28)
Castetter and Bell 1951: 165

Marquesas (OX6)
Handy 1923: 187, 189

Chukchee (RY2)
Bogoras 1904-1909: 178, 183, 195
Nordenskiold 1882: 467

Lapps (EP4)
Itkonen 1948: 384, 399, 408-409, 412

Mosquito (SA15)
Conzemius 1932: 91

Woleai (OR21)
Bates and Abbott 1958: 74
Burrows 1949: 35-36
Kramer 1937: 46

Lau (OO6)
Hocart 1929: 139
Thompson 1940: 157-158

Marshalls (OR11)
Erdland 1914: 33
Kramer and Nevermann 1938: 190-191

River Yumans (NT15)
Spier 1933: 64-65, 89-91

Papago (NU28) Pima
Castetter and Bell 1942: 183, 189

Samoa (OU8)
Buck 1930: 132
Coulter 1941: 36
Grattan 1948: 77-78

Southeast Salish (NR19)
Cline 1938: 31-32

Ojibwa (NG6)
Densmore 1929: 40
Hilger 1939: 153
Jenness 1935: 13

Table 2. Continued

Pomo (NS18)
Barrett 1916: 7-9
Gifford and Kroeber 1916: 7-9

Tubatulabal (NS22)
Voegelin 1938: 16, 20

Koryak (RY4)
Antropova 1964: 857
Jochelson 1908: 398

Truk (OR19)
Bollig 1927: 60

Miao (AE5)
Ling and Ruey 1947: 66, 97

C. Groups that used storage pits for processing:

Rundi (FO42)
Czekanowski 1917: 109-110

Bellacoola (NE6)
McIlwraith 1948: 536-537

Pukapuka
Beaglehole and Beaglehole 1938: 103-104

Andamans (AZ2)
Man 1932: 132

Tlingit (NA12)
Jones 1914: 104-106

Pit functions were not so readily apparent for such groups as the Lovedu, Zulu, and River Yumans. The Lovedu, for example, appear to have used subterranean storage for concealment. Their pits were so well hidden that they had to relocate them by probing for the pits' caps with a stick (Krige and Krige 1943: 19-20). Likewise, Zulu storage structures seem to have had a concealment function because there was no outward indication of the locations of their cache pits (Krige 1965: 44). In contrast, the data suggest that the River Yumans used pits for preservation because their pits were not concealed; indeed, the pits were covered with gabled roofs (Spier 1933: 89-90).

Finally, pit function was assigned to two groups based on the location of above ground storage structures used in addition to subsurface facilities. The Lapps are considered to have used pits for preservation, since they used both raised storage platforms and pits, and left both unguarded for considerable lengths of time while they were away from their settlements. In fact, raised storage platforms were sometimes located at considerable distances from their settlements and were visited infrequently (Itkonen 1948: 391-392, 399, 406-409).

Tubatulabal pit use was also assigned a preservation function, based on the fact that their above ground acorn granaries were located at some distance from their winter camps. Acorns were stored through the winter in elevated

granaries near the locations where they were collected. Pinyon nuts likewise were stored at considerable distances from the Tubatulabal's winter camps. Pinyon nuts were preserved in basin shaped pits that were located in rockshelters near the pinyon grounds (Voegelin 1938: 16, 20). The possibility does exist, however, that the storage of pinyon in pits may have represented concealment. If pinyon nuts were a more valuable commodity than acorns, then they may have been more subject to theft. In the absence of any further evidence, this case will be considered storage for preservation.

Processing

Groups that use pits primarily for processing food generally use them for shorter lengths of time than groups that use pits for long term storage, and sometimes store their food in different receptacles after it is processed. The use of pits for processing food frequently involves some form of fermentation or pickling. Processing pits are also used to ripen fruit. The Yucatec Maya, Rundi, Bellacoola, Pukapuka, Andamanese, and Tlingit all used subterranean facilities in this manner.

The Rundi, for example, used pits on a short term basis to ripen bananas and ferment fresh beer (Czekanowski 1917: 109-110). The Pukapuka likewise ripened bananas in

pits (Beaglehole and Beaglehole 1938: 104). The Bellacoola and the Tlingit used pits to aid in the rendering of ooliken (or olachen) fish for their oil. The fish were placed in pits for two weeks or so to rot. After they were thoroughly rotten, the fish were boiled and the oil was extracted and stored in containers for winter use (Jones 1914: 104-105; McIlwraith 1948: 536-537). Groups that used pits primarily for processing will not be considered further, because I feel that different processes are structuring this form of short term "storage." Groups that used pits primarily for processing are identified in Table 5 and Appendix A.

It should be noted here that groups in tropical regions, particularly in Oceania, that used subterranean facilities for processing by fermentation frequently used the same receptacles for long term food storage for the purpose of preservation once the fermentation process was complete. In cases where groups used pits for both the processing and long term preservation of food, the preservation function was given primacy in my analysis. These groups include the Lau, Trukese, Marshallese, Marquesans, Samoans, Woleai, and Mosquito (See Table 4 and Appendix A).

Ethnographic Atlas

In order to identify the principal factors associated with the use of below ground food storage, I had to collect

information on variables other than those that were present in the primary data from the Human Relations Area File. Murdock's (1967) Ethnographic Atlas provided a convenient source for this information. I selected the potentially significant variables based on the assertions of previous studies, which claim that the most important conditions associated with the use of subterranean food storage are related to groups subsistence economies and mobility strategies (DeBoer 1988; Gilman 1983, 1987; Ingold 1983; Testart 1982; Ward 1985).

The data on pit use from the Human Relations Area File were combined with material amassed from the Ethnographic Atlas on the subsistence economy, degree of agricultural intensity, and settlement patterns. This information is presented in Tables 3 through 5. I used this material for two purposes: (1) to examine the role of concealment and preservation in the selection and use of storage pits; (2) to test the postulated relationship between pit storage, a need for concealment, settlement patterns marked by some degree of residential mobility, and a low reliance on agriculture (as presented in DeBoer 1988; Gilman 1983, 1987; and Ward 1985).

Before the data from the Human Relations Area File and the Ethnographic Atlas were combined, I checked the references used in each data base to make sure that at least some of the same sources were used when each group

Table 3. Societies that Select Pit Storage for Concealment

		----------IN PERCENT----------						
	GROUP	AGRI.	GATHERING	HUNTING	FISHING	A. H.	WHY STORE IN PITS	SETTLEMENT PATTERN
1	Yucatec Maya	66-75	0-5	6-15	16-25	0-5	Concealment, in past	Complex Settlement
2	Zulu	46-55	0-5	6-15	0-5	36-45	Concealment	Family Homesteads
3	Blackfoot	0	16-25	76-85	0-5	0-5	Concealment	Nomadic
4	Uncompahgre (Ute)	0	36-45	46-55	6-15	0-5	Concealment	Nomadic
5	Ahaggaren (Tuareg)	26-35	6-15	6-15	0-5	46-55	Concealment	Nomadic
6	Iroquois	36-45	6-15	26-35	16-25	0-5	Concealment, in past	Permanent
7	Yaruro	36-45	16-25	16-25	6-15	6-15	Concealment	Permanent
8	Katab	46-55	16-25	6-15	6-15	6-15	Concealment	Permanent
9	Kanuri	56-65	6-15	0-5	6-15	16-25	Concealment	Permanent
10	Ngoni	56-65	0-5	6-15	16-25	6-15	Concealment, in past	Permanent
11	Antarianunts (S. Paiute)	0	46-55	26-35	16-25	0-5	Concealment	Seminomadic
12	Gosiute (W. Shoshone)	0	46-55	36-45	6-15	0-5	Concealment	Seminomadic
13	Kidutokado (N. Paiute)	0	36-45	36-45	16-25	0-5	Concealment	Seminomadic
14	Kuyuidokado (N. Paiute)	0	46-55	16-25	26-35	0-5	Concealment	Seminomadic
15	Unitah (Ute)	0	26-35	36-45	26-35	0-5	Concealment	Seminomadic
16	Wadadokado (N. Paiute)	0	46-55	26-35	16-25	0-5	Concealment	Seminomadic
17	Kaibab (S. Paiute)	0-5	66-75	26-35	0-5	0-5	Concealment	Seminomadic
18	Chemehuevi (S. Paiute)	6-15	56-65	26-35	0-5	0-5	Concealment	Seminomadic
19	San Juan (S. Paiute)	6-15	46-55	26-35	6-15	0-5	Concealment	Seminomadic
20	Shivwits (S. Paiute)	6-15	46-55	36-45	0-5	0-5	Concealment	Seminomadic
21	Delaware	36-45	16-25	16-25	16-25	0-5	Concealment	Semisedentary

KEY TO ABBREVIATIONS AND SYMBOLS IN TABLE:

1. AGRI. - Agriculture
2. A. H. - Animal Husbandry
3. 0 - Agriculture is totally absent

NOTE: Individual group numbers correspond to numbers in boxes in Figure 1.

Table 3. Societies that Select Pit Storage for Concealment

		----------IN PERCENT----------						
	GROUP	AGRI.	GATHERING	HUNTING	FISHING	A. H.	WHY STORE IN PITS	SETTLEMENT PATTERN
22	Navajo	36-45	16-25	6-15	0-5	26-35	Concealment	Semisedentary
23	Omaha	36-45	6-15	36-45	6-15	0-5	Concealment	Semisedentary
24	Mandan	46-55	0-5	26-35	16-25	0-5	Concealment	Semisedentary
25	Papago	46-55	26-35	16-25	0-5	0-5	Concealment	Semisedentary
26	Pawnee	46-55	6-15	36-45	0-5	0-5	Concealment	Semisedentary
27	Dard	56-65	0-5	6-15	0-5	26-35	Concealment	Semisedentary
28	Lovedu	56-65	6-15	0-5	0-5	26-35	Concealment	Seperated Hamlets

KEY TO ABBREVIATIONS AND SYMBOLS IN TABLE:

1. AGRI. - Agriculture
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3. 0 - Agriculture is totally absent

NOTE: Individual group numbers correspond to numbers in boxes in Figure 1.

Table 4. Societies that Select Pit Storage for Preservation

		----------IN PERCENT----------						
	GROUP	AGRI.	GATHERING	HUNTING	FISHING	A. H.	WHY STORE IN PITS	SETTLEMENT PATTERN
1	Mohave	36-45	26-35	16-25	6-15	0-5	Preservation	Family Homesteads
2	Marquesas	46-55	0-5	0-5	36-45	6-15	Preservation	Family Homesteads
3	Tiv	46-55	6-15	16-25	6-15	6-15	Preservation	Family Homesteads
4	Chukchee	0	0-5	16-35	26-35	46-55	Preservation	Nomadic
5	Lapps	0	0-5	16-25	16-25	56-65	Preservation	Nomadic
6	Mosquito	16-25	26-35	16-25	16-25	6-15	Preservation	Permanent
7	Iroquois	36-45	6-15	26-35	16-25	0-5	Preservation, nov	Permanent
8	Ifaluk (Woleai)	46-55	0-5	0-5	36-45	6-15	Preservation	Permanent
9	Lau	46-55	0-5	0-5	36-45	6-15	Preservation	Permanent
10	Majuro (Marshalls)	46-55	0-5	0-5	36-45	6-15	Preservation	Permanent
11	Maricopa (River Yuma)	46-55	16-25	6-15	16-25	0-5	Preservation	Permanent
12	Pima (Papago)	46-55	26-35	6-15	6-15	0-5	Preservation	Permanent
13	Ngoni	56-65	0-5	6-15	16-25	6-15	Preservation, nov	Permanent
14	Samoa	56-65	0-5	0-5	26-35	6-15	Preservation	Permanent
15	Coeur d'Alene (Salish)	0	26-35	36-45	26-35	0-5	Preservation	Seminomadic
16	Eastern Ojibwa	0	26-35	26-35	36-45	0-5	Preservation	Seminomadic
17	Northern Pomo (Pomo)	0	46-55	26-35	16-25	0-5	Preservation	Seminomadic
18	Sinkaietk (Salish)	0	26-35	26-35	36-45	0-5	Preservation	Seminomadic
19	Tubatulabal	0	46-55	26-35	16-25	0-5	Preservation	Seminomadic
20	Chippewa (Ojibwa)	16-25	16-25	16-25	36-45	0-5	Preservation	Seminomadic
21	Koryak	0	6-15	6-15	46-55	26-35	Preservation	Semisedentary

KEY TO ABBREVIATIONS AND SYMBOLS IN TABLE:

1. AGRI. - Agriculture
2. A. H. - Animal Husbandry
3. 0 - Agriculture is totally absent

NOTE: Individual group numbers correspond to numbers in boxes in Figure 2.

Table 4. Societies that Select Pit Storage for Preservation

		----------IN PERCENT----------						
	GROUP	AGRI.	GATHERING	HUNTING	FISHING	A. H.	WHY STORE IN PITS	SETTLEMENT PATTERN
22	Papago	46-55	26-35	16-25	0-5	0-5	Preservation	Semisedentary
23	Truk	46-55	0-5	0-5	46-55	0-5	Preservation	Seperated Hamlets
24	Miao	56-65	0-5	6-15	6-15	16-25	Preservation	Seperated Hamlets

KEY TO ABBREVIATIONS AND SYMBOLS IN TABLE:

1. AGRI. - Agriculture
2. A. H. - Animal Husbandry
3. 0 - Agriculture is totally absent

NOTE: Individual group numbers correspond to numbers in boxes in Figure 2.

Table 5. Societies that Select Pit Storage for Processing

		IN PERCENT						
	GROUP	AGRI.	GATHERING	HUNTING	FISHING	A. H.	WHY STORE IN PITS	SETTLEMENT PATTERN
1	Yucatec Maya	66-75	0-5	6-15	16-25	0-5	Processing, nov	Complex Settlement
2	Rundi	56-65	0-5	0-5	6-15	26-35	Processing	Family Homesteads
3	Bellacoola	0	16-25	16-25	56-65	0-5	Processing	Permanent
4	Pukapuka	46-55	0-5	0-5	36-45	6-15	Processing	Permanent
5	Andamans	0	36-45	16-25	36-45	0-5	Processing	Seminomadic
6	Tlingit	0	6-15	26-35	56-65	0-5	Preservation	Semisedentary

KEY TO ABBREVIATIONS AND SYMBOLS IN TABLE:

1. AGRI. - Agriculture
2. A. H. - Animal Husbandry
3. 0 - Agriculture is totally absent

was originally coded. Most of the societies presented in Tables 3 through 5 shared at least one common reference. Identical sources were used in both data bases when nineteen of the pertinent societies were coded.

Sixty-two of the seventy-nine pit using societies identified in the HRAF are also present in the Ethnographic Atlas. The corresponding group names and codes from these two data bases are presented in Table 1. Of these sixty-two cases, the critical question of why pits are selected for storage could be inferred for forty-five HRAF groups. These forty-five HRAF groups correspond to fifty-five Ethnographic Atlas groups, due to differences in the way cultural units are defined by each data base (Table 1).

The fifty-five Ethnographic Atlas groups (see Table 1) and pertinent data on their subsistence practices and mobility strategies are listed in Tables 3, 4, and 5. Table 3 presents data on groups that used pits to conceal food surpluses, whereas Table 4 reveals those societies that used storage pits to preserve their food. Twenty-eight groups were classified as using pit storage primarily for concealment (Table 3), while twenty-four were placed in the preservation category (Table 4). Table 5 lists those societies that used pits to process food for long term storage or immediate consumption. These cases, drawn from the HRAF and the Ethnographic Atlas, are the basic data set

for this study. Pertinent data on storage pit function and morphology for these groups are found in Appendix A.

In Chapter III, the data in Tables 3 and 4 are compared to Gilman's (1983; 1987) suggestions on the relationship between pit storage, concealment, residential mobility, and the degree of reliance on agriculture. The role of concealment and preservation in the selection and use of subterranean storage facilities will be examined in detail in Chapter IV.

CHAPTER III

ETHNOGRAPHIC ATLAS DATA PRESENTATION

Storage Pit Function

This chapter examines the suggested relationship between subterranean storage, seasonal residential mobility, and the degree of reliance on agriculture that is proposed by Gilman (1983, 1987), Ward (1985), and DeBoer (1988). These authors assume that food storage pits are usually selected in order to conceal food surpluses from human predation. They hypothesize that the need for concealment arises in societies with some degree of residential mobility (at least seasonal movement). Accordingly, societies that exhibit this pattern may use pits to hide their food surpluses while they are away from the residential localities where their goods are stored. Gilman (1983, 1987) and Ward (1985), but not DeBoer (1988), also postulate a link between concealed pit storage and a relatively low degree of reliance on agriculture. They believe that the need for the concealment of stored foods and therefore for pit use declines when groups become more dependent on agriculture. This is because agriculturists

tend to be more sedentary and spend much of the year at the location of their stored foods. Under these conditions, they conclude that people no longer need to conceal their surpluses, and above ground storage becomes feasible (Gilman 1983, 1987; Ward 1985).

If this model adequately explains the variation associated with below ground storage, then most groups: (1) should use pit storage for concealment, (2) should have a relatively low reliance on agriculture, and (3) should be at least seasonally mobile. The model fails to recognize that storage pits may not always be concealed, i.e., that pits may be selected as storage devices simply because they represent the best method of preserving certain stored foods in a given environmental setting.

If the postulated relationship between concealment, pit storage, high mobility, and low agricultural reliance holds true, then groups that store in pits for preservation may have a relatively high degree of reliance on agriculture or some other seasonally restricted resource that is gathered in large quantities for storage. They also may live in permanent or nearly permanent habitations. Gilman (1983) suggests that pit storage among sedentary agriculturalists will be rare, and if present, will probably be used for a limited number of foods that store better in pit facilities. Additionally, she notes that

Table 6. Mobility strategies and subsistence systems that may be associated with the use of storage pits when they are used for concealment and preservation.

A. Groups that use subterranean storage facilities for <u>concealment</u> should:

1. Practice little or no agriculture.
2. Have a high degree of residential mobility.
3. Store a wide variety of foods in pits.

B. Groups that use subterranean storage facilities for <u>preservation</u> should:

1. Rely heavily upon agricultural production
2. Live in permanent villages.
3. Store a low diversity of foods in pits.
4. Store a significant portion of their food in above ground facilities.

these groups should exhibit a marked use of above ground storage facilities.

From this suggestion, I hypothesize that the diversity of stored foods should be fairly low among peoples who use storage pits for preservation relative to those who use them for concealment. If pit storage is used for concealment, then a larger variety of goods likely would be stored in pits, since these facilities are chosen for their ability to hide food. In other words, the primary concern of concealed storage is not the preservation qualities of these subterranean facilities, but rather the need of a given society to hide commodities from human predation (see Table 6).

In this study, I compare DeBoer's (1988), Gilman's (1983, 1987), and Ward's (1985) suggestions regarding the variability associated with pit storage to the worldwide data set that I have gathered from the Ethnographic Atlas and the Human Relations Area File. My data are presented in Tables 3 - 5 and Figures 1 - 4. The tables list information from the Atlas on the groups' subsistence economies and mobility strategies, and from the HRAF on why pits were selected as storage containers. The figures illustrate the relationship between the degree of agricultural intensity and the degree of residential mobility for groups that use pits for concealment and preservation. The ethnographic data presented in

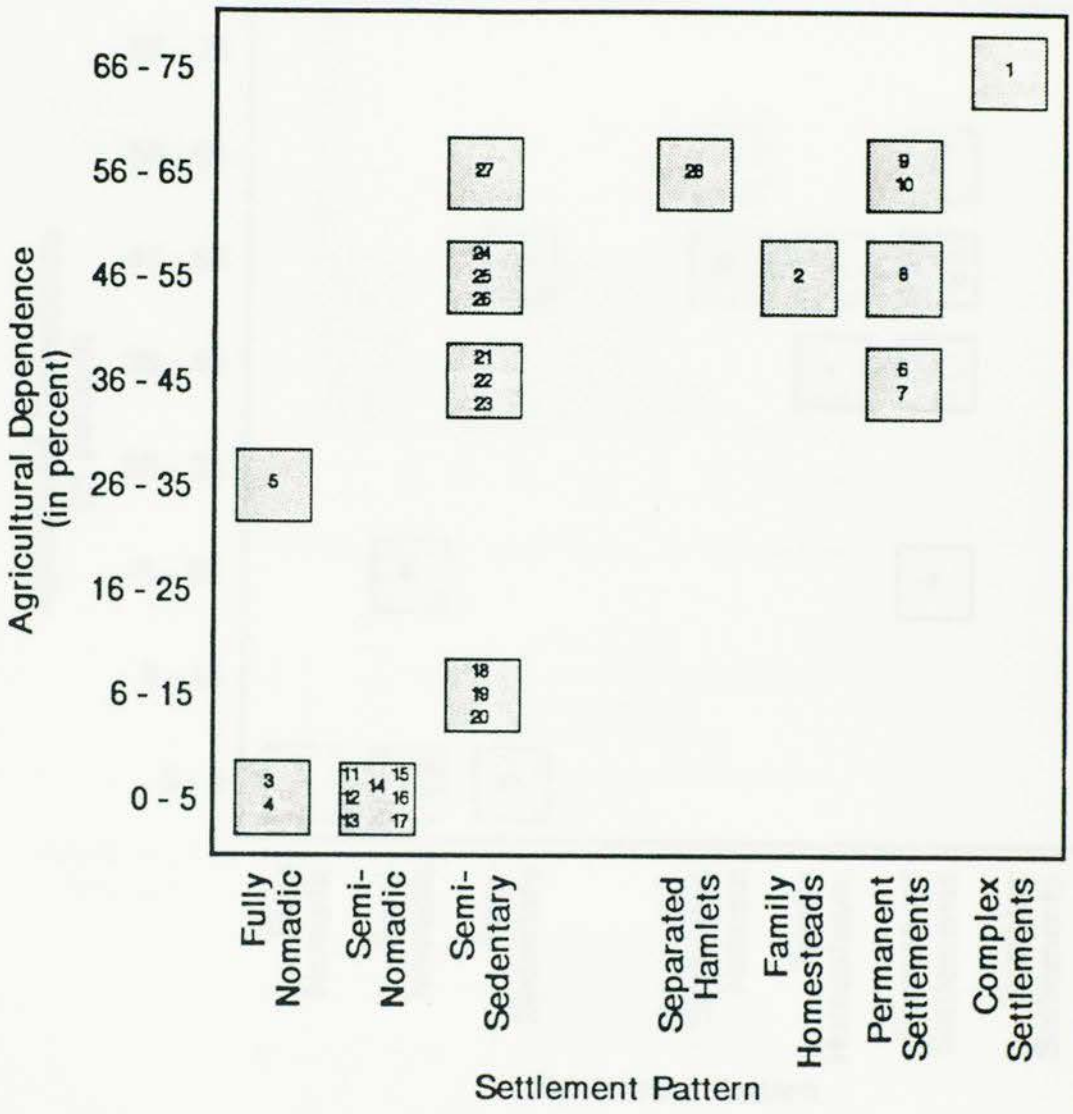


Figure 1. Correlation Between Agricultural Dependence and Settlement Pattern for Groups Using Pits for Concealment. (Note: The numbers in the graph correspond to the individual group numbers in Table 3.)

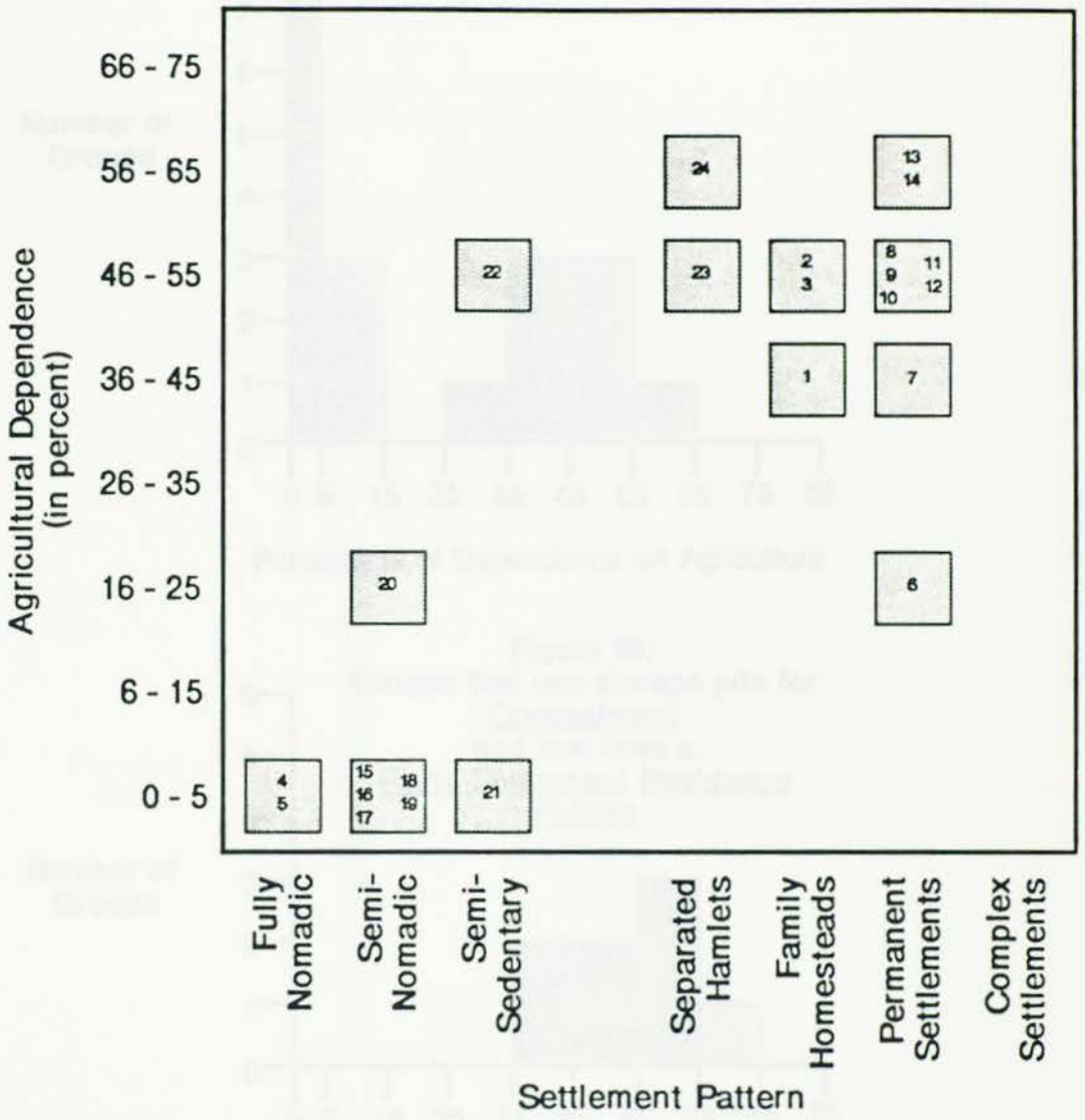


Figure 2. Correlation Between Agricultural Dependence and Settlement Pattern for Groups Using Pits for Preservation. (Note: The numbers in the graph correspond to the individual group numbers in Table 4.)

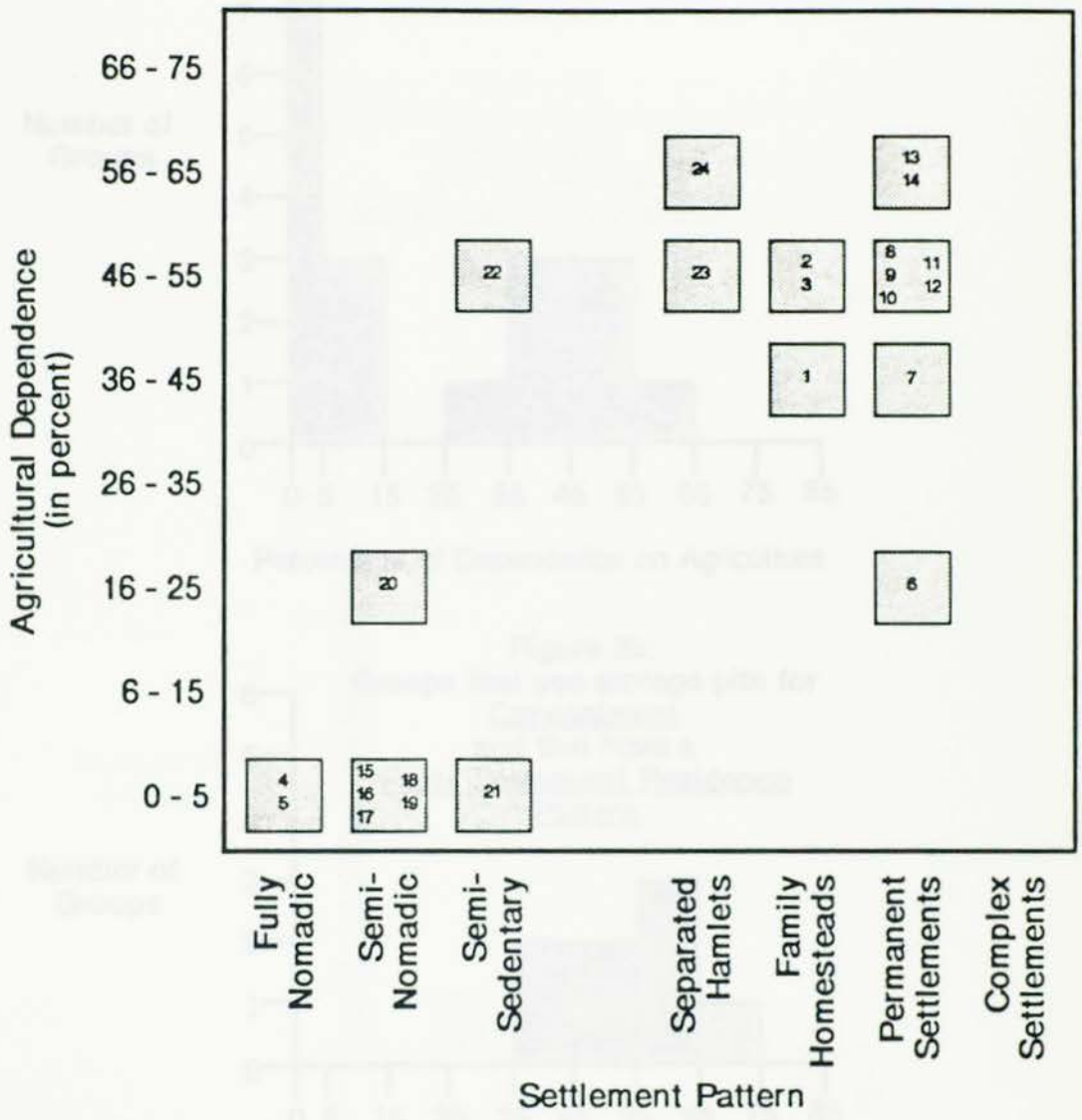


Figure 2. Correlation Between Agricultural Dependence and Settlement Pattern for Groups Using Pits for Preservation. (Note: The numbers in the graph correspond to the individual group numbers in Table 4.)

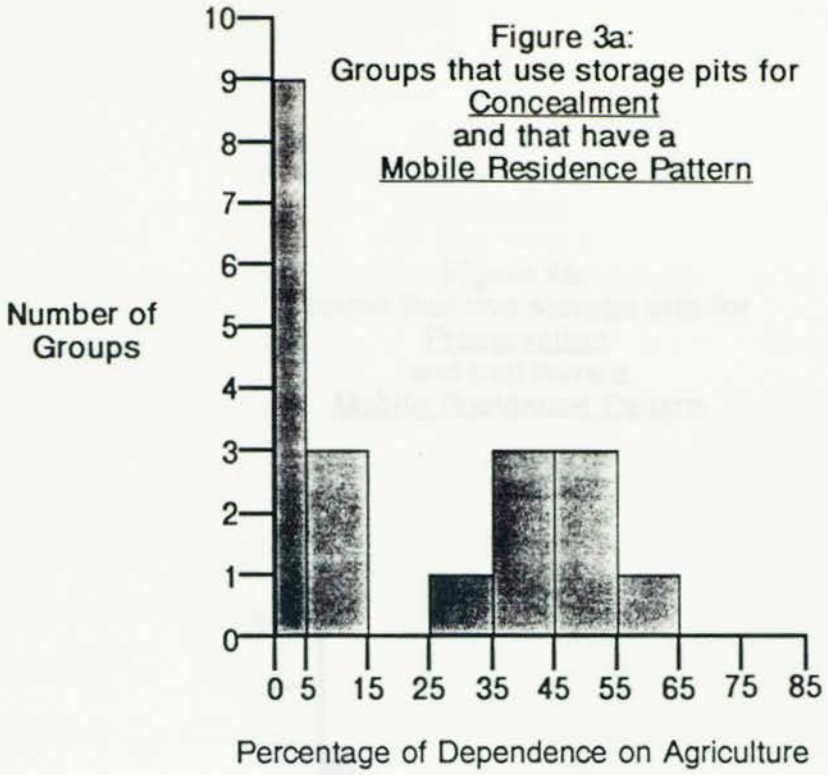


Figure 3a:
Groups that use storage pits for
Concealment
and that have a
Mobile Residence Pattern

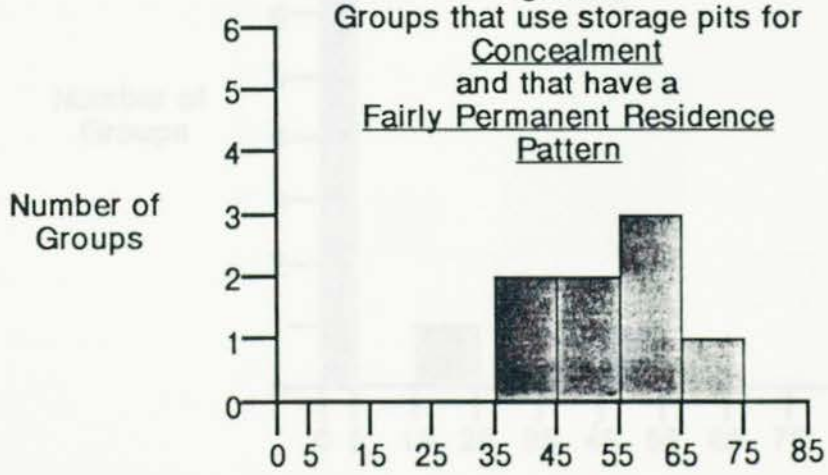


Figure 3b:
Groups that use storage pits for
Concealment
and that have a
Fairly Permanent Residence
Pattern

Figure 4a:
Groups that use storage pits for
Preservation
and that have a
Mobile Residence Pattern

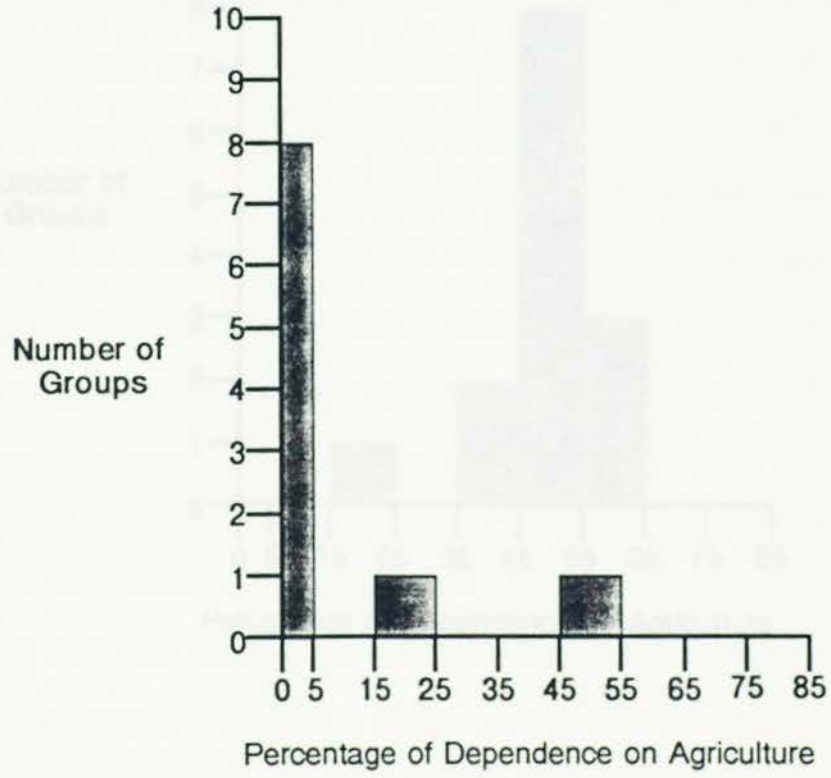
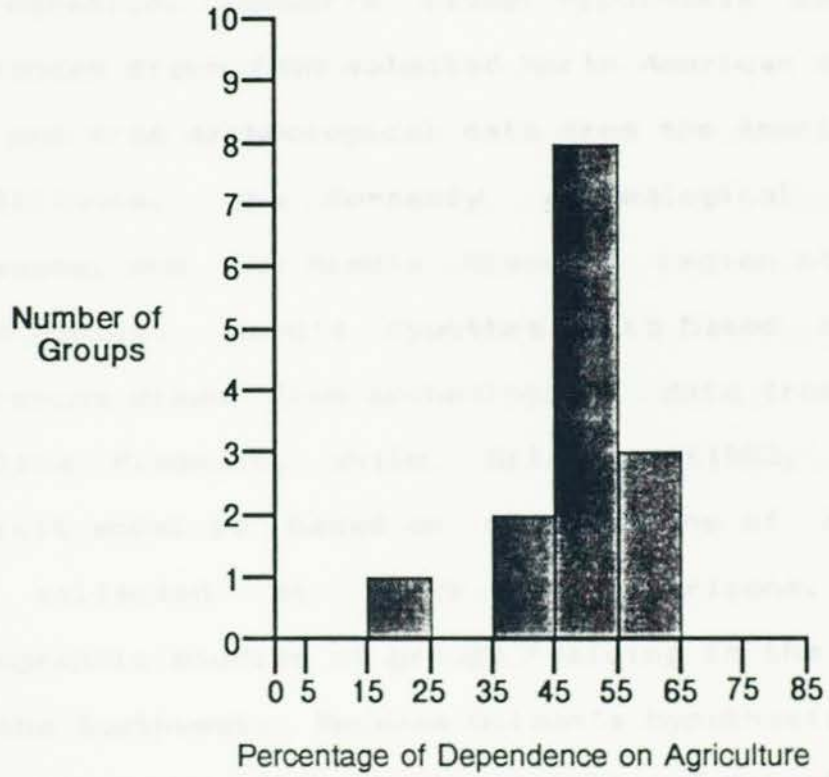


Figure 4b:
Groups that use storage pits for
Preservation
and that have a
Fairly Permanent Residence
Pattern



Tables 3 - 5 and in Figures 1 - 4 will be used to examine the role of concealment and preservation in the selection and use of storage pits.

An examination of the data presented in Tables 3 - 5 and Figures 1 - 4 demonstrates that DeBoer's (1988), Gilman's (1983, 1987), and Ward's (1985) hypotheses do not explain the variation present in the worldwide sample under consideration. DeBoer's (1988) hypothesis is based upon inferences drawn from selected North American ethnohistoric data and from archeological data from the American Bottoms in Illinois, the Normandy Archeological Project in Tennessee, and the Middle Missouri region of North and South Dakota. Ward's hypothesis is based on intuitive inferences drawn from archeological data from the North Carolina Piedmont, while Gilman's (1983, 1987) more explicit model is based on observations of archeological data collected at Black Mesa, Arizona, and from ethnographic studies of groups residing in the Great Basin and the Southwest. Because Gilman's hypothesis is the most explicit of the three similar model's of pit storage under consideration, I will give her study primacy in my discussion of the conditions associated with the use of subterranean food storage (see Table 6).

The data presented in the tables suggest that the relationships that Gilman (1983, 1988) explores are adequate to explain the patterns of subterranean storage

present in the southwestern United States. However, my data indicate that there are other conditions affecting the selection and use of pit storage that her regionally restricted data base fails to account for.

A major weakness of the models under consideration (Table 6) is their failure to recognize the important role of subterranean storage when it is used for reasons other than the concealment of stored foods. My data show that pits are frequently selected for their preservation qualities. Table 4 lists twenty-four societies that appear to use pit storage for preservation rather than for concealment. The preservation function of subterranean storage in these societies is inferred based on the fact that storage pits in most of these cases were obviously not concealed. Several examples are presented below to illustrate this conclusion.

The Tiv stored root crops in deep pits that had mud huts built over them (Bohannan and Bohannan 1957: 15-16). The Maricopa (River Yuman) stored watermelons and pumpkins in pits that were located near their dwellings. These pits were protected from the elements by dirt covered gabled roofs or by small storage houses that were built over them (Spier 1933: 64-65, 89-90). The Chippewa and Eastern Ojibwa stored a wide variety of foods in pits that were adjacent to their dwellings and that were covered with a mound of earth that rose up to eighteen inches above the

ground surface (Densmore 1929: 40; Hilger 1939: 154; Jenness 1935: 13). The Pomo stored acorns in basket granaries that were half buried in pits located on the crests of knolls and that were covered with a conical, slab roof. When raids were anticipated, the Pomo sometimes disguised the roofs with brush (Barrett 1916: 7-9; Gifford and Kroeber 1937: 181). Finally, the Trukese used breadfruit pits that were easy to recognize because they were covered with piles of stones (Bollig 1927: 60).

Figures 3 and 4 illustrate the relationship between mobility strategies and agricultural intensity (expressed as the percentage of dependence on agriculture) for groups that used pit storage for concealment (Figures 3a and 3b) and for preservation (Figures 4a and 4b). Figures 3a and 4a illustrate the relationship for groups that had a mobile residence pattern (ranging from fully nomadic to semisedentary), whereas Figures 3b and 4b illustrate the relationship for groups that had largely permanent residence patterns.

An examination of Figures 3a and 3b shows that the suggestions of Gilman (1983, 1987) and Ward (1985) regarding the relationship between concealment, mobility strategy, agricultural dependence, and pit storage are inadequate (see Table 6). Only 12 of the 28 cases illustrated in these figures match their hypotheses. Seven groups had a mobile residence pattern and a significant

degree of reliance on agriculture, whereas eight groups lived in largely permanent settlements and also relied heavily on agriculture for their subsistence needs. One group, the Ahaggaren (Tuareg), had a moderate degree of agricultural reliance (26-35 percent) and a mobile residence pattern.

Figures 4a and 4b contrast the degree of agricultural dependence and mobility strategies of groups that used pit storage for preservation. One might hypothesize that if the models under consideration were correct, then groups that use pits for preservation rather than concealment might have a high degree of reliance on agriculture and live in permanent settlements (Table 6). The figures show that these suppositions are incorrect and thus cast further doubt on the relationships postulated by Gilman (1983, 1987) and Ward (1985). Nine groups that used pit storage for preservation had a low degree of reliance on agriculture and were residentially mobile, whereas 13 groups lived in largely permanent settlements and had a high degree of reliance on agriculture. One group, the Mosquito (Table 4 and Figure 2), lived in permanent villages and had a low degree of agricultural dependence.

One group of pit users, the Papago (See Table 3 and Figure 1), were semisedentary, but they also had a high degree of reliance on agriculture. This group will not be further considered in my analysis because of a discrepancy

between the observed storage pit morphology and the ethnographer's statements regarding Papago pit use. Castetter and Bell (1942: 184) note that the Papago preferred to hide their food, but describe pit facilities that were not apparently concealed. The Papago used cubical watermelon pits that were located on a hill if possible and that were covered with an arrowweed and dirt roof (Castetter and Bell 1942: 206-207).

Storage for Concealment

Twelve of the twenty-eight groups that stored for concealment meet the suggested criteria (Table 6) for the type of settlement-subsistence systems that should usually be associated with the use of concealed pit storage (Table 3 and Figure 1). Under the proposed model of pit storage, groups that use pit storage for concealment should: (1) have a mobile residence pattern, (2) have a low degree of reliance on agriculture, and (3) store a relatively high diversity of foods in their pits. These groups are the Blackfoot, Uncompahgre (Ute), Antarianunts (Southern Paiute), Gosiute (Western Shoshone), Kidutokado (Northern Paiute), Kuyuidokado (Northern Paiute), Uintah (Ute), Wadadokado (Northern Paiute), Kaibab (Southern Paiute), Chemehuevi (Southern Paiute), San Juan (Southern Paiute), and Shivwits (Southern Paiute).

Agriculture was completely absent from eight of these groups. Two groups, the Uncompahgre and the Blackfoot, were fully nomadic, whereas the other ten were seminomadic. All twelve groups got the bulk of their subsistence from hunting and gathering, though four of them practiced a small amount of agriculture. All but one of the groups, the Blackfoot, were located in the Great Basin. The Blackfoot lived on the Northern Plains, in Montana and Alberta.

The diversity of foods that was stored in pits by these groups was high (Clemmer 1972: 315; Jones 1955: 215; Lowie 1924: 202; Smith 1974: 64, 331; Steward 1938: 121, 142; Stewart 1942: 250, 252; Steward 1941: 231, 279-281; Wissler 1910: 97). The five Southern Paiute groups, for example, used storage pits for a wide variety of foods, including dried meat, agave, pinyon seeds, mesquite pods, and other seeds (Laird 1976: 6; Manners 1974: 81; Steward 1941: 231, 279-281; Stewart 1942: 250, 252). The Blackfoot likewise stored a variety of foods and other goods in pits, which included bison meat, roots, berries, ammunition, moccasins, and tobacco (Forde 1952: 63-64; Wissler 1910: 97). The Blackfoot will be examined in greater detail in Chapter IV, in order to examine a group that fits the proposed model of pit storage (Table 6) that was not located in the Southwest.

Seven groups that used storage pits for concealment were seasonally mobile, but also had a relatively high degree of reliance on agriculture (Table 3 and Figure 1). The settlement-subsistence system of these groups met the suggested criteria for concealed pit storage (Table 6) in two respects, in that all seven groups were seasonally mobile and six of the seven groups stored a diverse assortment of food and other goods in pits. On the other hand, all seven had a significant degree of reliance on agricultural production, which is not expected by the models of storage pit function under consideration (Table 6).

The seven groups are the Delaware, Navajo, Omaha (Dhegiha), Mandan, Pawnee, Dard, and Papago. The Papago will not be further considered due to a discrepancy between the observed storage pit morphology and the ethnographer's statements regarding Papago pit use. All seven groups had a semisedentary residence pattern and relied on agriculture for 36 to 65 percent of their subsistence. The Dard and Navajo had a significant reliance on animal husbandry (26 to 35 percent) in addition to agriculture, and the Mandan, Omaha, and Pawnee relied on bison hunting for 26 to 45 percent of their subsistence (Deland 1908; Dorsey 1884; Weltfish 1965). The Delaware relied on hunting, gathering, and fishing for equal parts of their subsistence, ranging from 16 to 25 percent.

All of the groups, with the exception of the Papago, stored a wide variety of foods and other goods in subterranean facilities (Bailey 1940: 290; Brewer 1937: 58; Catlin 1857: 122; Deland 1908; 322, 609; Dyk 1938: 81-82; Hill 1938: 43-45, 49-50; Leitner 1893: 39-40; Will and Spinden 1906: 110). The Omaha, for example, stored agricultural produce, dried meat, clothing, and regalia in pits (Fletcher and La Flesche 1911: 98) and the Delaware stored corn, beans, all kinds of meat, tobacco, and other provisions in pits (Herman 1950: 53; Lindestrom 1925: 253; Newcomb 1956: 19).

The Mandan, Omaha, and Pawnee, who hunted bison, and the Navajo and Dard, who raised livestock, all seasonally abandoned their villages in order to exploit these nonagricultural food resources, which were apparently valuable enough to warrant the risk of losing agricultural produce to human predation. The Navajo and Mandan will be examined in greater detail in Chapter IV, in order to study groups who use pit storage for concealment, but who do not meet the expectations of Gilman's model (Table 6).

Eight of the 28 groups that stored in pits for concealment failed to satisfy two of the suggested criteria (Table 6) for concealed pit storage (Table 3 and Figure 1). These groups, which include the Yucatec Maya, Zulu, Lovedu, Iroquois, Yaruro, Katab, Kanuri, and Ngoni, all dwelt in permanent or nearly permanent villages, and had a high

degree of agricultural dependence, which ranged from 36 to 75 percent of their total subsistence.

The diversity of foods that was stored in pits by these eight groups was variable. The model (Table 6) suggests that groups that use pit storage for concealment should store a wide variety of foods in pits. Four groups (the Katab, Lovedu, Kanuri, and Yucatec Maya) limited their use of pits to the storage of one type of food, their staple grains (Cohen 1960: 269; Gotthilf 1982: 154-157; Krige and Krige 1943: 19-20; Meek 1931: 45-46). The Iroquois, Ngoni, Yaruro, and Zulu, on the other hand, stored a diverse assortment of foods in pits, including agricultural produce (Zulu, Iroquois, and Ngoni), meat and household goods (Iroquois), and gathered plant foods, baskets, and tools (Yaruro) (Bryant 1949: 303; Lyford 1945: 12, 16, 19; Morgan 1901: 311; Pertrullo 1939: 201; Raum 1973: 145; Read 1956: 137, 1960: 140-141; Tyler 1891: 42; Waugh 1916: 43).

Five of the groups, the Zulu, Katab, Ngoni, Kanuri, and Lovedu, were located in Africa, and should be examined in detail to determine how their reliance on concealed subterranean storage differs from the twelve cases, which were all from the southwestern United States, that fit Gilman's model. The differences may be based on environmental variation between Africa and the southwestern United States. The Zulu and the Ngoni will be discussed in

detail in Chapter IV in order to examine the conditions associated with pit storage among these groups.

The Ngoni (from Malawi), Iroquois (from western New York), and Yucatec Maya (from the Yucatan Peninsula) present a unique opportunity to examine the role of concealment and preservation in the selection and use of storage pits, because all three exhibited diachronic change in the reasons that they used pits for food storage. In the past, pits were used to conceal food from human predation. In this century, subterranean storage continued in use among all three groups, but it no longer seemed to be used for concealment. When these groups shifted from using pits for concealment to using them for preservation (Ngoni and Iroquois) or processing (Yucatec Maya), several changes occurred in the nature of their pit storage. Most notably, the diversity of foods that were stored in pits was reduced (Gotthilf 1982: 151, 154, 157; Read 1956: 137, 1960: 140-141; Waugh 1916: 43). These three groups will be examined in greater detail in Chapter IV. A more detailed study of them should enable us to gain some perspective on the variability associated with the use of subterranean food storage. Please note that the Ngoni and the Iroquois are cross-listed in Tables 3 and 4, and the Yucatec Maya appear in both Table 3 and Table 5. These dual listings reflect changes through time in why subterranean food storage was used by these three groups.

Storage for Preservation

Fourteen of the twenty-four groups that used subterranean storage for the preservation of foods meet most of the suggested criteria (Table 6) for unconcealed pit storage (Table 4 and Figure 2). Under the proposed model of pit storage, groups that use pit storage for preservation should (1) live in permanent villages, (2) have a high degree of reliance on agriculture, (3) store a relatively low diversity of foods in their pits, and (4) rely on above ground storage facilities for a substantial part of their storage needs. The groups are the Mohave, Marquesans, Tiv, Mosquito, Iroquois, Ifaluk (Woleai), Lau, Majuro (Marshallese), Maricopa (River Yumans), Pima, Ngoni, Samoans, Trukese, and Miao. All of these groups, with the exception of the Mosquito, had a relatively high degree of reliance on agriculture, ranging from 36 to 65 percent of their diet, and lived in largely permanent settlements.

The diversity of foods that was stored in pits by these groups was low (Bates and Abott 1958: 75; Bollig 1927: 60; Bohannan 1954: 18; Bohannan and Bohannan 1958: 15-16; Buck 1930: 132; Burrows 1949; 35-36; Castetter and Bell 1942: 183, 189, 1951: 165; Conzemius 1932: 91; Coulter 1941: 36; Erdland 1914: 33; Handy 1923: 8; Hocart 1929: 139; Kramer 1937: 46; Kramer and Nevermann 1938: 190-191; Ling and Ruey 1947: 66, 97; Spier 1933: 64-65, 89-91; Stone 1951: 15; Thompson 1940: 157-158). Eight of the fourteen,

including the Mohave, Tiv, Mosquito, Iroquois, Maricopa (River Yumans), Pima, Ngoni, and Miao, used above ground storage facilities in addition to pits. The vast majority of their food storage was devoted to the preservation of agricultural products.

These characteristics matched Gilman's (1983) suggestions of the storage practices that should be associated with the use of pit storage for preservation. Gilman (1983) suggests that groups with a largely permanent residence pattern and a high degree of agricultural reliance will rely heavily on above ground storage. Additionally, if pits are used at all, only a small assortment of foods that preserve better below ground will be stored in pits.

Three groups, the Maricopa, Mohave, and Pima, were located in the southwestern United States, and used pit storage for the preservation of watermelons and pumpkins. These groups used a variety of above ground facilities to store other produce, especially their grain crops (Castetter and Bell 1942: 183-185; 1951: 127, 165; Drucker 1941: 96, 102; Spier 1933: 51-53; 63-65). Two groups, the Miao and the Tiv, primarily used pits for the preservation of root crops. Like the southwestern groups, they also used above ground storage facilities (Bernatzik 1947: 369, 484; Bohannan 1954: 18, 251; East 1939: 87-88; Ling and Ruey 1947: 66).

The Iroquois and the Ngoni used pit facilities for the preservation of beans, root crops, and squashes and stored their grain crops in above ground granaries (Barnes 1948: 5; Lyford 1945: 12; Morgan 1901: 310; Read 1956: 137, 1960: 140-141; Waugh 1916: 43, 48-49). In the past, both of these groups used subterranean storage for concealment rather than preservation. When they used pit storage for concealment, they stored a greater variety of foods in pits, including their grain crops (Read 1960: 140-141; Waugh 1916: 43). In recent times, they have retained the use of storage pits, but only for the preservation of specific foods that evidently keep better in pit facilities. These two groups will be discussed in greater detail in Chapter IV, since they apparently used pit storage for concealment in the past. An examination of the changes that occurred when these two groups shifted from using pit storage for concealment to using it for preservation should enable us to gain a better perspective on what conditions are associated with the use of subterranean food storage.

Six groups, the Marquesans, Ifaluk, Lau, Majuro, Samoans, and Trukese, were located in Oceania. These groups shared a remarkably similar pattern of subsistence activities. Pit storage was the only method of long term food preservation that they practiced (Buck 1930: 132; Burrows 1949: 35-36; Handy 1923: 187-189; Hocart 1929: 139;

Kramer and Nevermann 1938: 190-191). Subterranean facilities were used primarily for the processing (by fermentation) and long term preservation of one food, breadfruit, that was stored in pits each year for use as a lean season staple. Breadfruit was also kept in pits for several years at a time as a famine food (Burrows 1949: 35-36; Coulter 1941: 36; Handy 1923: 8; Hocart 1929: 139; Stone 1951: 5). These Oceanic groups present a unique situation among sedentary agriculturists who used subterranean food storage for preservation rather than concealment, in that they practiced almost no above ground storage. Except for this one deviation, they meet all of the other suggested criteria for unconcealed storage pits that are used for preservation (Table 6). The Truk will be discussed in greater detail in Chapter IV in order to examine this difference in pit use practices.

Nine groups do not meet the criteria (Table 6) suggested for pit storage for preservation (Table 4 and Figure 2). These are the Chukchee, Lapps, Coeur d'Alene (Salish), Eastern Ojibwa, Northern Pomo, Sinkaietk (Salish), Tubatulabal, Chippewa (Ojibwa), and Koryak. Unlike the sedentary agriculturists that I have just discussed, these groups were largely hunter-gatherers who practiced little or no agriculture and who were highly mobile. Eight groups practiced no agriculture at all. Two groups were fully nomadic, six were seminomadic, and one

was semisedentary. The diversity of foods that was stored in pits was also relatively high among many of these groups.

Two groups, the Koryak and the Tubatulabal, stored a small assortment of foods in their pits. The Koryak pickled a small portion of their annual fish catch for use as dogfood, while the Tubatulabal stored pinyon nuts and digger pine cones in pits. Both groups stored much of their food in above ground facilities (Antropova 1964b: 857; Voegelin 1938: 16, 20). The diversity of the stored commodities among these two groups meet the expectations of the proposed model of pit storage for preservation (Table 6).

Six groups, the Chukchee, Lapps, Coeur d'Alene, Eastern Ojibwa, Sinkaietk, and Chippewa, used pit storage for a wide variety of foods (Hilger 1939: 153-154; Itkonen 1948: 384, 391-392; Jenness 1935: 13; Nordenskiold 1882: 481-482; Sauer 1802: 253; Teit 1930: 63). Subterranean storage was the main method of long term preservation among the Chukchee, Chippewa, and Eastern Ojibwa (Antropova and Kuznetsova 1964: 813; Bogoras 1904-1909: 183; Densmore 1929: 40; Hilger 1953: 153-154; Nordenskiold 1882: 467, 481-482), while the Sinkaietk and Coeur d'Alene used pit storage as their main winter storage technique (Cline 1938: 31-32). The Lapps relied on both storage pits and above ground structures for the long term preservation of their

foods. They essentially stored the same foods in their pits and above ground storage facilities (Itkonen 1948).

The large scale reliance on pit storage as a method of preservation among these six groups may be related to environmental conditions of the areas where these groups lived. Four of the six groups were located in the boreal forest and the subarctic regions of northern North America, Siberia, and Scandinavia, whereas two groups, the Sinkaietk and Ceour d'Alene, were located in the relatively harsh climate present in the mountains of northern Idaho. This possible relationship between large scale pit use for preservation by hunter-gatherers and the harsh northern climates where they reside should be examined in detail in future investigations of the conditions associated with pit use for preservation.

Two groups, the Lapps and Chukchee, relied on animal husbandry (reindeer herding) for a significant portion of their subsistence (46 to 65 percent). Fishing was a significant part of five groups' subsistence, and ranged from 26 to 65 percent. These groups included the two Ojibwa groups, the two Southeast Salish groups, and the Koryak. Gathering and hunting were important subsistence activities among the two Salish groups, the two Ojibwa groups, the Northern Pomo, and the Tubatulabal. Gathering made up 26 to 55 percent of these groups diet and hunting made up 26 to 45 percent of their diet. The Ojibwa (both

the Eastern Ojibwa and the Chippewa) will be considered in greater detail in Chapter IV in order to examine the conditions that are associated with storage for preservation among these largely mobile, northern hunter-gatherers.

Summary

These data indicate that although the proposed model (Table 6) of the conditions affecting the selection and use of subterranean storage for concealment and preservation holds true in many cases, there are a number of notable exceptions (Table 7 lists the exceptions discussed in the text). I have made some tentative suggestions regarding why these exceptions occur. The next step is to examine a sample of these cases in greater detail to see if we can discover what other as yet unrecognized variables may be affecting the selection and use of subterranean food storage. In Chapter IV, I will examine nine of these groups, including the Blackfoot, Mandan, Navajo, Zulu, Ojibwa (Eastern Ojibwa and Chippewa), Trukese, Ngoni, Iroquois, and Yucatec Maya using the more detailed information on pit storage that I collected from the Human Relations Area File. This information is listed in the data forms in Appendix A.

Table 7. Groups that diverge from the expectations of the proposed model (see Table 6) of storage pit function.

A. Groups that Used Storage Pits for Concealment:

Delaware
Navajo
Omaha
Mandan
Pawnee
Dard
Papago
Yucatec Maya
Zulu
Lovedu
Iroquois
Yaruro
Katab
Kanuri
Ngoni

B. Groups that Used Storage Pits for Preservation:

Chukchee
Lapps
Coeur d'Alene
Eastern Ojibwa
Northern Pomo
Sinkaietk
Tubatulabal
Chippewa
Koryak

CHAPTER IV

HUMAN RELATIONS AREA FILE DATA PRESENTATION

This chapter presents detailed information from the Human Relations Area File in order to illustrate the variability associated with the use of storage pits. I will use a sample of the pit using groups from the HRAF to delineate what socio-economic conditions are associated with the use of storage pits for concealment and for preservation. Hopefully, this exercise will allow us to determine the necessary conditions that are associated with the use of pits for storage.

Nine groups are examined in this chapter. They are the Blackfoot (NF6), Mandan (NQ17), Navajo (NT13), Zulu (FX20), Ojibwa (NG6), Trukese (OR19), Ngoni (FR5), Iroquois (NM9), and Yucatec Maya (NV10). These groups were selected so that the concealment-storage versus preservation-storage dichotomy developed in Chapter III could be examined in greater detail. These groups are representative of the trends delineated in Chapter III. One or more groups were selected from each association of the degree of agricultural dependence and the degree of residential

mobility (Figures 1 and 2). Whenever possible, groups from the southwestern United States were avoided, since Gilman (1983; 1987) has already examined pit storage for this region in some detail. The only exception that I made was in the case of the Navajo, because of the exceptionally rich data on pit storage practices that were available forthis group.

The Blackfoot, Mandan, and Navajo used pit storage for concealment, whereas the Ojibwa and Trukese stored in pit facilities for preservation. The Ngoni, Iroquois, and Yucatec Maya used pit storage for concealment in the past, but now use pits for either preservation (Iroquois and Ngoni) or processing (Yucatec Maya) (Please note that this discussion refers to pit use among the historic Yucatec Maya and not to the chultuns of their pre-Columbian ancestors). The use of pit storage for concealment will be discussed separately from the use of pit storage for preservation. The Ngoni, Iroquois, and Yucatec Maya will also be discussed separately because they represent a unique opportunity to examine changes in the use of food storage pits over time: from concealment in the past to preservation or to processing today.

The following questions are examined for each group discussed in this chapter:

1. What goods are stored in pits?

2. Is the diversity of the stored goods high or low?
3. How intensively is pit storage used by this group?
4. What is the importance of pit storage in the group's subsistence system?
5. What above ground storage facilities are used? What is stored in them? How important is above ground storage?
6. Where are the storage pits located?
7. What is the morphology of the storage pits?

Groups that Used Pit Storage for Concealment

Groups with a Low Degree of Agricultural Dependence and a High Degree of Residential Mobility

The Blackfoot were fully nomadic hunter-gatherers who practiced no agriculture. This group fits Gilman's (1983; 1987) and Ward's (1985) hypotheses regarding the relationship between concealed subterranean storage, a low degree of agricultural dependence, and a high degree of residential mobility (Table 6). The diversity of goods that the Blackfoot stored in pits was high, and included dried bison meat, wild roots, berries, ammunition, moccasins, and tobacco (Forde 1952: 63-64; Wissler 1910: 97). According to Forde (1952: 63-64), all Blackfoot storage methods were aimed at concealing their surpluses.

In addition to storage pits, they also concealed their food surpluses in hollow trees, in rock shelters with concealed entrances, and underwater (Wissler 1910: 97-98). Blackfoot storage pits were essential to the concealment of their surpluses (Wissler 1910: 97). The pits were located near their winter camps and were about four feet deep, lined with stones, and covered with earth (Forde 1952: 63-64; Wissler 1910: 97). This brief synopsis of Blackfoot storage practices shows that they are a perfect example of Gilman's (1987), Deboer's (1988), and Ward's (1985) models (Table 6).

Groups with a High Degree of Agricultural Dependence and a Semisedentary Residence Pattern

Two groups will be discussed here, the Mandan and the Navajo. Both of these groups had a high degree of reliance on agriculture and were seasonally mobile. The Mandan and Navajo diverge from the expectations of Gilman's (1983, 1987) and Ward's (1985) models because they were agriculturalists who were residentially mobile and who relied heavily on pit storage for concealment (Table 6). The subsistence-settlement system of these groups suggests that the key factor associated with concealed pit storage is seasonal settlement abandonment, and that the degree of agricultural dependence is not a causal factor in the use of pits for concealment.

The Mandan, who were located on the Northern Plains, in the Middle Missouri region of South Dakota, relied on two resources, bison and agricultural products, for the bulk of their diet. They derived 46 to 55 percent of their subsistence from agriculture and 26 to 35 percent from hunting. Because of their subsistence system, the Mandan had two settlement patterns. In the late winter, spring, and summer, they were fully sedentary and resided in their villages, which were located in the vicinity of their fields (Deland 1908: 609). In the fall and winter, they abandoned their villages in order to follow and hunt the bison herds. Each fall, before they left for the hunt, the Mandan concealed large quantities of their harvest in subterranean pits (Deland 1908: 322, 609). Thievery was apparently a serious problem for the Mandan, as well as for all of the sedentary Northern Plains tribes, and the use of pit storage for concealment was a common practice among them.

Mandan storage pits were located under the floors of their houses and were scattered throughout the village in the vicinity of their dwellings (Deland 1908: 609; Will and Spinden 1906: 110). When the Mandan covered a pit in the fall, they carefully noted the distance to some fixed object, like a door or hearth, so that their stores could be located when they returned to their villages in the spring (Deland 1908: 609). Mandan pits were bell-shaped

with an opening that was barely large enough for a person to enter. The pits were quite large, ranging from 6 to 8 feet deep, and had a capacity of 20 to 30 bushels. After the pits were filled, they were carefully covered with raked earth that obliterated all traces of their locations (Catlin 1857: 122; Deland 1908: 609; Will and Spinden 1906: 110).

Like the Blackfoot, the Mandan stored a wide variety of goods in their pits, including corn, squash, beans, meat, pemmican, and valuable household utensils (Catlin 1857: 122; Deland 1908: 322, 609; Will and Spinden 1906: 110). They apparently had little or no use for above ground storage facilities, since none were mentioned in any of the reviewed ethnographies, and since Will and Spinden (1906: 110) state that the use of concealed pit storage was their main storage technique. Pit storage was apparently of major importance to Mandan subsistence practices; the use of pits enabled them to keep food for several years in a safely hidden storage container that served the dual purpose of preserving their agricultural produce from both human predation and the elements (Will and Spinden 1906: 110).

The Navajo were located in the southwestern United States, in northwestern New Mexico and northeastern Arizona. Like the Mandan, they were semisedentary, they relied on pit storage for concealment, and they stored a

highly diverse selection of foods in their pits. Their stored goods included their winter corn supply, squash, dried roots, seeds, pumpkins, dried melons, beans, dried peaches, and wheat (Bailey 1940: 290; Brewer 1937: 58; Dyk 1938: 64, 81-82; Hill 1938: 42-50). The Navajo relied on agriculture for 36 to 45 percent of their diet, and on animal husbandry for 26 to 35 percent of their diet. Concealed pit storage apparently was used for a significant portion of their annual harvest. In one instance, a Navajo group stored 57 sacks of corn in pits located near their fields and carried 30 sacks to their winter camp (Dyk 1947: 64).

The Navajo used pit storage because it prevented thievery, and because it preserved their corn for up to two years (Brewer 1937: 58; Hill 1938: 43-45). Most of their above ground storage was also aimed at concealing their surpluses from human predation. They concealed food in cedar trees in the mountains and in natural rock shelters that had hidden entrances (Dyk 1938: 352-353; Hill 1938: 43-45). Even though the majority of their storage was aimed at concealment, the Navajo did have above ground facilities that were located near their dwellings (Landgraf 1950: 107).

A large percentage of Navajo storage pits were located at their agricultural fields (Dyk 1938: 220-221, 1947: 39-40). They also located their pits a day's ride from

their spring camps (Dyk 1938: 81-82). The Navajo stored their winter corn supply in pits and travelled to the cache locations throughout the winter as they needed to draw on the supplies (Hill 1938: 43). Navajo corn pits were bell-shaped, and all signs of the pit's locations were obliterated when they covered them (Hill 1938: 42-45).

The Navajo's significant reliance on animal husbandry and gathering, in addition to their agricultural crops, possibly necessitated their seasonally mobile residence pattern. They would have had to move the herds throughout their territory during the year in order to keep their animals from overgrazing any one part of the range. Their need for concealment was necessitated by a problem with human predation on the unattended stored surpluses.

Groups with a high degree of agricultural dependence that lived in largely permanent villages

The Zulu were located in the Natal province of South Africa. This group does not meet Gilman's (1983, 1987) and Ward's (1985) expectations regarding settlement-subsistence systems that should be associated with the use of concealed pit storage (Table 6). Like the Mandan and the Navajo, the Zulu had a high degree of reliance on agriculture; in contrast, they lived in permanent villages. The co-occurrence of a sedentary life style and a heavy reliance on storage pits for concealment, as in the case of

the Zulu, throws into doubt Gilman's (1983, 1987) and Ward's (1985) suggestion of a causal relationship between seasonal settlement abandonment and concealed pit storage.

Like the Navajo, the Zulu relied on agriculture (46 to 55 percent) and animal husbandry (36 to 45 percent) for much of their diet. The Zulu lived in largely permanent family homesteads and had a high diversity of stored foods. Their stored commodities that included sorghum grain, beans, millet, and maize (Bryant 1949: 303; Krige 1965: 42; Mayr 1965: 467; Raum 1973: 145; Reader 1966: 35; Tyler 1891: 42). Pit storage was the Zulu's main form of permanent winter storage; with it their crops could be preserved for up to two years (Krige 1965: 44, 202; Mayr 1965: 467). In addition to long term pit storage, the Zulu used above ground granaries for temporary storage (Krige 1965: 44). Traditionally (1847-1862), they put their grain in above-ground bins for a few months after the harvest, and then threshed it and put it in their pits when winter set in (Grout 1864: 103-104).

Zulu subterranean facilities were located in their cattle kraals, in the center of their compounds (Grout 1864: 103-104; Krige 1965: 42; Raum 1973: 145). Their pits were bottle shaped, held from 50-100 bushels of grain, and were lined with clay taken from ant mounds, making them waterproof (Grout 1864; 103-104; Krige 1965: 44; Tyler 1891; 42). The pit mouths were closed with stones that

were plastered with cow dung (Bryant 1949: 303; Tyler 1891: 42). After the pits were covered, there was no outward indication of the pits' locations, since they were in the kraal and were trampled by the cattle (Grout 1864: 103-104; Krige 1965: 44).

Pit storage provided an efficient method of preservation because it protected the stored foods from weevils (Bryant 1949: 303; Grout 1864: 103-104). Zulu pit storage is considered to represent the use of subterranean facilities for concealment because of the apparently concealed location of their pits, and the fact that this form of storage is almost extinct in southern Africa (including Zimbabwe) today (Robinson 1970: 63).

Discussion

The Blackfoot, Mandan, Navajo, and Zulu had both similarities and differences in their subsistence and storage practices. All of these groups concealed a wide variety of commodities in their storage pits, and each group relied heavily on subterranean facilities for the concealment and long term preservation of their staple foods. The subterranean storage facilities used by all four groups apparently had similar morphologies. All of their pits were quite deep and had a large capacity with a low surface-to-volume ratio. Navajo, Mandan, and Zulu pits also had bell-shaped profiles, and therefore fit DeBoer's

(1988) and Siegel's (1982) suggestions regarding the most efficient shape of subterranean storage facilities.

Three groups, the Mandan, Blackfoot, and Navajo, were overwhelmingly concerned with the problem of thievery and the need for concealing their food surpluses. Not only did they use concealed storage pits, but they also used various methods of concealed, above ground storage. Their storage facilities were apparently vulnerable to depredations by thieves because all three groups had some degree of residential mobility. It is not clear what factors caused the Zulu to choose concealed pit storage, since the concealment function of their storage facilities is inferred. Perhaps their use of concealed storage is related to the endemic warfare that was characteristic of their society in the mid to late nineteenth century.

There are several aspects of the Blackfoot, Mandan, and Navajo subsistence systems that were notably different from each other. The three groups had radically different degrees of reliance on agriculture, and the reasons for seasonally abandoning the locations of their winter food supply were somewhat different. The Blackfoot were fully nomadic hunter-gatherers who practiced no agriculture, whereas both the Mandan and the Navajo had a significant reliance on agriculture. The Mandan seasonally abandoned their villages (and their storage pits) in order to hunt bison. This suggests that bison were a valuable enough

resource to offset the risk of losing their stored crops to human predation while they were away from their villages. The Navajo possibly concealed their stored commodities because of their significant reliance on animal husbandry and gathering in addition to agriculture. This subsistence pattern forced them to be residentially mobile, as they collected seasonally available wild plants and rotated their herds through their territory in order to avoid overgrazing any one part of their range.

Groups that Used Pit Storage for Preservation

Groups with a Low Degree of Agricultural Dependence and a High Degree of Residential Mobility

The Ojibwa were seminomadic and relied on hunting, gathering, and fishing for most of their diet. One subgroup, the Eastern Ojibwa, practiced no agriculture, while another, the Chippewa, were extensive agriculturists, with agriculture making up 16 to 25 percent of their diet. The Ojibwa are inferred to have used pit storage for preservation rather than concealment, because their pits do not seem to have been concealed (Hilger 1939: 153). Additionally, Densmore (1929: 40) notes that their pit facilities were rarely disturbed by thieves. The Ojibwa do not meet the suggestions that I made in Chapter III for the settlement-subsistence system that should typify groups that use pit storage for preservation (Table 6).

Therefore, they weaken Gilman's (1983, 1987) arguments regarding the relationship between concealment, pit storage, a low degree of reliance on agriculture, and a relatively high degree of residential mobility (Table 6).

The diversity of stored goods among the Ojibwa was high, and included maple sugar, wild rice, smoked fish, meat, vegetables, seed potatoes, seed corn, dried corn, dried meat, and fish (Densmore 1929: 46; Hilger 1951: 149; Jenness 1935: 13-16). At one time, they stored dried berries in pits, and later they stored potatoes, rutabagas, and several varieties of canned berries (Hilger 1939: 153). Subterranean storage was the Ojibwa's main storage technique. Pits were used for the summer and winter preservation of food (Densmore 1929: 40; Hilger 1951: 154), which was successfully stored for up to a year in this manner (Hilger 1939: 153).

The Ojibwa located their pits near their summer dwellings, outside their lodges, and beneath their house floors (Densmore 1929: 29, 40; Hilger 1939: 154). Their pits were six feet deep and were filled with baskets and bark containers full of their surpluses (Densmore 1929: 40). The pits were covered with a mound of earth that was up to eighteen inches high (all of the authors mention that the pit covers are mounded) (Hilger 1939: 153).

Groups with a High Degree of Agricultural Dependence that Lived in Largely Permanent Villages

The Truk were located in Oceania and most of their subsistence came from two sources -- agriculture (46 to 55 percent) and fishing (45 to 55 percent). They lived in largely permanent, separated hamlets and stored only one commodity for long periods: fermented breadfruit. Breadfruit was their main staple, providing their chief source of food all year around. It was available fresh for six months of the year and was intensively preserved for the other six months when the Truk relied on fermented breadfruit as their lean season staple. Breadfruit was also stored for several years at a time as a potential famine food (Goodenough 1951: 23; Hall and Pelzer 1946: 53; LeBar 1963: 117; Matsumara 1918: 53-54).

Breadfruit was both stored and processed for storage in pit facilities. Breadfruit was processed and stored by the Truk in the following manner: the fresh breadfruit was peeled and placed in shallow pits, where it fermented and was thus preserved for long periods of time (Gladwin and Sarason 1953: 34; Hall and Pelzer 1946: 53). Breadfruit pits were funnel shaped and rather shallow, with diameters ranging from three to five feet, and depths of two feet (Bollig 1927: 60; Murai 1954: 156). Breadfruit pits were not concealed and were covered with large stones that made them easy to recognize (Bollig 1927: 60).

Two types of breadfruit pits were used. They were not morphologically different but were distinguished by the quality of the breadfruit that was stored in them. The best breadfruit was put in the first type of pit, which was filled early in the growing season by cooperating groups of lineage members. The second type of pit was built later in the season and was filled with the inferior fruits. These second pits were only opened and used after the superior breadfruit in the first type of pit was consumed (LeBar 1963: 195-197).

The Truk had a rather minor reliance upon above ground storage facilities. Fish were kept for a few days by salting them, and breadfruit and taro were made into doughy loaves that they stored in their houses (Hall and Pelzer 1946: 46). This method of preservation probably represented temporary storage for immediate use.

Discussion

Neither the Ojibwa nor the Truk fit Gilman's (1983; 1987) suggestions regarding the use of subterranean pit storage for preservation (see Table 6). While the Truk were sedentary agriculturalists who exhibited a very low diversity of stored commodities in their pits, they also had no reliance on above ground storage facilities. This is probably explainable because of the nature of the crops they are preserving and because of the limitations that

their tropical environment places on most other forms of large scale, long term food preservation. Their only stored commodity, breadfruit, was preserved by fermentation in shallow pits. In this situation, a pit formed a perfect container in which to preserve this food. The Trukese subsistence pattern was typical of the six Oceanic groups that were discussed in Chapter III. These groups apparently are a rather unique case where pit storage was the best way to store their primary lean season staple.

The Ojibwa do not fit Gilman's model in any respect (Table 6). They were highly mobile hunter-gatherers with only a small reliance on agriculture. They stored a wide variety of commodities in their pits, which was their main method of preservation. The Ojibwa are an example of the six groups identified in Chapter III who all exhibited this anomalous subsistence and storage pattern. Perhaps these groups had a large scale reliance on pit storage and a high diversity of stored goods in subterranean storage devices because this form of storage may represent an excellent method of preservation in the colder northern climates where these groups were located. Unfortunately, the presence of groups who used pit storage for preservation and who also stored a wide vareity of foods in their pits limits the viability of using the degree of diversity of stored goods as a method of differentiating concealment storage from preservation storage.

Groups that Changed from Storage for Concealment to Storage for Preservation

Subterranean storage among he Ngoni, Iroquois, and Yucatec Maya will be examined in this section. These three groups present a unique opportunity to examine the role of concealment and preservation in the selection and use of storage pits, because all three exhibit change through time in the reasons why they used pits for food storage. In the past, pits were used to conceal food from human predation. In this century, subterranean storage has continued in use among all three groups, but now it seems to be used for preservation. When these groups shifted from using pits for concealment to using them for preservation, several changes occurred in the nature of their pit storage practices. Most notably, the diversity of foods that were stored in pits was reduced, and there were changes in the form and locations of the group's pit facilities.

The Ngoni

The Ngoni are sedentary agriculturalists located in Malawi, Africa, who rely on fishing for 16 to 25 percent of their diet, and on agriculture for 56 to 65 percent of their diet. Today, they store chilis, beans, and sweet potatoes in pits, but in the past they stored these as well as millet, which was their staple grain (Read 1956: 137, 1960: 140-141). In the past, they stored a greater variety

of commodities in pits, when they were apparently used for concealment, than they do now. The Ngoni millet pits, like the grain pits of the Zulu, were located in their cattle kraals, thus implying concealment.

In contrast, the modern pits for chilis, beans, and sweet potatoes are located in the side verandahs of their houses (potatoes stored here) and under the eaves of their roofs (potatoes, beans, chilis). Based on the location of these facilities and upon the fact that grains are no longer stored in pits, I infer that pit storage in modern times is for preservation and not concealment.

In the past, pit storage seems to have been the main bulk storage technique. At some time in the recent past, however, above-ground grain bins replaced pits for the storage of Ngoni staple cereals, and maize replaced millet as the staple grain (Read 1956: 137, 1960: 140-141). Ngoni grain bins consist of a bamboo granary that is placed on a raised platform (Barnes 1948: 5). The modern Ngoni also store food by suspending it from the rafters of their houses, and placing it in pots located on their verandahs (Read 1956: 137).

The Iroquois

Like the Ngoni, the Iroquois are sedentary agriculturalists who once used food storage pits for concealment but now use them for preservation. They rely

on agriculture for 36 to 45 percent of their diet and to a lesser degree on hunting and fishing. The Iroquois stored a greater variety of commodities in pits in the past than they do today. In modern times, they store pumpkins, squashes, potatoes, and carrots in subterranean facilities (Waugh 1916: 43). In the past, they stored these commodities plus surplus dried corn and possibly meat and venison in the pits (Morgan 1901: 311; Waugh 1916: 43).

According to Waugh (1916: 2, 42-43), subterranean storage was used by the Iroquois in the past for two reasons: 1) to conceal food surpluses from their needy neighbors in order to avoid excessive requests for largess from their larders and 2) to guard against the capture of their food stores by their enemies. Pits are no longer used for concealment; they are now used for the winter preservation of root crops and vegetables. The modern pits are covered with earth that is mounded up for several feet over each pit in order to protect its contents from frost (Waugh 1916: 42-43). Corn is no longer stored in pits. Instead it is stored in above ground corn cribs that were adopted from the early settlers (Lyford 1945: 16; Waugh 1916: 43).

The Yucatec Maya (Historic)

The use of pit facilities among the historic Yucatec Maya is somewhat different than it is among the Ngoni and

Iroquois. While the Yucatec Maya used large bell shaped pits for the short term concealment of corn in the past, they now use pit facilities not for concealment, but for the processing of certain commodities. Small bell shaped pits are used to ripen bananas and zapotes and to ferment alcoholic beverages. Pits were used in the past to store corn for a month or two during times of unrest. The pit storage of corn in the Yucatan Peninsula is not very successful, because the extremely wet microenvironment of the pit's interiors soon causes the concealed corn to start to decay (Gotthilf 1982: 150-160).

The corn pits used by the Yucatec Maya in the past were quite large, with a capacity of approximately 500 kilograms. Modern zapote processing pits are by contrast quite small, with a capacity ranging from 20 to 50 kilograms. Zapote pits are located on patios adjacent to Yucatec Maya dwellings, whereas the larger corn pits were located in a variety of places including their agricultural fields, the vicinity of their dwellings, and in the bush at some distance from the towns. Corn and other agricultural products are stored today in a variety of above ground localities, including corn cribs that were located in their agricultural fields and bins and sacks in their dwellings (Gotthilf 1982: 150-160).

Discussion

When the Ngoni, Iroquois, and Yucatec Maya changed from using pit storage for concealment to using pit storage for preservation or processing, several changes occurred in the nature of their subterranean storage practices. Most notably, the diversity of foods that were stored in pits was reduced. In addition, there were also changes in the form and locations of the group's pit facilities. In the past, all three groups used pit storage to conceal their staple grains. In modern times, they no longer need to conceal their surpluses, and their grain crops are stored in above ground bins or cribs. Pit storage is now used for the long term preservation of particular vegetables and root crops that preserve better in these facilities than elsewhere.

The location of Ngoni pit facilities changed when they ceased using storage pits for the concealment of their staple grains. In the past, the Ngoni concealed their grain in pits located in their cattle kraals, whereas today, their preservation pits are placed adjacent to their dwellings. When the Yucatec Maya ceased using pit storage for concealment, the locations of their pits became more restricted. In the past, they concealed corn in pits located in their fields, in the bush some distance from their communities, and next to their dwellings. In

contrast, their modern zapote processing pits are placed in the patios adjacent to the dwellings.

Changes in pit morphology that accompanied the change from using pits for concealment to using pits for preservation are rather subtle and are probably archeologically invisible. There were no data on pit morphology recorded for the Iroquois or the Ngoni. When the Yucatec Maya shifted from concealing corn in pits to ripening zapotes and bananas in them, the shape of their pits did not change, but the volume was reduced markedly. Concealment pits were huge, with an average volume of 500 kilograms, whereas processing pits are small, ranging from 20 to 50 kilograms in size. Both types of pits are bell shaped.

CHAPTER V

CONCLUSIONS

My cross cultural examination of a worldwide sample of pit using societies has enabled us to gain a better perspective on the role of pit storage in prehistoric economies. The primary goal of this research was to identify the principal factors affecting the selection and use of subterranean facilities for food storage. I identified and discussed three reasons why subterranean food storage facilities are selected for storage: concealment, preservation, and processing. I examined the role of concealment and preservation in the selection and use of storage pits and tested DeBoer's (1988), Gilman's (1983, 1987) and Ward's (1985) suggestions of the causes for the use of subterranean facilities (Table 6).

What does this study allow us to say about the role of concealment in the selection and use of subterranean storage? First, DeBoer's (1988), Gilman's (1983, 1987), and Ward's (1985) hypothesis that pit storage is usually selected as a method of concealment by groups with a low degree of agricultural dependence and a high degree of

residential mobility is questioned. This study shows that the degree of agricultural dependence plays little part in delineating which groups will use pit storage for concealment. It also strongly suggests that seasonal settlement abandonment is not always associated with a need to hide food.

I have observed several conditions that are apparently always present when pit storage is selected for concealment. First, the condition that triggers a need for concealment and the subsequent selection of pit storage to solve this need is the presence of human predation, either in the form of intergroup thievery or intragroup requests for handouts. Second, there is usually a relatively high diversity of commodities stored in pits by groups that used subterranean facilities for concealment, and pit storage was often the main storage technique practiced by these groups. Unfortunately, there are also several groups who used pit storage for preservation who also stored a wide variety of foods in their pits and used pit storage as their major method of food preservation. Consequently, the storage of a diverse assortment of foods in pits is not exclusively associated with the use of pit storage for concealment.

Four of the twenty-eight groups who used pit storage for concealment diverged from the conditions that are usually associated with the use of subterranean storage for

concealment. Although the Katab, Lovedu, Kanuri, and Yucatec Maya all used storage pits to hide their staple foods from human predation, all four groups limited their use of pits to the concealment of one commodity, their staple grains. Three groups, the Katab, the Lovedu, and the Kanuri, were located in Africa, while one group, the Yucatec Maya, was located in the Yucatan Peninsula of Mexico. All four groups lived in permanent or nearly premanent villages, and had a high degree of agricultural dependence.

The low diversity of goods that was stored in pits by these groups suggests that either (1) staple grains were the only stored commodity that was subject to theft among these groups or (2) staple grains were the only foods that were intensively stored by these groups. In any case, the presence of a small number of concealers who stored a low diversity of foods in their pits shows that a few sedentary agriculturalists will diverge from the dominant pattern associated with concealed pit storage. The fact that three of these four exceptional groups were located in Africa suggests that there may be regionally specific variations in the conditions that are associated with the use of subterranean food storage. Future investigators should pay particular attention to African groups when they are examining the conditions associated with the use of subterranean food storage.

I also have observed several conditions that are frequently, but not always, associated with the use of pit storage for preservation. With two notable exceptions, the use of pits for preservation usually entails (1) a lower diversity of goods that are stored in pits, (2) a lesser importance of pit storage in the overall subsistence economy, and (3) a heavy reliance upon above ground storage facilities in addition to pits.

The exceptions to this pattern are (1) the six groups discussed in Chapter III, who were located in the boreal forest or subarctic regions of northern North America, Siberia, and Scandinavia, and the alpine conditions of the Northern Idaho mountains (Chippewa, Chukchee, Coeur d'Alene, Eastern Ojibwa, Lapps, and Sinkaietk) and (2) the six groups discussed in Chapter III who were located in Oceania (Ifaluk, Lau, Majuro, Marquesans, Samoans, and Trukese). These twelve groups diverged from the conditions that are usually associated with pit storage for preservation in two distinct ways.

First, the Oceanic groups, who were typified by the Truk, were sedentary agriculturalists who used pit storage as their main form of preservation. Little or no above ground storage was practiced by these groups. All six groups did store a low diversity of crops in pits, since subterranean storage was primarily used for the preservation by fermentation of one staple food

(breadfruit). These groups present a rather unique case where pit storage was the best way to store breadfruit, which was their primary lean season staple. In the tropical environments where these groups lived, the storage of fermented breadfruit in pits was apparently the only viable alternative for the long term preservation of this vital crop.

Second, the six groups of preservers that were located in boreal, alpine, and subarctic environments and who were typified by the Ojibwa, were highly mobile hunter-gatherers who stored a wide variety of foodstuffs in subterranean facilities. These groups diverged from the conditions that are frequently associated with the use of pit storage for preservation in that pits were used as their primary storage receptacles. These groups apparently present an environmentally restricted situation where the large scale use of food storage pits is an excellent method of preservation in the colder northern climates where they were located.

If these divergent forms of pit storage for preservation are truly restricted to specific environmental zones, than certain predictions can be made about the form that this type of storage may take in these regions. First, groups that live in tropical environments and in high latitudes may be predisposed to select pit storage for the long term preservation of their staple foods

Consequently, the use of pit storage for preservation may be more widespread in these regions than in other areas. Second, groups living in high latitudes and tropical regions will possibly store a wider variety of foods in their pits, since the use of pit storage for preservation may be one of the best methods of long term storage in these areas. The evidence suggests that this is not so in Oceania, where breadfruit is often the only plant food that is stored. Third, it is possible that groups living in tropical regions and high latitudes may use less above ground storage than groups that live in other environmental zones.

The apparent regional and enviromental variations in the form of pit storage for preservation and concealment that this study has delineated should be examined in greater detail by future investigators. Future studies of pit storage that use ethnohistoric data should incorporate detailed environmental data about the localities where each group resides. This will allow us to see if any of the patterns of pit storage that this study has identified are restricted to specific environmental or regional zones.

This study shows that the socioeconomic conditions that are associated with the use of subterranean storage are highly diverse and very complex. Consequently, it is difficult to delineate all of the necessary conditions associated with the use of these facilities. Furthermore,

the sufficient conditions that have been described in this paper would often be archeologically invisible. For example, the presence of human predation, which prompts groups to select concealed storage strategies, usually cannot be distinguished in the archeological record. Additionally, the diversity measure that was developed in this study to differentiate preservation storage from concealment storage would be very difficult to delineate Finally, the heavy use of above ground storage that is often associated with the use of pit storage for preservation is often hard to distinguish in the archeological record. It is often hard to assign a storage function to the archeological remains of above ground structures.

Fortunately, my study indicates that preservation storage pits can often be distinguished from concealment storage pits in the archeological record. The unconcealed nature of preservation pit storage often enables us distinguish this type of storage from concealment storage. Pit storage facilities that are used for preservation are frequently protected from the elements by various types of roofed structures. Evidence of these structures would often be preserved in the archeological record in the form of post mold patterns located adjacent to or within pit facilities. Consequently, when pits are found on archeological sites that have evidence of roofs or other

unconcealed covers, than these pits may represent the use of pit facilities for preservation. For example, Schroedl (1986) found oblong pits with posts at each end at the Overhill Cherokee site of Chota-Tanasee. These facilities may represent preservation pit storage.

This study has several important consequences for the interpretation of archeological pit features. First, my data show that subterranean food storage is used for preservation as often as it is used for concealment. Consequently, one cannot interpret all archeological storage pits as representing concealed storage. Second, I have shown that a high degree of agricultural dependence and a low degree of residential mobility are not exclusively associated with the use of concealed pit storage. Hence, the presence of storage pits on an archeological site does not necessarily imply that the site inhabitants were residentially mobile hunter-gatherers. Finally, there is evidence that in some cases concealment storage pits can be distinguished from preservation storage pits, if the preservation pits are covered with a roof or hut.

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APPENDIX A

DATA FORMS COMPILED FROM THE HUMAN RELATIONS AREA FILE

HRAF Information Leslie E. Raymer

Group: Korea (AA1)

Location:

Other Names:

Data Quality: Fair

Why store:

What store: Cabbage and turnips (Han 1949: 168); kim-chi (cabbage) (Kang 1931: 51).

Importance as storage technique: Keep products through winter (harvested in late September) (Han 1949: 168). Kim-chi keeps for a year (Kang 1931: 51).

Other storage techniques: Above ground granaries and storage rooms (Han 1949: 168).

Importance of stored commodity:

Pit morphology: Larger cabbages and turnips put in um, a large hole dug in the back yard (Han 1949: 168). Kim-chi is "made from tender long vegetables, somewhat like cabbage. It was preserved with salt, red hot pepper, and sometimes fish, and put underground for a year in tall jugs 6 feet high (Kang 1931: 51)."

Illustrations: None

Pit locations: Large holes in the backyards of dwellings (Han 1949: 168).

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Okayama (AB43)

Location: Central Japan

Other Names:

Data Quality: Good.

Why store: Preservation (not concealed).

What store: Starchy root crops (sweet potatoes, taro, and a few white potatoes) (Beardsley, et al. 1972: 106); sweet potatoes (briefly cured in sun) (Norbeck 1954: 36).

Importance as storage technique: Store "against the winter cold" (Cornell 1956: 165).

Other storage techniques: Above ground storehouses; detached buildings (Beardsley, et al. 1972: 77, 106); in house in roof beams (Cornell 1956: 165).
Rice stored in village storehouse (Sigur 1979: 133); greens and onions stored in house (Norbeck 1954: 36).

Importance of stored commodity: Starchy root crops supplement cereals (Beardsley et al1972: 106).

Pit morphology: Covered, straw-lined pit (Beardsley et al. 1972: 106). Other root crops are stored in earth-lined pits, that are covered with board lids (Cornell 1956: 165). Earthen pits are lined with rice hulls and straw. Pit facilities are often permanent (Norbeck 1954: 36).

Illustrations: None

Pit locations: Front of each house (Beardsley et al 1972: 106). Beside the irori (Cornell 1956: 165). Frequently dug in the floor of the entrance room of the dwelling or in an outbuilding (Norbeck 1954: 36).

Pit preparation:

Pit dimensions:

Group: Okayama (AB43)

Other: "Potatoes rarely spoil, but are sometimes gnawed by rodents (Norbeck 1954: 36)."

Stone and concrete pits have been built in recent years to prevent rodent damage, but spoilage is thought to be greater (Norbeck 1954: 36).

HRAF Information Leslie E. Raymer

Group: Miao (AE5)

Location: Central China

Other Names:

Data Quality: Good.

Why store: Preservation (not concealed).

What store: Potatoes and sweet potatoes; sugar cane (Ling and Ruey 1947: 66).

Importance as storage technique:

Other storage techniques: In wealthy family homes, side rooms or 2nd story used for storage of grain. Storage lofts used for grain (Ling and Ruey 1947: 66). Several storage lofts in each house (Bernatzik 1947: 369). Detached granaries were used in there was a rich harvest (Bernatzik 1947: 484).

Importance of stored commodity:

Pit morphology: Houses often have underground storage places, which are about a chang deep and divided into 2 or 3 bins for storing potatoes and sweet potatoes (potatoes are imported crops). Pits are covered with a bamboo, plaited cover, to allow free circulation of air (Ling and Ruey 1947: 66).

* "After harvest, canes are tied up and stored in earth pits about one kung ch'ih deep." Pits are lined with cane leaves, on which the cane is placed. Pits covered with leaves and dirt. Stick in ventilation tubes to insure flow of air so won't decay (Ling and Ruey 1947: 97).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Group: Miao (AE5)

Other: Canes carried to town for sale on market day. (Ling and Ruey: 1947: 97).

HRAF Information Leslie E. Raymer

Group: Sinkiang (AI1)

Location: Northwest China (Sinkiang)

Other Names:

Data Quality: Poor

Why store:

What store:

Importance as storage technique:

Other storage techniques: New Uighurs -- store in outside above ground granaries (University of Washington 1956: 247).

Importance of stored commodity:

Pit morphology: "Necessary to store vegetables throughout the winter by burying them in deep pits. Didn't have to dry them first because of dry air. Mouths of pits were filled with a layer 3 feet thick of branches, matting, straw, and leaves, a small hole closed with straw only being left for the gardener to get in and out by (Skrine 1962: 80)."

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: "As we had no greenhouse due to the prohibitive cost of glass, stored food in pits (Skrine 1962: 80)."

HRAF Information Leslie E. Raymer

Group: West Tibetans (AJ4)

Location: Southwestern China (Tibet)

Other Names:

Data Quality: Poor (Ramsey 1890: 30) -- All

Why store:

What store: Grain.

Importance as storage technique:

Other storage techniques:

Importance of stored commodity:

Pit morphology: Panga (storeroom for grain) -- "underground compartments kept for the storage of grain."

Illustrations: None

Pit locations: Keep in house (each cultivator).

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Dard (AV3)

Location: India

Other Names:

Data Quality: Fair

Why Store: Concealment (hidden from invaders; only owners know location).

What Store: Grain of every kind, butter, etc. (Leitner 1893: 39-40). Clarified butter (Biddulph 1880: 84).

Importance as storage technique: Can store butter for great number of years (over 100 years) (Biddulph 1880: 84).

Other storage techniques:

Importance of stored commodity: "Wealth is calculated by the owners by the amount of butter stored up" (Biddulph 1880: 84).

Pit Morphology: In cellars - "A tree is sometimes planted over store to make sure it isn't being disturbed" (Biddulph 1880: 84).

Illustrations: None.

Pit locations: In mountains or near homes (Leitner 1893: 39).

Pit preparation:

Pit dimensions:

Other: All Dards share the custom of burying provisions of every kind in underground cellars that are scooped out in the mountains or near their homes. Only the Dard have any knowledge of the pits locations. (Leitner 1893: 39).

"The Maharajah's troops when invading Gilgit often suffered severely from want of food, when, unknown to them large stores of grain of every kind, (including butter, etc.) were buried close to them" (Leitmer 1893?: 40).

HRAF Information Leslie E. Raymer

Group: Bihar (AW2)

Location: India

Other Names:

Data Quality: Poor (Grierson 1885: 16) - All.

Why store:

What store: Grain.

Importance as storage technique:

Other storage techniques: Straw or brushwood granary; wattle and daub circular closets in houses.

Importance of stored commodity:

Pit morphology: Underground pits for grain.

Illustrations: None

Pit locations: Everywhere, (also south of the Ganges).

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Tamil (AW16)

Location: Southern India

Other Names:

Data Quality: Fair

Why store:

What store: Millet, sorghum (Dumont 1957: 103).

Importance as storage technique:

Other storage techniques: * Detached granaries and in houses (Singh and Joseph 1965: 58-59).
* "Cylindrical towers are placed on flagging stones and "divided inside, often serving several families" (common storage method, structures are sometimes monumental) (Dumont 1957: 97, 103).
* Small amounts kept in the house, in stacked jars (Dumont 1957: 103; Nambiar and Bharati 1965: 17).
* Rice is stored on the ground, under thick heaps of straw (Ramanathan and Nambiar 1964: 90).

Importance of stored commodity:

Pit morphology: Millet granaries are constructed by hollowing out the subsoil. Sorghum pits are described as "subterranean silos, which are sort of narrow, vertical cones closed with a stone." Grain rapidly ages and is protected from insects (Dumont 1957: 64, 103).
Pits are hard to go into due to heat suffocation; they are large enough for a man to enter (Dumont 1957: 66).

Illustrations: Above ground silos (Dumont 1957: 96; Nambiar and Bharathi 1964: 15, 27).

Pit locations:
Pit preparation:
Pit dimensions:

Other: Mentions "compost pits" located outside house where all refuse thrown (Djurfeldt and Lindberg 1975: 95).

HRAF Information Leslie E. Raymer

Group: Andamans (AZ2)

Location: Andaman Islands, northeastern Indian Ocean.

Other Names:

Data Quality: Fair (Man 1932: 132) 1869-1880 - All.

Why store: Processing

What store: Semecarpus sp.; Artocarpus chaplasha seeds.

Importance as storage technique: Used to process seeds; takes several weeks; until monsoon ends.

Other storage techniques: Other food preserved by smoking it on a shelf above the household fire (pp. 38, 83, 131, 132).

Importance of stored commodity: Popular food for consumption during rainy season.

Pit morphology: Food to be processed in pits is prepared during the monsoon: outer husks of seeds removed, and all people present "partially suck pieces," half-boil fragments in water, wrapped in bundles of leaves and " buried in moist soil." Pits not marked, several weeks later monsoon ends, dig up "decaying deposits."

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: After removed from pits, dried in sun or in nets over fire; baked and eaten.

HRAF Information Leslie E. Raymer

Group: Yugoslavia (EF1)

Location:

Other Names:

Data Quality: Fair (Thurner 1956) - all.

Why store: Preservation (not concealed).

What store: Potatoes (in upper villages) (pp. 41-42).

Importance as storage technique: Winter preservation (upper villages).

Other storage techniques: Croatia and Slavonia: rectangular, wicker corn houses (gives dimensions). Bosnia and Herzegovina: store in attics and in houses. Macedonia: grain bins in houses (p. 65).

Importance of stored commodity:

Pit morphology: Yugoslav Littoral and the Karst: houses have a main room and 2 side rooms. One sideroom is used for storage, and may have several pits for the preservation of food. All ground floor room floors are tiled. Upper villages: find paved pits that are used for winter storage. Close pit with thick wooden beams, than stones, covered with earth. Mark place in winter with stick so can locate in snow (pp. 41-42).

Illustrations: None

Pit locations: Yugoslav Littoral and the Karst: Inside rooms of dwelling (p. 40).

Pit preparation:

Pit dimensions: 1.5 M. deep x 1.2 M. wide (p. 40).

Other:

HRAF Information Leslie E. Raymer

Group: Sarakatsani (EH14)

Location: Central Greece

Other Names:

Data Quality: Fair (Campbell 1964: 21 - all).

Why store:

What store: Cheese

Importance as storage technique: Keeps cheese fresh.

Other storage techniques:

Importance of stored commodity:

Pit morphology: Cheese stored below ground to keep it fresh. When cheesemaker comes to village, women make 2 huts for him. One is his dwelling. Other hut is pithouse with floor 3' below ground. Cheese is stored there. Storage hut is entered through low trap door in dwelling.

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: Note that this storage practice appears to be isolated.

HRAF Information Leslie E. Raymer

Group: Lapps (EP4)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation

What store: Meat, fish, potatoes (Itkonen 1948: 384, 391-392).

Importance as storage technique: Preserve food in summer at distant hunting areas until brought home in winter. Skolts stored fish during summer at sites of winter villages.

Other storage techniques: In chests in houses (Itkonen 1948: 384).

Stored meat and milk in a "cold well" (submerged under water). Placed in well in fall. May go bad by the winter (Itkonen 1948: 391).

Reindeer Lapps: store food on raised platforms and freeze (photos and drawings). Reindeer and Skolts: above ground shelters (Itkonen 1948: 397). Temporary meat storage platforms on long poles (reindeer meat until could be carried home (and fowl) (Itkonen 1948: 406-407).

Above ground log structure identical to subsurface pit structure (placed near Skolt fishing areas (especially near fall villages) (Itkonen 1948: 412). Above ground storehouses on poles (Itkonen 1948: 417).

Above ground storage shelters constructed at a considerable distance from dwellings (Itkonen 1948: 399).

Nili - variety of storehouse that was built on a 4-5 knr. high, polished post. The polished post kept bears and wolverines from raiding storehouses. In the past, nilis were built in hunting areas far from home for storing reindeer meat in the fall. Toward the end of the 19th century, nilis were still common in hunting areas.

Group: Lapps (EP4)

Other storage techniques, continued: In Inari, were built near village and in forest. Floor and walls made of thin boards and roof covered with shingles. In forest, nilis were used to store reindeer meat, dried meat, and fish. Stored goods were taken home in the winter. Skolts built nilis near houses and near fishing grounds (Itkonen 1948: 408-409).

Above ground storage sheds sometimes built in faraway places for the convenience of herdsmen. Meat and fish stored here (Indiana University 1955: 111).

Importance of stored commodity:

Pit morphology: Reindeer Lapps (of Inari) dug cellars under floors of dwellings for storing potatoes. Enter cellar from room by removing 2 floorboards (Itkonen 1948: 384).

"If no cold well in" vicinity, Lapps dug a pit "and lined it with twigs." "Meat was placed in the hole and covered with twigs, leaves, and sand" (protects from animals) (Itkonen 1948: 391).

"Bottom and sides of pits lined with stones and twigs; sometimes bottom and sides are lined with birch bark, and pit covered with sprigs of fir (Itkonen 1948: 391)."

Skolts dug a hole on lake shore (1/2 sylta deep and wide), lined it with layers of fish and salt; covered with bark, peat, twigs, and stones. When arrived at winter village, opened the hole (Itkonen 1948: 392).

In Inari pits were sometimes square and lined with logs (inside dimensions = 2 Knr. long and 1 Knr. wide and high). "Twigs and leaves placed under and above meat." Pit was covered with poles, earth, and big stones (Itkonen 1948: 392).

In village of Iijarvi, fish preserved in holes dug in dry, mossy ground (Itkonen 1948: 392).

Illustrations: Photos of pits: Itkonen 1948: 392, 398. Illustrations of nilis: Itkonen 1948: 409, 411.

Group: Lapps (EP4)

Pit locations: Cellars under floor of houses (Itkonen 1948: 384). Pits often placed in ruins (Itkonen 1948: 391). Skolts placed pits on lake shore (at site of winter village) (Itkonen 1948: 392).

Pit preparation:

Pit dimensions:

Other: "When winter comes the meat is brought home (Itkonen 1948: 392)."

"During the summer, preserving meat is a problem (no salt at distant hunting areas). Meat stored on platform on pole, in pits, and occasionally in cold wells. Brought home in winter. Meat often spoiled (Itkonen 1948: 463)."

Lapps were nomads, and didn't need any outbuildings, except for preserving food. Easiest method was to keep their food in a cold well or a pit. Also build scaffolds of three forked poles on which they hung their meat and equipment. Also used small sheds of high poles to store meat, flour, sugar, and coffee (Indiana University 1955: 110).

HRAF Information Leslie E. Raymer

Group: Rural Irish (ER6)

Location: Ireland

Other Names:

Data Quality: Fair.

Why store:

What store: Potatoes, turnips, and mangels (Arensburg and Kimbal 1940: 44); potatoes, roots, and apples, (O'Danachair 1956: 6).

Importance as storage technique: Winter storage (Arensburg and Kimbal 1940: 44).

Other storage techniques: Corn stored in outside ricks or stacks (O'Danachair 1956: 6).

Importance of stored commodity:

Pit morphology: October and November: turnips and mangels pulled and stored in fields, in straw and earth-covered pits. Potatoes similarly stored (Arensburg and Kimbal 1940: 44). Potatoes, roots, and apples stored outside in "suitable pits (O'Danachair 1956: 6)."

Illustrations: None

Pit locations: In fields (Arensburg and Kimbal 1940: 44).

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Malta (EZ6)

Location: Island of Malta, Central Mediterranean

Other Names:

Data Quality: Fair

Why store: Preservation (not concealed).

What store: Imported grain (Luke 1960: 216).

Importance as storage technique: Communal subterranean storage - implied (Luke 1960: 196).

Other storage techniques: Store crops in rooms in house (Bowen-Jones, et al. 1961: 322).

Importance of stored commodity: Staple - imported grain (implied).

Pit morphology: Jar-shaped underground granaries (Knights of Malta). Covered with round stone lids (Luke 1960: 216).

Illustrations: Photo (Luke 1960: 193)

Pit locations: In open space between Valetta and suburb of Floriana (Luke 1960: 216).

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Katab (FF38)

Location:

Other Names:

Data Quality: Fair (Meek 1931: 45-46) - All.

Why store: Concealment (in past, used pits if expected raids).

What store: Grain (p. 45).

Importance as storage technique: Regular storage technique (Kare-kare) (p. 45).

Other storage techniques:

Importance of stored commodity:

Pit morphology: "Decanter-shaped" (resemble graves) "Closed opening with stone and mud plaster" (p. 46).

Illustrations: None.

Pit locations:

Pit preparation: "Dry pits with wood fires" (p. 46).

Pit dimensions:

HRAF Information Leslie E. Raymer

Group: Tiv (FF57)

Location: Southern Nigeria

Other Names:

Data Quality: Good.

Why store: Preservation (pits not concealed, other crops above ground).

What store: Mature and seed yams (Bohannan 1954: 18). Root crops (Bohannan and Bohannan 1953: 15-16). Fresh storage (no processing).

Importance as storage technique: Best way to store potatoes?

Other storage techniques: Millet, maize, and guinea corn stored in above ground granaries (Bohannan 1954: 251; East 1939: 63-64; 72-73). Store in large baskets placed in trees or on raised platforms (Bohannan and Bohannan 1958: 250). Whole yams and sometimes seed yams are stored above ground in small huts (East 1939: 87-88; Abraham 1933: 207-208). Store in houses (Bohannan and Bohannan 1958: 249).

Importance of stored commodity: Yams are a staple. They will keep several months as long as they are kept dry (Bohannan and Bohannan 1958: 249).

Pit morphology: Root crops were stored belowground in trenches, and covered with a matting of dried grass (Bohannan 1954: 18). Deep pit with mud hut built over it. Root crops stored here (Bohannan and Bohannan 1953: 15-16). Seed yams were kept in holes in the ground (East 1939: 87-88).

Pit locations: Stored in fields in trenches (Bohannan 1954: 18).

Pit preparation:

Pit dimensions:

Group: Tiv (FF57)

Other: Yams carefully graded and sorted according to type prior to storage. Placed in pits according to type and size Care to put in trenches symmetrically (Bohannan 1954: 18).

"Millet is stored in shacks on the farms, and is never guarded and apparently never stolen" (Bohannan 1954: 28).

Staple foods are yams, millet, and sorghum (Bohannan and Bohannan 1958: 249).

Comments: Certain amount of secrecy about how much food store, as opposed to how much harvest. Heads of compounds have granaries from which feed whole community (Bohannan 1954: 30).

Sanctions for anyone to look in storage places except owners. Owner keeps most potent magical apparatus there (results if look: women - barrenness; men - bad luck, sterility, and possible eventual death) (Bohannan 1954: 30).

Women have secret caches of food- keep mainly to feed children in time of famine (Bohannan 1954: 30).

Food shortages: held food shared equally. (Bohannan 1954: 30).

<It appears that intra-community concealment was practiced. Granaries - only grain concealed? Opportunistic. Method of concealment: secrecy on how much store and sanctions against looking in other's granaries.>

<* Claiming direct link between pit storage and concealment too simplistic. Concealment can have other expressions, as here, where crops "concealed" in above ground granaries as well as in pits. Indirect link - pits appear to 'conceal' crops, but not cause disguised or locations unknown. Pits covered with mats in fields. Concealment function is blurring of how much stored combined with sanctions on looking in storage places.

HRAF Information Leslie E. Raymer

Group: Ngonde (FN17)

Location:

Other Names:

Data Quality: Fair (Mackenzie 1925: 126) - A11.

Why store: Preservation (also strive to conceal locations).

What store: Meat (Nyakyusa).

Importance as storage technique: Preserves meat for several months.

Other storage techniques: Above ground granaries (grain).

Importance of stored commodity: Visit at night for supplies. Re-cover quickly with sand and water. Visit at night so location remains hidden from neighbors.

Pit morphology: Bury meat in sand for three months under running water.

Illustrations: None.

Pit locations: In sand in running water (this method of pit storage will not be archeologically visible).

Pit preparation:

Pit dimensions:

Other: <Concealment function of pits appears to be secondary. Method of storage is method of preservation.

HRAF Information Leslie E. Raymer

Group: Rundi (FO42)

Location: Rwanda, East Africa

Other Names:

Data Quality: Fair

Why store: Processing; no mention of concealment.

What store: Green bananas, fresh beer (northern and western Ruanda) (Czekanowski 1917: 109-110).

Importance as storage technique: Bananas kept in until ripen and fresh beer until ferments. Pits heated before bananas stored there (N. @ W. Ruanda) (Czekanowski 1917: 109-110).

Other storage techniques: Beans, millet, and sorghum kept in basket-shaped above ground granaries (Meyer 1916: 33, 85). In huts (Meyer 1916: 85). Root crops generally are "left in the ground" until they are used (sweet potatoes, yams, manioc, and arrowroot) (Meyer 1916: 85).

Importance of stored commodity:

Pit morphology: "Caves in shape of butter molds, walls supported by bent branches and hoops." The hoops starting at the bottom form diminishing concentric circles up to the opening which is wide enough for a man to enter (Czekanowski 1917: 109-110).

Illustrations: None.

Pit locations: Near huts (Northern and Western Ruanda) (Czekanowski 1917: 109-110).

Pit preparation: Pits heated before bananas stored there (Northern and Western Ruanda) (Czekanowski 1917: 109-110).

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Ngoni (FR5)

Location:

Other Names:

Data Quality: Good.

Why store: Concealment, in past. Preservation, now (grain once placed in concealed pits in cattle kraals; in modern times, grain storage has been moved to above ground granaries)

What store: Chilies, beans, and sweet potatoes (Read 1956: 137). Sweet potatoes, millet. Millet formerly, potatoes now (Read 1960: 140-141) .

Importance as storage technique: Staple grain stored in the past in pits located in cattle kraals. Formerly seems to have been main bulk storage technique. Other foods (chilies, beans, potatoes) still stored in pits that are located in the side verandahs and under the eaves of their houses (Read 1960:140-141).

Other storage techniques: Rafters of hut; in pots on closed verandah (Read 1956: 137). Above ground granaries (see page 2) (Barnes 1948: 5).

Importance of stored commodity: Millet - staple grain in past. (Read 1960: 141).

Pit morphology: Pits covered with a flat stone, lined with fired mud (Read 1960: 140).

Illustrations: None.

Pit locations: Dug under eaves of house (sweet potatoes, beans, chilies) (Read 1956: 137). In side verandahs (sweet potatoes) (Read 1960: 140). In kraal - staple cereals stored in pits in past (Read 1960: 140).

Pit preparation: Pits dug, mudded, fired, and covered with flat stones. Kraal pits and verandah pits are made the same (Read 1960: 140).

Pit dimensions:

Group: Ngoni (FR5)

Other: Note change in storage of staple cereals from below ground to above ground over time (Read 1956: 137, 1960: 140-141).

[Retained potato pits after grain pits abandoned. Different crops stored in different pits and locations.]

Comments: Each wife had granary built by husband. Stored other foods, such as chilies, beans, and sweet potatoes in rafters of hut, in pots on closed verandah, and in pits dug under eaves (Read 1956: 137).

Part of property of each household was food stored after harvest or gathered from bush (Read 1960: 140).

Formerly Ngoni stored staple cereals in pits dug in kraal. (Read 1960: 140).

"Same kind of pit was sometimes [dug] in side verandah for storing sweet potatoes, but nothing was [now] stored in kraal." (Read 1960: 140).

Maize replaced millet as staple. Above ground grain bins replaced pits (Read 1960: 141).

Presence of large grain stores conferred importance on owners (husbands and wives) (Read 1960: 141).

Above ground granaries made of bamboo or thick grass; sometimes had a plastered detachable roof. Built on platform (plastered) approx. 2 feet off ground. Separate storehouses for each household and each crop. Granaries last 2 to 3 years. (Barnes 1948: 5).

HRAF Information Leslie E. Raymer

Group: Bushmen (FX10)

Location:

Other Names:

Data Quality: Good.

Why store:

What store: "Veld crops", "ostrich egg shells full of water" (Kaufman 1910:30).

Importance as storage technique: Probable small-scale storage;"small caches" are one of several anti-predator techniques (implied) (Kaufman 1910:30).

Other storage techniques: Gathered "veld crops" are kept in small leather sacks in huts. "Store provisions of veld crops in tops of large trees (Kaufman 1910:30)."

!Kung - Kept a small supply of dried meat and hide cached in storage baskets in trees for days of poor hunting (Lee 1966: 180). !Kung - Meat is dried and kept for some time (Marshall 1961: 241).

Importance of stored commodity: Small caches of food reserves (Kaufman 1910:30).

Pit morphology: Bury sacks of "veld crops" and ostrich eggs with water in them (Kaufman 1910:30).

Strychnos cocculoides fruits may be picked green and ripened by burying them in the sand. They will keep several months (Story 1958: 38).

Illustrations: None.

Pit locations:

Pit preparation:

Pit dimensions:

Group: Bushmen (FX10)

Other: "None of the 15 independent camps observed ever kept more than a few days supply of vegetable foods on hand." (Lee 1966: 180).

HRAF Information Leslie E. Raymer

Group: Hottentot (FX13)

Location:

Other Names:

Data Quality: Fair

Why store:

What store: Wild almonds with silky shells; arum roots; various bulbs. Dried and roasted. (Grevenbroek 1933: 185)

Importance as storage technique:

Other storage techniques: In caves (Grevenbroek 1933: 185).

Importance of stored commodity: Winter food supply that was kept "to serve as dainties." Implies was a dietary supplement (Grevenbroek 1933: 185). Among the Nama, meat is salted and dried (Schultze 1907: 14; Schapera 1930: 238). Nara fruit is stored in their houses (Schultze 1907: 22).

Pit morphology:

Illustrations: None.

Pit locations:

Pit preparation: Sun dry food, roast over fire, and "bestow in ditches and caves to serve as dainties".

Pit dimensions:

Other: "More distant natives (Southern Nguni) dig storerooms in the earth in which they skillfully preserve corn for many years"; "To keep dry they fill the bottom with straw to a depth of a span"; "cover sides with same"; "cover mouth of pit with straw, brush and earth (sods)".

HRAF Information Leslie E. Raymer

Group: Lovedu (FX14)

Location: Northeast Transvaal, South Africa.

Data Quality: Fair (Krige and Krige 1943: 19-20) - All.

Why store: Concealment (have to probe with stick to locate) (p. 19).

What store: Dried mealies (p. 19).

Importance as storage technique: Seems to be the main long-term storage technique (implied).

Other storage techniques: Mealies also stored in above-ground bins in enclosure behind huts (mealies store here until dry enough for decobbing.).- implied temporary storage (p. 20).

Importance of stored commodity: Mealies probably dietary staple (implied).

Pit morphology: Narrow neck, roomy, capped with a stone (notes offensive smell when pits were opened, because dampness had entered pit and spoiled mealies. Mealies were still edible) (p. 19).

Pit locations: Pits were located in an open space in village (Khoro). Pits dotted about this space were apparently concealed. Located pits by probing for them with a stick. (implies stone covered with soil layer) (p. 19).

Pit preparation:

Other: Small child put in pit to hand out mealies - size.

Implies pits individually owned (people want to trade for grain) (p. 19).

Notes lack of accumulation of large surplus (after harvest beer parties consume surplus) - helps prestige. Form of insurance considering lack of reliable termite-proof storage (Krige 1964: 19).

HRAF Information Leslie E. Raymer

Group: Zulu (FX20)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment implied (no outward indication of cache pit location) (Raum 1973:145).

What store: Grain (Krige 1965: 42; Tyler 1891: 42). Sorghum grain (Bryant 1949: 303). Surplus grain (Reader 1966: 35). Indian corn, beans, other cereals (Tyler 1891: 42). Maize, millet (Raum 1973: 145). Maize (Mayr 1965: 467).

Importance as storage technique: Winter granaries (after harvest, corn not needed for immediate use put in pits - permanent storage (Krige 1965: 44, 202). Surplus grain stored (Reader 1966: 35). Could keep corn for a year or two in storage pits (Mayr 1965: 467).

Other storage techniques: Grain threshed in autumn. Put in temporary granaries (grass huts) in between dwellings. Beer and vegetables also stored in huts located between dwelling and outer fence (Krige 1965: 44). Grain baskets (3' diameter) on raised platforms (plastered with cow dung (Bryant 1949: 303). Ouside dwellings. Above ground granaries (Reader 1966: 35).

A. Traditional Zulu (1847-1862) "stored maize for a few months in cylindrical reed bins, raised a little from the earth." Grain was left here until winter began to set in, at which time (around May), they threshed the grain and placed it in pits (Grout 1864: 103-104).

Importance of stored commodity: Probably grain is a staple (inferred).

Pit morphology: B. Traditional Zulu (1847-1862) placed maize in airtight pits in May. Located in cattlefold (in central part of kraal) and provided protection from weevils.

Group: Zulu (FX20)

Pit morphology, continued: B. Pits were bottle-shaped -- had a small round mouth, neck was 2' deep, at this depth the pit widened in all directions. Pits held 50-100 bushels. Was sealed with stone and earth, which was trampled by cattle (Grout 1864: 103-104).

Pits have narrow funnel-shaped mouths and are lined with clay from ant heaps which is impermeable to water. If pits were damp, they were lined with banana leaves. Fine grass layer was placed at bottom, then the crops were added. When the pit was full, the opening was covered with a thick layer of grass, mud, and a stone. After it was covered, there was no outward indication of the pits' location (Krige 1965: 44). Calabash shaped (Bryant 1949: 303). Pit mouth was covered with stone, that was plastered with cow dung, and covered with soil (Bryant 1949: 303; Reader 1966: 35; Tyler 1891: 42). Pits had narrow openings at top (Reader 1966: 35). Pits were jar-shaped (Tyler 1891: 42).

Maize was formerly stored in pits in kraals. Funnel-shaped. 6' deep. Mealies placed in and capped with a stone and earth. Could keep corn for a year or two in this manner (Mayr 1965: 467).

Illustrations: None

Pit locations: Cattle kraal in center of circular village (Krige 1965: 42; Grout 1864: 103-104)). Describes morphology of kraal (Krige 1965: 42; Bryant 1949: 303). Kraals usually located on hillside to keep rain from "settling around huts" or seeping into pits in cattle pen (Tyler 1891: 42). Pits distributed all over the cattle pen, but are found most often on its upper side (Raum 1973: 145).

Pit preparation: Newly dug pits often smoked (Krige 1965: 44).

Pit dimensions: 6-8' deep (Krige 1965: 44). 4' diameter (Bryant 1949: 303). 6' deep (Tyler 1891: 42). "Large as a hogshead (Tyler 1891: 42)."

Group: Zulu (FX20)

Other: Pits free from weevils, but were often soured from damp. Outer layer of grain often moldy. Note: discusses other pit-users in Southern Africa (Bryant 1949: 303). Cover pit openings with flat stone, smear earth and dung as seal. Usually enter pits with a ladder. Each time sacks of food removed, must renew seal. Protects grain from rot. Also use above ground granaries (Reader 1966: 35).

Indian corn, other cereals stored away from weevils and white ants (Tyler 1891: 42).

"Pits are dug by the kraal head, at the founding of a kraal before the huts are" built. When digger is 6' down, a child is lowered into the pit to dig out the sidewalls. Pit is filled with maize or millet and covered over with a stone and earth. An adult is always present when pits opened. Prefer an old woman to be present, because she knows the location of the pits. When open, put a child in the pit to scoop out the grain (Raum 1973: 145).

HRAF Information Leslie E. Raymer

Group: Rwala (MD4)

Location: Syrian Desert (Bedouin)

Other Names:

Data Quality: Poor

Why store:

What store: Wild plant called Semh (Musil 1928: 15).

Importance as storage technique:

Other storage techniques: Food kept in women's compartment (Musil 1928: 66).

Importance of stored commodity:

Pit morphology: In years of abundance, Semh is collected and stored in pits that were safe from water or in bags (Musil 1928: 15).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Somali (M04)

Location:

Other Names:

Data Quality: Good.

Why store:

What store: Durra (grain) (Puccioni 1936: 113).

Importance as storage technique: Preserves food undamaged for 3-4 years (Burton 1856: 121). Most common storage technique (Puccioni 1936: 113). Several years preserved (Puccioni 1936: 113).

Other storage techniques: Hang grain in leather pouch on wall of hut facing door (Puccioni 1936: 21). Some places is stored immediately after harvest above ground in small huts under the trees (Puccioni 1936: 113).

Importance of stored commodity: Dietary staple (implied).

Pit morphology: "Deep, dry holes, which are carefully covered to keep out rats and insects" (Burton 1856: 121). Large ditches, dug 2 meters deep in ground, lined with dry grass or ash to keep out ants; cover pits with wood or dry lumps of clay (Puccioni 1936: 113).

Illustrations: None.

Pit locations:

Pit preparation:

Pit dimensions: 2m. deep (Puccioni 1936: 113).

Other: Durra either used at once or taken from pits as needed (Puccioni 1936: 113). Grain is stored more often in pits then in above ground structures (Puccioni 1936: 113).

HRAF Information Leslie E. Raymer

Group: Kanuri (MS14)

Location:

Other Names:

Data Quality: Good (Cohen 1960: 215, 241, 269, 281) - All.

Why store: Concealment (household head reluctant to discuss numbers of pits and their locations) (p. 215).

What store: Crops (grain) (p. 269).

Importance as storage technique: Main storage technique. Provided a way to conceal the volume of food surpluses from neighbors. Allows long-term storage (pp. 215, 269).

Other storage techniques: above ground granaries used, not as common as pits (p. 269).

Importance of stored commodity: Dietary staple (implied).

Pit morphology: Food was put in pits at the time of harvest (p. 269).

Pit locations: In household compound (under control of household head - implied) (p.215).

Pit preparation:

Pit dimensions:

Other: <In this instance, pit storage apparently provides better concealment than above ground, since pits more prevalent.>

"A household head is very reluctant to discuss how many storage pits he has in his compound or how much of last years crops remains uneaten. If this information can be obtained at all, much assurance has to be given that it is to be kept entirely confidential (p. 215)." If not secretive, informants insist will have multiplication of requests for gifts of money, clothes, food, and loans (p. 215). "Positive evaluation of covert or secret savings. (p. 241)."
<A good example of concealment from neighbors.>

HRAF Information Leslie E. Raymer

Group: Tuareg (MS25)

Location:

Other Names:

Data Quality: Excellent.

Why store: Concealment (hidden from eyes of passersby) (Lhote 1944: 83).

What store: Cereals - including wild seeds (both agriculturists and pastoralists) (Ahaggar); cereal grains (Kel Ferwen) (Nicolaisen 1963: 206-207).

Importance as storage technique: surplus grain (Kel Ferwen) (Nicolaisen 1963: 206-207). Hide goods from passersby. Protect from men and rodents (Lhote 1944: 83). Common storage technique (Lhote 1944: 83). Food reserve in case camps raided (Lhote 1944: 83).

Other storage techniques: Ahaggar - Skin bags hidden under rocks in mountains (grain, dates, etc.) (Lhote 1944: 83; Nicolaisen 1963: 206-207). Stone and mud silos used today by both agriculturists and pastoralists, introduced to Ahaggar 100 yrs. ago with irrigation agriculture (Nicolaisen 1963: 206). Kel Ferwen - Earthenware containers (Nicolaisen 1963: 206-207).

Importance of stored commodity: Grain probably staple (implied).

Pit morphology: Underground storerooms (bell-shaped pits) lined with mats; often so deep can hide a grown man standing up; lined and covered with mats. Used by both agriculturists and pastoralists (Ahaggar and Kel Ferwen Tuareg) (Nicolaisen 1963: 206-207). Cellars dug in the soil at ground level (Lhote 1944: 83).

Illustrations: Line drawing (Nicolaisen 1963: 207).

Pit locations: Located in or near gardens (Kel Ferwan) (Nicolaisen 1963: 206-207; Lhote 1944: 83).

Pit Preparation:

Group: Tuareg

Pits: in bedrock (Lhote 1944: 83).

Pit dimensions: 2m.x2.5m. deep; 2m. diameter bottom, .75m. at top (Nicolaisen 1963: 207).

Other: Granaries dug in rock common among all Berbers (Lhote 1944: 83); Pits used by pastoralists and agriculturists alike (Nicolaisen 1963: 206-207) (Kel Ferwen and Ahaggar).

Comments: If have gardens in areas of cultivation, have food deposits there. Stored for whole family group (Lhote 1944: 83).

Storage centers have secret granaries (hardly used today, but were used before French occupation) (Lhote 1944: 83).

Cellars dug in the soil at ground level and hidden from eyes of passersby. Merchandise thus protected from men and rodents (Lhote 1944: 83).

Pastoralists of Ager use pits for surplus grain and skin bags on poles for immediate consumption storage (Kel Ferwen) (Nicolaisen 1963: 206-207).

Keep limited stock on hand for immediate use. "2-3 bags of sorghum or dates" that are "transported" each time the "camp is moved". When supplies more considerable, customary to leave in rocks of mountains in spots known to people of tribe. Reserve in case camps raided; this allows them to travel lighter with their reserves in safe places (Lhote 1944: 82-83).

HRAF Information Leslie E. Raymer

Group: Libyan Bedouin (MT9)

Location:

Other Names:

Data Quality: Fair

Why store:

What store: Barley (Obermeyer 1969: 51; Murray 1935: 277).

Importance as storage technique: Can preserve grain for up to 3 years (Obermeyer 1969: 51).

Other storage techniques:

Importance of stored commodity: Dietary staple (Obermeyer 1969: 51).

Pit morphology: 2m. deep pits (Obermeyer 1969: 51); "Seed for next year is buried in a hole lined with straw and covered with clay" (Murray 1935: 277) - Egypt.

Illustrations: None.

Pit locations:

Pit preparation: After thresh grain, store in pits (Murray 1935: 277).

Pit dimensions: 2m. deep (Obermeyer 1969: 51).

Other: Good barley crop every 5-6 years (Murray 1935: 277). Year's forage is set aside. Rest goes to market (Murray 1935: 277).

HRAF Information Leslie E. Raymer

Group: Rif (MX3)

Other Names:

Data Quality: Fair

Why store:

What store: Grain, dried figs (Hart 1954: 58); grain (Blanco Izaya 1975: 170).

Importance as Storage technique:

Other storage techniques: above ground storage in loft over cow stall (Hart 1954: 58).

Importance of stored commodity:

Pit morphology: "Figs kept in big circular wickerwork baskets sunk into the earth (Hart 1954: 58)." Underground silo (Hart 1954: 58).

Illustrations: None.

Pit locations: Pit in courtyard in walled home (Hart 1954: 58); patio of house (Blanco Izaya 1975: 170).

Pit preparation:

Pit dimensions:

Other: "Each man keeps his grain in an underground deposit in the patio of his house (Blanco Izaya 1975: 170)."

House sites in Aith Wuryaghil: selected for water & defensibility. Courtyard in walled home. Oven, sunken cow stall with overhead storage area, kitchen, & underground silo, where grain kept (Hart 1954: 58).

HRAF Information Leslie E. Raymer

Group: Tlingit (NA12)

Location:

Other Names:

Data Quality: Good

Why store: Processing. (Oolikan fish put in pits to rot; after rotten, oil extracted and stored in containers) (Jones 1914: 104-105).
Salmon heads buried until rot. Eaten without any other preparation (Jones 1914: 106). Note - Other pits used for storage, whether for concealment or preservation is uncertain.

What store: Part of food deposited in caches (Krause 1956: 135). Oolikan fish oil (used in winter) (Jones 1914: 104-105). One cache held smoked salmon, sweet weed (famine food), and pack straps (Krause 1956: 14).

Importance as storage technique: Pits used to process candlefish in order to extract oil (Jones 1914: pp). Pit storage used to keep food from freezing (de Laguna 1960: 178).

Other storage techniques: Salmon dried and stored for winter (Krause 1956: 121; Jones 1914: 103). Airtight wooden chests (fish, seaweed, oil, berries, shellfish) (Knapp and Childe 1896: 166; Oberg 1937: 57, 60).
Storehouses built like blockhouses (Krause 1956: 273).
Store fish oil in seal bladders (Oberg 1937: 59). Venison dried Jones 1914: 107).

Importance of stored commodity: Oolikan fish is a major source of food oil (Jones 1914: 104-105). Oolikan oil is used as a preservatiove for many foods. Berries are preserved in wooden boxes in oolikan (oalachen) oil (Oberg 1937: 60).

Pit morphology: 1. Cache pits are used to protect food from bears. After pits are filled and covered, grass is burnt off the area surrounding the pit (smell keeps bears away).

Group: Tlingit (NA12)

Pit morphology, continued: 2. Single pit description: dimensions - 18' long, 12' wide, 12' deep. Pit covered with frame of poles, over which are put cedar bark, stones, and cut grass (Krause 1956: 14).

3. Oolikan fish put in large pits to rot. After rotten, oil extracted and placed in containers for winter use. Tlingit claim oil easier to extract when fish rotten (Jones 1914: 104-105).

* In past, the Tlingit dug big pits in the ground that were used as storage containers in which their food would keep from freezing. (Location uncertain) (de Laguna 1960: 178).

* "Salmon heads are buried in the ground and left there for days until they became good and ripe." Eaten with out further preparation when taken from the ground (Jones 1914: 106).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: * Description of pit Krause (1956: 14) opened in 1881-1882. Pit covered with cut grass. Under grass was a covering of stones overlying a frame of poles. Poles were overlaid with bark. Contained bark cases of smoked salmon, a package of sweet weed, inner bark of larch or fir (famine food), pack straps made of seaweed. Dimensions: 3 fathoms long x 2 fathoms wide x 2 fathoms deep.

* Candlefish processed in pits. Caught in spring, placed fresh in a large pit rot. When rotten, taken from pit and oil extracted. Stored above ground in containers and used in winter (Jones 1914: 104-105).

Group: Tlingit (NA12)

Other, continued:

* "By far the most important oil fish is the oalachen (oolikan), which crowd the mouths of the large rivers for the purpose of spawning," in May. Oalachen oil was used to preserve berries, roots, and herbs and drank it as a beverage at feasts (Oberg 1937: 59). Also use oalachen oil as a condiment. Dipped salmon in it (Oberg 1937: 99).

HRAF Information Leslie E. Raymer

Group: Hare (ND9)

Location:

Other Names:

Data Quality: Good

Why store: Preservation (This method is an easy way to preserve fish for dogfood. Note that the fish partially rots. This saves the labor of smoking fish for dogs). Note that fish is placed in pits in the early fall and used in the winter when people return to their winter camps. Camps are abandoned for a short time.

What store: Fish (Savishinsky 1974: 19; 1970: 402). Caribou (Savishinsky 1970: 299).

Im. as storage technique:

Other storage techniques: Four kinds
1. Elevated platforms or stages (illustrations)
2. Elevated storage boxes.
3. Storage boxes on ground surface (illustrations)
(Savishinsky 1974: 90; Savishinsky 1970: 274-275, 424-425).
Winter - fish frozen. Summer and fall - Fish dried and smoked (Hara 1976: 182; Savishinsky 1974: 18).

Im. of stored commodity: Pits used to store fish for dogfood and trap bait (Savishinsky 1970: 402).

Pit morphology: Fish for dogfood collected and stored in fall for winter feed. 1. Dig pit, line with spruce wood frame and cover with wood, moss, and dirt. Leave small hole in covering so can extract and put in fish. Stored in Sept. and used in Oct. - Dec. when return to villages during winter. Fish rots while it is stored. Sometimes put fish on stage when weather gets cold in Oct., so won't rot too much. 2. More common and simpler: hook fish to poles and place on rack atop open storage platforms. Start using this method of preservation in late when temperature drops (Savishinsky 1970: 404).

Group: Hare (ND9)

Pit morphology, continued: Pits dug about 7 feet into the permafrost. Covered with moss and brush. Left small hole at ground level. Because walls prepetually frozen = underground ice-houses. Fish thrown in in early fall and winter. Coldness of pits retards rotting. Winter dogfood and trap bait (Savishinsky 1974: 19-20). Fish and caribou meat stored in "large underground icehouses" in spring and summer or is dried. Caribou hunted in winter and spring and preserved for summer in underground icehouses (maybe trackers freezer) or dried. Fish and caribou meat major staples (Savishinsky 1974: 20; Savishinsky 1970: 16, 299).

During summer, if want to keep picked berries fresh, dig a small pit in a shady place and put closed tin can with berries in hole. Keep fresh and cool for about a week (Hara 1976: 222).

Illustrations: None

Pit locations: At winter camp (Shavishinsky 1970: 402). Near houses (Shavishinsky 1974: 18).

Pit preparation:

Pit dimensions:
Other: Begin storing fish in pits in September. Store so will have dogfood on hand when return to winter camps. Fish stored like this rot. Left in pit until Oct. - Dec. (Shavishinsky 1970: 402).

* Several families "dug deep pits near their homes" (men dug). Ffresh fish thrown in these pits in fall and early winter. Some decay, but coldness of ground retards rotting. Too putrid for people, great dogfood (Shavishinsky 1974: 18).

Meat and fish stored on stages or in caches. Frozen in winter and smoked/dried in the summer (Savishinsky 1970: 249).

Summer and fall fish surplus cached for the winter (smoked and dried) at various places. Used in winter when food scarce. Reports were plundered (Savishinsky 1970: 94).

Group: Hare (ND9)

Other, continued: Little large-scale storage (early post-contact). What cached frequently given to fellow band members. Little incentive to cache extra meat because of social requirement of sharing among band members and relatives (Savishinsky 1970: 93).

<Vast majority of food stored above ground. This method is only used for dogfood, because it is an easy method of preserving partially fresh fish with few processing costs>.

HRAF Information Leslie E. Raymer

Group: Bellacoola (NE6)

Location:

Other Names:

Data Quality: Good

Why store: Processing

What store: Olachen fish

Importance as storage technique: Prepares a staple food for long term storage

Other storage techniques: Some olachen dried and used as winter food (McIlwraith 1948: 536-537). Salmon smoked for winter (McIlwraith 1948: 2-3).

Importance of stored commodity: Olachen grease second only to salmon as food source. Used as relish for other foods. Oil keeps indefinitely (McIlwraith 1948: 2-3).

Pit morphology: After caught, immediately placed in pit that was ten to fifteen feet from the riverbank. Pits were 3'- 4' deep and lined with planks covered with evergreen boughs. Pits covered with planks. Placed fresh olachen in pits to rot. This aided in oil extraction. Left in pits 10 days to 2 weeks. After rotten, fish were boiled and oil was extracted (McIlwraith 1948: 536-537).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: Olachen run 3-4 days each year. 2 families working in partnership catch fish. Caught with nets. Each group of 2 families usually filled 3-4 pits (McIlwraith 1948: 536-537).

HRAF Information Leslie E. Raymer

Group: Blackfoot (NF6)

Location:

Other Names:

Data Quality: Good

Why store: Concealment (explicitly stated).

What store: Dried bison meat, wild roots, and berries (Forde 1952: 63-64). Spare ammunition, moccasins, tobacco, dried meat (hunting parties) (Wissler 1910: 97).

Importance as storage technique: Caches were indispensible to nomads: war parties and hunting parties frequently used caches to conceal excess supplies (Wissler 1910: 97).

Other storage techniques: Parfleches and bags (often 100 lbs. each) (Ewers 1971: 73-74; Forde 1952: 44, 81). Provisions (dried) hung in trees near trails (Forde 1952: 62, 64). Other means of concealing food: 1. Placed food in sacks in hollow trees; 2. Placed in rock shelters in "rough country", and sealed the entrances with stones; 3. in tree-tops; 4. Fresh meat sometimes anchored under water (Wissler 1910: 97-98).

Importance of stored commodity: Bison meat most important food (Forde 1952: 62-63).

Pit morphology: "... Pits were about 4 feet deep and were lined on the sides and bottom with stones and closed with a heavy slab of some material. Pit openings were concealed by a covering of earth (Wissler 1910: 97)."

"Food was seldom cached in this manner because rodents and other animals smelled it out and burrowed into the store (Wissler 1910: 97)."

Group: Blackfoot (NF6)

Pit morphology, continued: Stored large quantities of bison meat after the annual communal buffalo hunts. Meat was sun-dried, slightly roasted, pounded up, mixed with fat, and stored in hide bags sealed with tallow. The bags were often 100 lb. each and held the meat of 2 buffalo. "Large stone-lined pits were built near winter camps in which food supplies could be stored (Forde 1952: 63-64)."

Illustrations: None

Pit locations: Near winter camps (Forde 1952: 63-64).

Pit preparation:

Pit dimensions: 4 ft deep

Other: All methods of storage aimed at concealment (several types were used). Stored large quantities of bison meat which were made into pemmican and stored in hide bags (parfleches) that could hold about 100 pounds each (Forde 1952).

* Only tobacco cultivated (Forde 1952).

Group: Ojibwa (NG6)

Pit morphology, continued: E. Ojibwa - Rice was collected, dried, parched, and stored in pits; either in cylindrical elm bark boxes like corn was kept in, or in smaller birch-bark baskets like maple sugar was kept in (Jenness 1935: 14).

Chippewa, S. Ojibwa - 2 or 3 families combined to store their provisions in pits. Women dug them. Pits were never disturbed. Rice, sugar, and vegetables often kept in seperate pits. Morphology - 6' deep, lined with birch bark. Rice and sugar placed in pits in birch-bark containers. Spaces between containers filled with hay. Covered with bark or hay, a layer of wooden beams, and a mound of earth (Densmore 1929: 40).

S. Ojibwa - Food surpluses were kept in cache pits. Stored commodities included - braided corn, maple sugar, and dried berries. These were kept in birchbark containers. Rice was kept in cedar-bark containers. Dried meat and fish was kept in bark bags. Dried vegetables were also stored. Stored in pits before went on hunt (Hilger 1951: 149).

Chippewa - 80 of 150 houses in study area had subterranean storage areas within their dwellings. Were 5' deep x 3' square. Kept under trapdoors in floor. Winter food storage. Mostly potatoes and some canned goods (Hilger 1939: 154).

Hilger (1939: 153; 1951: 150) witnessed the opening of several pits in the 1930's. The morphology and contents of each pit is described in the Comments section.

Illustrations: None

Pit locations: Chippewa, S. Ojibwa - Food collected in the summer was kept in pits dug near the summer dwellings (Densmore 1929: 40).

Chippewa, S. Ojibwa - Food was stored outside of the lodges. Daily supply was kept on a frame near the door. Large supply was kept in cache-pits. Also had a tipi or log storehouse for implements and extra clothes (Densmore 1929: 29).

Group: Ojibwa (NG6)

Pit locations, continued: Chippewa - Located storage pits in dwellings as well (Hilger 1939: 154).

S. Ojibwa - Food not needed during season kept in cache pits built near home wigwams (Hilger 1951: 149).

Chippewa - Had subfloor pits in their dwellings: caches under the floors. 80 of 150 dwellings in study area had interior storage pits (Hilger 1939: 154).

Pit preparation:

Pit dimensions:

Other: Hilger (1939: 153) witnessed the opening of three pits among the Chippewa in August, 1933. Each pit is described below.

Cache 1 6' deep x 3' square. Walls lined with hay 8 inches thick. Contained a bushel of potatoes and rutabagas. Covered with saplings, cornstalks, and dead leaves (to "fool the deer").

Cache 2 Contained canned blueberries and gooseberries (in mason jars) nested in hay. Hay kept the fruit from freezing.

Cache 3 Contained canned raspberries and Juneberries. This cache was 12 inches deep x 22 inches in diameter.

All three caches were covered with earth that was mounded up at least 18 inches high.

Hilger (1951: 150) describes three Southern Ojibwa pits that were used in the mid-1930's:

Cache 4 3'7" long x 3'5" wide x 4'2" deep. Potatoes stored in this pit. Covered with hay, timbers, and mounded earth that was 18" high. Opened in 1932.

Group: Ojibwa (NG6)

Cache 5 4' square x 6' deep. Contained potatoes, dried corn, wild rice, and maple sugar in bark containers. Used in the winter of 1934-1935.

Cache 6 Contained 200 pounds of wild rice that was left in the pit until the snow was gone. Put food in pit in fall of 1934.

HRAF Information Leslie E. Raymer

Group: Delaware (NM7)

Location:

Other Names:

Data Quality: Good.

Why Store: Concealment (explicitly stated

What store: Dried corn, dried beans (Newcomb 1956: 19); Tobacco, meat, corn (Herman 1950: 53); corn, beans, tobacco, other provisions (Deer-meat, elk, birds, fish) (Lindestrom 1925: 253).

Importance as storage technique: Pit storage disappears after 17th century (Newcomb 1956: 19). Most common storage technique (Herman 1950: 53).

Other storage techniques: Store in crude, above ground shelters or in houses (Newcomb 1956: 19). Hemp bags hung from ceiling of houses (Herman 1950: 53).

Importance of stored commodity:

Pit morphology: Mat-lined pits (put dried grain in rush or oiled hemp baskets and bury) (Newcomb 1956: 19). Pits covered first with grass and bark and then with earth (Herman 1950: 53). "Dig larders in ground" (Lindestrom 1925: 253). Dried grain put in hemp or rush baskets and then buried (Newcomb 1956: 19).

Illustrations: None.

Pit locations: Close to houses (Lindestrom 1925: 253).

Pit preparation:

Pit dimensions:

Other: When store - bury after harvest or store in house until after winter hunt (Newcomb 1956: 19).

All foods preserved by drying (Newcomb 1956: 19).

Group: Delaware (NM7)

Other, continued: Pit storage seemingly disappeared after the 17th century. Sources after this century don't mention subterranean storage (Newcomb 1956: 19).

Missionary Loskiel referred to pit storage among Delaware in eighteenth century, "They commonly keep the situation of these magazines very secret, knowing that if they are found out, they must supply the wants of every needy neighbor...for some are so lazy, that they will not plant at all" (quoted in DeBoer 1988: 2).

HRAF Information Leslie E. Raymer

Group: Iroquois (NM9)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment in the past (Morgan's supposition 1901: 22, 31) (Waugh's statement 1916: 7) and preservation now (Waugh 1916: 43).

What store: Surplus dried (roasted) corn and charred green corn (Morgan 1901: 311). Cured venison and other meats (Morgan 1901: 311). Household treasures and dried, shelled corn (Lyford 1945: 12, 16, 19). Pumpkins, squashes, potatoes, carrots; corn in the past (Waugh 1916: 43). Charred corn (Lyford 1945: 16, 19).

Im. as storage technique: Corn lasts a year (green corn much longer) (Morgan 1901: 311). Store dried corn for long periods in cache pits (several years) (Lyford 1945: 16). Concealment from needy neighbors (Waugh 1916: 7). Charred corn is preserved for years in pits. Charred to preserve for domestic use (Morgan 1901: 30; Lyford 1945: 16).

Storage of corn in pits is no longer practiced (Waugh 1916: 43). Now use pit storage as a method of winter preservation for potatoes, carrots, squashes, pumpkins, and other vegetables that were still stored in pits. Pits not concealed. Dirt mounded up several feet over vegetables.

Other storage techniques: Hang from rafters (corn and beans); kept in barrels in houses (corn and beans) (Morgan 1901: 310). Hung dried corn, pumpkins, apples, and squash from rafters of houses (Lyford 1945: 12). Booths and platforms at each end of longhouse (Lyford 1945: 12; Waugh 1916: 48-49). Outside corn cribs (Lyford 1945: 16; Waugh 1916: 41). Adopted from early settlers (Lyford 1945: 16).

Im. of stored commodity:

Group: Iroquois (NM9)

Pit morphology: Lined bottom and sides of pits with bark. Pits had bark roofs to make them watertight and were covered with earth. (corn and meat stored in pits - meat pits lined with deerskin and bark) (Lyford 1945: 19; Morgan 1901: 311). Put bark barrels in pits (Lyford 1945: 19). "Preserve crops in round holes dug in ground...lined and covered with dry leaves or grass" (Waugh 1916: 7). Lined with bark straw or boards (Waugh 1916: 43). Pits covered with dirt to a sufficient depth to exclude frost (Waugh 1916: 43).

* Informant described variant style of above ground corn storage facility used in his memory: circular, shallow pit dug about 1.5 feet deep. Pit surrounded by vertical posts set side by side in ground around pits' margin. Barrel-shaped recepticle filled with corn on cob and top of facility covered with poles laid across top and covered with elm bark (Waugh 1916: 41-42)..

Illustrations: Yes

Pit locations: "Dug pits under bed for storage of household treasures" (Lyford 1945: 12). "Some distance from houses"(crops) (Waugh 1916: 7). Pumpkins and squashes placed in pits in fields (Waugh 1916: 42-43).

Pit preparation: Make bark barrels from inner rind of red elm or black ash bark. Sew sides, bottom, and top. Corn buried in caches in these types of barrels (Morgan 1901: 22).

* Dug pit in dry season and lined sides, bottom, and top with waterproof bark lining (Lyford 1945: 19).

Pit dimensions:

Other: Still find pits of charred green corn near ancient villages (Morgan 1901: 311). War of 1812 - when British expected Seneca attack, buried corn in bark barrels (3 bushels to one peck) (Morgan 1901: 22).

Group: Iroquois (NM9)

Comments: Storage for times of want rare. Pits of charred corn probably result of flight of villagers, who buried corn to conceal it (Morgan 1901: 31).

* Iroquois and Seneca roasted green corn to dry it prior to storage. Roasted in field, then shelled and dried in sun (Morgan 1901: 30; Lyford 1945: 16).

* Keep locations of pits secret (if known, have to supply wants of needy neighbors) (Waugh 1916: 2).

* Favorite storage method: corn cribs made of boards with shingle roofs. Also suspend braided corn form rafters of house (Waugh 1916: 41).

* Pit use reasons: (Waugh 1916: 42-43) - All.
"Caches while travelling"
"Guard against capture by enemies"
"Preservation of garden produce such as squashes and pumpkins...placed in fields to protect from severity of winter"
Only store corn in pits as a necessity. More common to store in inside bark bins.

* Waugh 1916: 43-44, 112, 177 - rest of entries.

* Potatoes, carrots, and other vegetables, also squashes and pumpkins still often stored in pits. Storage of corn in pits no longer practiced (p. 43).

* Dig holes, line with straw or boards, cover with dirt to depth "to exclude frost (p. 43)."

* Champlain described pit storage of eastern Algonkin. Dug trenches 5'-6' deep on a dry, sandy slope. Grain (in grass bags) was covered with 3'-4' of sand (p. 44).

* Kalm - Holes dug 6' or less, lined with bark. Andropogon bicorne used when bark absent (p. 44).

* Fruit storage pits dug out as needed (p. 112).

* Winter vegetable cache pits mounded up - clearly not concealment. Knee deep, approximately 5' diameter (p. 177).

Group: Iroquois (NM9)

Comments, continued: <At time Waugh recorded, only used pits for preservation. Stored corn in cribs, and in houses. Potatoes, carrots, squashes, and pumpkins stored in pits in fields to protect from frost. Earlier, corn and other foods stored in pits to conceal from needy neighbors and enemies.>

HRAF Information Leslie E. Raymer

Group: Cherokee (NN8)

Location:

Other Names:

Data Quality: Excellent

Why store:

What store: Pulverized nuts, seeds, fruits, tubers, and vegetables (Goodwin 1977: 59). Corn, sunflower seeds, beans, dried roots, and tubers (Goodwin 1977: 60). Bottled fruits and vegetables (Wiedman 1987: 84). Bear grease (White 1980: 92).

Importance as storage technique: Preserved dietary staples and preserved foods for periods of hardship and food shortages (Goodwin 1977: 59-60).

Other storage techniques: Corn stored in above ground cribs (Goodwin 1977: 51). Some of crops from each harvest put in public granaries for use and disposition of priests (Gearing 1962: 28). Corn stored in clay-plastered above ground structures on posts (Reid 1970: 139). Hickory nuts and walnuts apparently stored in bags or baskets and were hung from rafters of their houses (White 1980: 138). Corn, beans, canned goods were stored in lofts in houses (French and Hornbuckle 1981: 195).

Importance of stored commodity: Dietary staple (Goodwin 1977: 59).

Pit morphology: Stored foods pulverized in a mortar. Meal was usually stored in the ground and possibly near their fireplaces (Goodwin 1977; 59). In times of hardship and food shortage, food was available in their storage pits (Goodwin 1977: 60).

Oklahoma Cherokee - Upland house sites often had a root cellar. Used to store bottled fruits and vegetables. Cellars stone-lined, often 7' deep, with a stone stairway. covered with large timbers and smaller pieces of wood. Roof was approximately 1 - 1.5' above ground (Wiedman 1987: 84).

Group: Cherokee (NN8)

Pit morphology, continued: Eastern Cherokee - Bear oil was extracted from fat and mixed with sassafras and wild cinnamon to keep it fresh. Stored in clay pots set in pits in the house floors (White 1980: 92).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: Summer crookneck was the most important squash (C. pepo). Could be stored for the winter (Goodwin 1977: 53).

Nuts and seeds (many kinds) were dietary staples (like chestnut) (Goodwin 1977:59).

Modern storage among the Eastern Cherokee: canning and freezing most common. Over 50% of surveyed households also used dry, pickling, and burying to preserve food. 46 families of 71 (64.8%) surveyed reported that they preserved some food by burying it (Terry 1987: 31-32).

Drying and burying are traditional Cherokee methods of food preservation. Main storage methods prehistorically (Terry 1987: 34).

HRAF Information Leslie E. Raymer

Group: Fox (NP5)

Location:

Other Names:

Data Quality: Good.

Why store:

What store: Corn (Marston 1912: 151) - (ca. 1820); dried corn, beans, pumpkins (Ferris 1910: 363), dried corn (Marsh 1900: 140; Joffe 1963: 263).

Importance as storage technique: Bury for use in spring and summer (vast majority of crops stored this way) (Marston 1912: 151). Winter storage of harvest (Ferris 1910: 363); bulk of corn stored in this manner (Joffe 1963: 263).

Other storage techniques: Potatoes in rafters; meat hung on pole or tree limb outside (Smith 1928: 254, 262; Jones 1939: 53).

Importance of stored commodity:

Pit morphology: Bury in pits in bags (Marston 1912: 151); pack harvest in rawhide sacks and trunks, when go on winter hunt, carry what will need with them and bury rest in pits 3-4 feet deep (Ferris 1910: 363). Stored in bark bags in cache pits. Bulk of corn was stored in cache pits (Joffe 1963: 263). "As soon as the corn is harvested, they shelled, dried, and put the corn up in sacks. Part of this was buried for future use." They took the remainder of the corn with them when they abandoned their villages and moved to the hunting grounds, where they stayed until January (Marsh 1900: 140) (ca. 1834).

Illustrations: None

Pit locations: Villages, where fields located (Marston, 1912: 151).

Pit preparation:

Pit dimensions: 3-4 ft deep (Ferris 1910: 363).

Group: Fox (NP5)

Other: Return to village in April; plant seed; 7000-8000 bushels harvested. 1000 bushels sold to traders; 5 bushels kept for each family on hunt; rest stored in pits in bags for use in spring and summer (Marston 1912: 151).

* As soon as harvested, corn is dried and put in sacks; Part is buried for future use; rest is carried with them.

* People leave villages and hunt in January, spend rest of winter in villages (Marsh 1900: 140).

* Bulk of corn was dried, placed in bark bags, and cached in pits (Joffe 1963: 263).

HRAF Information Leslie E. Raymer

Group: Dhegiha (NO12) Omaha

Location:

Other Names:

Data Quality: Excellent.

Why store: Concealment (inferred)

What store: Dried, shelled corn (in skin bags); strings of braided corn; jerked meat in hide bags; clothing; pelts; regalia (Fletcher and La Flesche 1911: 98); dried meat (smoked) (Dorsey 1884: 293).

Importance as storage technique: Preservation of winter food supply. (Fletcher and La Flesche 1911: 98).

Other storage techniques: Corn in parfleche hide cases (Dorsey, 1884: 304).

Importance of stored commodity:

Pit morphology: Pits are bell-shaped, about 8 feet deep, and rounded at the bottom and on the sides. The neck is just large enough to admit a person's body. Pits are lined with split posts, to which an inner lining of grass is tied. The opening is covered with grass and a layer of sod (Fletcher and La Flesche 1911: 98).

Illustrations: Yes (Fletcher and La Flesche 1911: 98).

Pit locations: Near each house, generally to the left of the entrance (Fletcher and La Flesche 1911: 98). In hunting camps (Dorsey 1884: 293).

Pit preparation:

Pit dimensions:

Other: During hunts, meat would be brought to the hunting camps where the women would dry it and cook it in pits (Dorsey 1884: 293).

Group: Dhegiha (NQ12) Omaha

Other, continued: * Before they left on their annual hunt, preparations were made for the departure from their villages: women buried in caches whatever they wished to leave. "Food, etc. laid in a blanket, which was gathered up at the corners into a bundle; the bundle was allowed to fall to the bottom of the cache; many such bundles were put into a single cache" (Dorsey 1884: 285).

* Corn ripens in August (most) and July (Dorsey 1884: 303).

* Each household stored its own grain and other provisions, since there were no outbuildings or public granaries (Dorsey 1884: 274).

* All food dried for winter use (squash, corn, meat, wild plants, etc.) (Dorsey 1884: 305).

HRAF Information Leslie E. Raymer

Group: Mandan (NO17)

Location:

Other Names:

Data Quality: Excellent.

Why store: Concealment (to keep food safe from enemies) (Deland 1908: 609).

What store: Grain, food, fat, robes, and skins; corn, squash, valuable household utensils (Deland 1908: 322, 609); beans, corn (Will and Spinden 1906: 110); corn, meat, pemmican (Catlin 1857: 122).

Importance as storage technique: Winter storage of harvest and valuables (some kept out for use, rest put in pits). Stored until spring when people returned to village (Deland 1908: 609).

* Main storage technique; food keeps several years (Will and Spinden 1906: 110).

Other storage techniques: None listed.

Importance of stored commodity:

Pit morphology: Pits are bell-shaped and look like an ordinary round cistern with round, small openings above that are barely large enough to allow a person to descend. When full, the top is filled with earth and raked over: "thus obliterating every trace of the excavation (Deland 1908: 322, 609)."

* Henry: Pits are 8 feet deep and bell shaped, with a "mouth just wide enough for a person to get in. Interior is hollowed out larger and the sides and bottom are lined with straw." (Will and Spinden 1906: 110).

* Cache pits held 20 or 30 bushels of beans or corn (Will and Spinden 1906: 110)."

* Cache pits are 6-7 feet deep, jug-shaped, tightly closed, and lined with prairie grass. Corn was dried on the cob before it was put in the pits (Catlin 1857: 122).

Group: Mandan (N017)

Illustrations: None

Pit locations: Numerous pits were located in the confederated villages. Some pits were located under the floors of the houses; others were placed outside on various parts of the village grounds (Deland 1908: 609). "Scattered about the village (Will and Spinden, 1906: 110)."

Pit preparation: When crops are harvested, before leaving on the winter hunt, old pits are cleaned out and new ones are dug (Deland 1908:609).

Pit dimensions: 8 feet deep, 6'-7' deep.

Other:

Comments: "Used cache pits as was common with most other sedentary tribes" (Will and Spinden 1906: 110).

* Matthews speaks "of the caches or circular pits of the confederated village."

Found remains of caches in 1905 (Deland 1908: 609).

* "The numerous cache pits for storing grain are noteworthy objects in the village." In the summer, when they are unused, they are left open or carelessly covered (Deland 1908: 609).

* They would note the distance from a door, hearth, or other fixed object, so stores could be relocated when they returned in the spring (Deland 1908: 609).

* Concealed pit storage is common among the plains tribes; has been adopted by whites on the plains (Deland, 1908).

HRAF Information Leslie E. Raymer

Group: Pawnee (N018)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment (Wedel 1936: 51-54; Smith 1852: 90-91; Weltfish 1965: 68).

What store: Surplus corn and household furniture (Wedel 1936: 51-54); dried corn & beans (Weltfish 1965: 68); dried bison meat (Weltfish 1965: 95); braided corn, vegetables, some skins and clothing, pumpkins, braided corn (Weltfish 1965: 238).

Importance as storage technique:

Other storage techniques: Raised storage platform (Weltfish 1965: 65).

Pit morphology: Pits bell-shaped (smooth, beaten walls; slightly depressed floors, which are usually bark covered). Sand present beneath bark in 4 of 11 caches (typical dimensions: Mouth 4'7" diameter, floor 6'4" diameter, depth 4'6"). Tool marks of diggers often present (Wedel 1936: 51-54).

* Description of the construction of a bell-shaped cache pit: sod cut out intact and laid aside to cap pit. 2' mouth, 6'-7' deep. Pit lined with grass, bark, sticks, and poles. Covered with hide, grass brush, and stones. Finally, sod is replaced (Smith 1852: 90-91).

* Walls of pits covered with thatch. Corn stored in skin bags. Pit closed with skin cover, thatch grass, earth (Weltfish 1965: 68).

* Pit was 10' deep, bell-shaped (narrow neck, round bottom) 10' diameter. Bottom lined with clean sand, stick grating, dry grass. Walls lined with thatch grass. Produce put in hide sacks. (Weltfish 1965: 268).

Illustrations: Yes.

Group: Pawnee (NO18).

Pit locations: At every village. Between earth lodges and within them. Not located at tipi settlements (Wedel 1936: 52). Generally on dry, low bank of clay, on margin of a watercourse (Smith 1852: 90-91). Near earth lodge (built at same time as lodge) (Weltfish 1965: 268).

Pit dimensions: Mouth diameter 4'7", floor diameter 6'4", depth 4'6". 2' Mouth, depth 6'-7'. Depth 10', Floor diameter 10'.

Other: Describes 11 caches excavated by archeologists at Pawnee village (Hill site). 4 in house, 6 outside. Outside pits approximately 15' from outer edge of floor (Wedel 1936: 52).

Description of the construction and concealment of a cache: stresses great care taken to conceal pits and make sure pit location looks undisturbed after pit dug. Put down blanket to prevent foot prints. Dirt from excavation discarded into stream or spread at distance from pit. Pits only revisited when time to take out contents. 4 men can conceal 3 tons of provisions or merchandise in 2 days (Smith 1852: 90-91).

Describes cleaning of food pit of one household. Dried corn in skin bags. Sweep thatch-covered walls. Take out 3 weeks supply of corn. Keep pit closed to reduce danger from rain leakage and let ground settle to conceal location (Weltfish 1965: 68).

Heavily stresses concealment function (Weltfish 1965: 68).

Women responsible for cleaning and maintaining pits (Weltfish 1965: 95).

Describes trip by several women to inspect a pit and get some supplies. Pit was 10' deep. Each woman had large sack of personal supplies in pit (Weltfish 1965: 239).

Only open pit once per month at most (Weltfish 1965: 268).

Group: Pawnee (NO18)

Other, continued: Traditional order of loading: bottom - sacks of mature dry corn. Next roasted green corn. Third beans. Fourth put in parfleches of bison meat. Braided corn and pumpkin put around sacks. Maybe clothing (Weltfish 1965: 269).

Food hidden in pits when seasonnally absent from villages or when at war (Smith 1852: 90-91).

Pits located adjacent to lodges were used by everyone in lodge. Stores in pits were segregated (Weltfish 1965: 268).

HRAF Information Leslie E. Raymer

Group: Klamath (NR10)

Location:

Other Names:

Data Quality: Good

Why store:

What store: Most of their food is stored in the ground. The only exception is fish (Spier 1930: 167). Seeds of Valeriana sp. (Spier 1930: 164-165).

Importance as storage technique: Seeds of Valeriana sp. were stored in pits in order to mask their disagreeable odor, which attracts animal predators (Spier 1930: 164-165).

Other storage techniques: Surface granaries on bedrock or stone foundations. On raised platforms (Voegelin 1942: pp). Fish are dried and cached. Caches are covered with bits of board and bark (Spier 1930: 55).
Food was sometimes stored in caves. The entrances were blocked with stones (Spier 1930: 167).

Importance of stored commodity: Seeds are fermented for use as famine foods (Spier 1930: 161).

Pit morphology: * Food is put in long tule sacks which are placed at the outer margins of the earth-lodges between the timbers, where the sacks are buried in the soil that is used to cover the lodges' roofs (Spier 1930: 167).'

* Large communal pits are dug near the houses. The pits are constructed and used by groups of neighbors. The pits are covered with tule mats and a layer of earth. An evil smelling plant (Valeriana edulis) is always buried with food to keep animals away (Spier 1930: 167).

Most of their supplies were kept in large communal storage pits (Voegelin 1942: pp).

* Roots are stored in pits and seeds are stored within the earthen roofs that cover the earthlodges (Pearsall 1950: 349).

Group: Klamath (NR10)

Pit morphology, continued: Pods of Valeriana sp. were collected for their seeds in Mid-August to September. The seeds were fermented in pits for one to five weeks (Spier 1930: 161). Nutlets of Valeriana sp. were pit roasted and then stored in pits (Spier 1930: 164-165).

Illustrations: None

Pit locations: In one town, 5 large pits were located in the town precinct, while a number of others were placed north of the town (Spier 1930: 14). Pits were located near their houses (Spier 1930: 167).

Pit preparation:

Pit dimensions: 15'-20' in diameter (Spier 1930: 14). 15' diameter x 3' depth (Speir 1930: pp).

Other: * Circa 1860-1900, a Klamath town was 1/2 mile long and was located along a river bank. The houses were situated on the bottomland. Five storage pits were located at the town. Four were about 25' in diameter and one was 15' in diameter. Other pits and a fish dam were located north of the town (Spier 1930: 14).

* Human thieves sometimes ransack storage places. When they are away from home, families cover their pits with extra stones (Spier 1930: 167).

* Klamath winter settlements in the 1890's consisted of several score earthlodges located in tiny hamlets. Most of their supplies were kept in communal storage pits (Voegelin 1942).

HRAF Information Leslie E. Raymer

Group: Northern Paiute (NR13)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment (Steward 1941: 231)

What store: Barley, other seeds (Lowie 1924: 202). Acorns (Riddell 1960: 37). Acorns processed in pits (Stewart 1941: 374). Pinyon nuts (whole cones - green); also cached nutlets removed from cones (Stewart 1941: 374). Seeds (Stewart 1941: 376). Acorns processed in pits, pinyon, seeds (Steward 1941: 279, 281).

Im. as storage technique:

Other storage techniques: Food was stored on either side of the door of dwellings. Stored food in tule bags. (Whiting 1950: 94, 98). Tons of fish dried for winter use (Riddell 1960: 27; Loud 1931: 157).

Pinyon piled on ground and covered (To, To, Pa, Sa) (Stewart 1941: 374). Seeds stored in baskets, bark bags, buckskin bags, in caves, and in rock crannies (Stewart 1941: 376). Food stored in houses in storage bags (Stewart 1941: 379).

Stored green pinyon in stone circles (Mc) (Steward 1941: 231).

Im. of stored commodity:

Pit morphology: Pits were lined with cattails and grass (some food stored here) (Whiting 1950: 94).

"Excess acorns stored in a pit dug into the ground and lined with oak leaves or pine needles." "Pit was covered over and acorns dug up when needed" (Riddell 1960: 202).

Barley, a great number of seeds generally stored in underground caches in the fall (Lowie 1924: 200).

Group: Northern Paiute (NR13)

Pit morphology, continued: Dried meat pounded with tallow and stored in tule bags and buried beneath rocks and earth (Kelly 1934: 93-94).

Acorns were leached in sand-lined pits (Tx, K1, K2, To, Pa) (Stewart 1941: 374). Whole pinyon cones were stored green in stone-lined circular pits (Ts, K1). Shelled nuts were stored in pits that were covered with brush and stone (Ts, K1, K2, Ku, To, Pa, Sa Ki) (Stewart 1941: 374). Pits had various linings including grasss linings, pine leaf soil linings, and juniper bark linings . Some groups did not line their pits (Ts, Ku, To, Ki) (Stewart 1941: 374). Seeds stored in bark or grass-lined pits (Ts, K1, K2, Ku, To, To, Pa, At, Sa, Tg, Wd, Ki).

Acorns processed by leaching in sage-lined pits (Fsp, Flk, Mc). Whole pinyon cones stored green in caches (Fsp, Flk, Mc). Pinyon stored in grass-lined pits covered with brush and stone (Fsp, Flk, Mc). Seeds stored in bark or grass-lined pits (Fsp, Flk, Mc) (Steward 1941: 279-281).

Illustrations: None

Pit locations: Pits were located outside doors of dwellings (Whiting 1950: 94).

Pit preparation:

Pit dimensions:

Other: Specific groups referred to in the references are:
Lowie 1924 = Paviotso - Pyramid Lake, Pallon
Riddell 1960 = Honey Lake or Wadatkuht Paiute
Kelly 1934 = Surprise Valley Paviotso

Acorn most important single food plant. Could be gathered in large enough quantities in some years to last 2 - 3 years. "Excess acorns stored in a pit dug into the ground and lined with oak leaves or pine needles." Pit was covered over and acorns dug up when needed. (Riddell 1960: 37).

Acorn not important in Paiute diet. Only obtainable from California. Several groups insisted acorns were important before white contact (Stewart 1941: 427).

Group: Northern Paiute (NR13)

Other, continued:

** Listing of Paiute groups associated with codes from Stewart 1941 used on this data form:

Tasiget-tuviwari - Ts
Kuyui-dokado - K1
Kuyui-dokado - K2
Kupa-dokado - Ku
Toe-dokado - To
Tovusi-dokado - To
Pakuii-dokado - Pa
Atla'kudokwa-tuviwarai - At
Samwa'waktodo-tuviwarai - Sa
Tago-toka - Tg
Wada-dokado - Wd
Kidu-dokado - Ki

** Listing of Paiute groups associated with codes from Steward 1941 used on this data form:

Northern Paiute Fish Springs - Fsp
Northern Paiute Fish Lake Valley - Flk
Northern Paiute Mill City - Mc

HRAF Information Leslie E. Raymer

Group: Southeast Salish (NR19)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation

What store: Coeur d'Alene - Dried fish, dried meat, roots, other kinds of food (Teit 1930: 63).

Importance as storage technique: Sinkaietk - Winter storage (Cline 1938: 31). Sinkaietk - Food stored in pits eaten late in the year. Used pits because food kept better in them than other storage methods (Cline 1938: 31-32).

Other storage techniques: Coeur d'Alene - Scaffolds, small platforms built in branches of large trees (Mats, camping equipment, skins, and sometimes food) (Teit 1930: 63).

Coeur d'Alene - Tree caches, scaffold caches, scaffolds (oblong and square) - drying racks. Rawhide bags (fat and meat) (Teit 1930: 63).

Sanpoil - Bags in ends of dwellings. Storage baskets. Salmon stored in tule bags. Storage houses and raised platforms (Ray 1933: 33).

Sinkaietk - In compartment in longhouses. Summer storage - arbors in woods used, 15'-20' square and 7' to 8' above ground on upright poles. Rock shelters (Cline 1938: 31-32).

Importance of stored commodity:

Pit morphology: Coeur d'Alene - Most common cache: circular pits dug in dry ground where drainage was good. Dried fish, dried meat, roots, and other kinds of food were stored by tribes (Teit 1930: 63). Circular pits (Teit 1930: 229).

Group: Southeast Salish (NR19)

Pit morphology, continued:
Coeur d'Alene - Cured salmon and other foods cached in ordinary pits. Were lined with grass or bark. Certain pits used for fish, while others were used for vegetable matter (Teit 1928: 119).

Spokane - used circular pits to store dried fish, roots, berries, and meat (Teit 1930: 342).

Sinkaietk - Pits circular. Lined with specially cut flat rocks and dry grass. Smaller pits built by individuals. Larger pits built by 2-3 families. Food placed in sacks in pits. Covered with grass and flat rocks. Caches not concealed. Generally covers to caches stood several feet above ground. Preferable because the freezing of the ground "would then not make it hard to get at the food" (Cline 1938: 31-32).

Illustrations: None

Pit locations: Coeur d'Alene - Dug in dry ground where drainage good (Teit 1930: 63).

Pit preparation:

Pit dimensions: 6'-16' diameter x 2'-4' depth (Cline 1938: 31-32).

Other: Sanpoil - Fish was mainstay of diet year-round (Ray 1933: 57). Huge quantities of salmon were dried each year. Stored in tule bags. Stored in storage houses or elevated platforms (Ray 1933: 75-76).

Sinkaietk - Dried salmon lasted one year. Stored in sacks of hemp or tule (Cline 1938: 14).

Sinkaietk - In summer, when foodstuffs gathered, frequently cached near where gathered and moved in winter when more time. Frequently stored in arbors in woods in summer. In winter, stores were moved to rock shelters or pits, usually nearer to the winter villages (Cline 1938: 31-32).

HRAF Information Leslie E. Raymer

Group: Pomo (NS18)

Location:

Other Names:

Data Quality: Good

Why store: Preservation (pit locations sometimes concealed from raiders with piles of brush).

What store: Acorns, wild oats, other small grains (Barrett 1916: 8-9). Acorns (Gifford and Kroeber 1937: 181).

Importance as storage technique:

Other storage techniques: Above ground granaries and baskets were used to store acorns. Baskets in houses. Above ground basket granary for acorns (Gifford and Kroeber 1937: 181).

Baskets in houses (Russian River and Coast Pomo) (Kroeber 1953: 242-243).

Built openwork storage baskets, which were mainly kept in houses. Built above ground granaries with dome-shaped roofs that held up to a ton of acorns (Barrett 1916: 7-8).

* Outdoor type 2. Above ground storage - willow-poles set in ground and cylinder woven and set up from ground 2'. Thatched with grass (Barrett 1916: 8).

Kept acorns, buckeyes, pepperwood nuts, and manzanito berries in baskets in houses (Loeb 1926: 173).

Eastern Pomo - Clear Lake Pomo stored their acorns in large outdoor granaries with an elevated floor (Kroeber 1953: 242-243).

Fish and deer often preserved. Dried fish salted and kept in baskets in dwellings (Meat and fish kept 5 months) (Loeb 1926: 172-173). Large quantities of fish and sea mammals dried and carried to permanent villages for winter use (Stewart 1943: 33).

Group: Pomo (NS18)

Other storage techniques, continued: Gifford and Kroeber 1937: 140 (see comments section for code explanations).

use above ground granaries detached from dwellings
Northern Pomo - all five groups
Central Pomo - Yo, Ss
Eastern Pomo - Ha, Ci
SE Pomo - Ko

use elevated granaries:
Central Pomo - Le
Southern Pomo - Mu
SE Pomo - Ko, El

granaries located indoors:
Northern Pomo - all five groups
Central Pomo - all three groups
SW Pomo - Me
Southern Pomo - Ma
Eastern Pomo - Ha
SE Pomo - Ko

Importance of stored commodity:

Pit morphology: Built acorn granaries in hills and roofed them with bark. Visited from time to time for acorns (Gifford and Kroeber 1937: 181).

Types of outdoor storage recepticles (used in years of abundant harvests): 1. Hollowed out summit of a conical knoll (made pit a few inches larger than the container) and placed wooden platform in bottom of the pit (to keep dampness out of the stored goods). Set basket granary on this (Barrett 1908). Top of basket even with top of pit. Built a low, gently sloping (conical), slab roof over the basket. Basket lined with grass when small seeds stored in it (acorns, wild oats, and other small grains stored). Brush thrown over cache roof to conceal it in case village raided (Barrett 1916: 7-9). 2. Described in Other storage techniques section.

Group: Pomo (NS18)

Gifford and Kroeber 1937: 140

store in subterranean pits
Northern Pomo - Kb, Ke
Central Pomo - Le

Illustrations: Above ground acorn cache (Barrett 1916: facing pp. 4 and 6).

Pit locations: 1. "Summit of conical knoll with good natural drainage" (Barrett 1916: 82). In hills (Gifford and Kroeber 1937: 181).

Pit preparation:

Pit dimensions:

Other: Two outdoor storage types described - heavily used in years of abundant harvests. 1. pits, 2. above ground basket granary (Barrett 1916: 8).

Groups and Codes for Pomo peoples recorded in Gifford and Kroeber 1937: 120-122 -

Northern Pomo

Kabe'dile, Eel River - Kb
Kaleka'e, Eel River - Kl
Buldam Willits, Eel River - Bw
Kacha', Russian River - Kc
Shane'l - Sn

Central Pomo

I'cheche, of coast - Kc
Yoka'ia, Russian River - Yo
Shane'l, Russian River - Ss

Southwestern Pomo

Mete'ni -Me

Group: Pomo (NS18)

Other, continued:

Southern Pomo

Mukan'no - Mu
Ma'kahmo - Ma

Eastern Pomo - Clear Lake

Habe'napo - Ha
Shi'gom - Ci

Southeastern Pomo - Lower Clear Lake

E'lem - El
Koi - Ko

HRAF Information Leslie E. Raymer

Group: Tubatulabal (NS22)

Location:

Other Names:

Data Quality: Excellent (Voegelin 1938) - All.

Why store: Preservation. (Pinyon nuts are buried, while acorns are stored above ground at acorn grounds).

What store: Dried pinyon nuts, dried digger pine cones (roasted) (p. 16).

Importance as storage technique: Winter preservation of nuts. Pinon nuts are dried and cached in pits. Digger pine cones are collected and cached in the fall (pp. 16, 20).

Other storage techniques: Acorns were stored in two ways: 1. Stored in baskets in elevated storehouses at the acorn-grounds. Acorns are stored for the winter. Man and wife go for acorns as needed. Granaries at acorn grounds were used from year to year (pp. 16, 20). 2. Gathered by women near home and stored near the houses (pp. 16, 20). Acorn granaries are used year to year; generally storehouses were morphologically similar to dwellings, and co-located with them. Walls of granaries were thatch and mud-covered. Household goods, fish, meat, pinyon, and acorns were stored in them (p. 20).

Importance of stored commodity:

Pit morphology: Pinyon caches are circular pits 5 feet in diameter by 2.5 feet deep. They are dug near the pinyon ground in the floors of natural rock-shelters and are lined with flat rocks or brush and covered with flat rocks or grass, and small stones (p. 20).

Illustrations: None

Pit locations: At the pinyon camps in the mountains (p. 16).

Pit preparation:

Group: Tubatulabal (NS22)

Pit dimensions: 5 feet diameter X 2.5 feet deep (p. 20).

Other: Acorns are cached at the collecting grounds or near the houses (pp. 16, 20).

* Hunting and Gathering economy: acorns, pinyon, deer, rabbit, and fish.

* Caches of pinyon and acorns are used from February through May; by June they are depleted (p. 11).

* Digger pine cones and pinyon nuts are processed by roasting the cones in sage (Artemesia tridentata) to open them (p. 16).

* Men go to the mountains for stored pinyon in the winter (p. 20).

* All inhabitants of hamlet or several hamlets went together to gather pinyon. Pinyon was collected when mature. Cones were burned on a bed of sage (Artemesia sp.), roasted until cones open. Nuts shaken loose from cones after roasted. left to dry 3-4 days. Cached in pits. Digger pine cone nuts collected and processed like pinyon in the fall (Voegelin 1938: 16-17).

HRAF Information Leslie E. Raymer

Group: Eastern Apache (NT8)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment ("their secret supply") (Opler 1941: 371).

What store: Meat, yucca fruit, mescal, and berries, valuables (Opler 1941: 368, 371). Meat, yucca, mescal (Castetter and Opler 1936: 40-41).

Im. as storage technique: Most of winter, early spring, use stored food. Food will keep for a year (Opler 1941: 356, 371). Food for emergencies and winter (Castetter and Opler 1936: 11).

Other storage techniques: Parfleches and sacks carried with as travelled. Only limited amount stored this way (Opler 1941: 23, 371).

Im. of stored commodity:

Cache morphology: Most stored food concealed in caches. "Hole in the rock, a little cave." Caches in rocky caves. (No pits as far as Opler knows) (Opler 1941: 371). Chiricahua and Mescalero: Cave caches of food for emergencies (Castetter and Opler 1936: 11).

Illustrations: None

Cache locations: In mountains (Opler 1941: 371; Castetter and Opler 1936: 11).

Cache preparation: Layer of rocks put down. Next oak brush. Parfleches on this. Entrance closed with rocks and plastered with mud. Concealed with grass and dirt (Opler 1941: 371).

Pit dimensions:

Group: Eastern Apache (NT8)

Other: Each extended family in the local group had its own place to store food (Opler 1941: 183).

* Most winter, early spring, use stored food (Opler 1941: 355).

* Caches used either by individual households or several camps of related people (Opler 1941: 183, 371).

* Mescal gathered in spring. Most food (yucca fruit, mescal, and berries) dried for storage. Yucca fruit gathered in fall (Opler 1941: 356, 371).

HRAF Information Leslie E. Raymer

Group: Navajo (NT13)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment ["All signs of pits were obliterated (Hill 1938: 43)." "We covered the hole and hid the place so no one else would get our corn. (Brewer 1937: 58)." Pit locations are known to members of the immediate family. The food supplies are removed from the pits before dawn in order to keep the locations of their storage places secret (Bailey 1940: 290).]

What store: Winter corn supply (Hill 1938: 42-43; Brewer 1937: 58, Dyk 1938: 81-82); corn (either shelled or on the cob) was put loose in pits or was placed in hide containers before it was put into globular pits (Hill 1938: 43-45). Corn, squash, flower seeds, dried roots, and seeds (dried over fires) (Bailey 1940: 290). Shelled corn, squash, pumpkins, dried melons (Dyk 1938: 81-82; Dyk 1947: 64). Hardest and most perfect squash, mature and dry melons, beans (Hill 1938: 45). Dried peaches, wheat (Hill 1938: 49-50).

Importance as storage technique: Winter storage. The Navajo travelled to their storage locations to get supplies through the winter (Hill 1938: 43). If the ground was dry and their corn was properly prepared, it could be preserved in pits up to 2 years (Hill 1938: 43-45). Used pits to conceal and preserve agricultural products when they moved their camps (Bailey 1940: 290).

Other storage techniques: Used natural cavities in rock faces for concealed storage. Put food in the cavities and built stone walls across the openings. Concealed the openings by making the wall look like the natural cliff face (Hill 1938: 43-45).
* Dried meat was stored in buckskin bags in caves. Squash was stored in their hogans (Bailey 1940: 290).
* Concealed goods in storage structures other than pits. For example, they concealed food in cedar trees in the mountains (Dyk 1938: 352-353).

Group: Navajo (NT13)

Other storage techniques, continued:
* Had storage structures in their dwelling clusters:
  1. used hogans without smoke holes.
  2. stored food in cabins (Landgraf 1950: 107).
* Squash was kept in unused hogans. Dried peaches were stored in storehouses (Hill 1938: 45, 49).

Importance of stored commodity: Winter corn supply was largely stored in pits (Hill 1938: 42-43).

Pit morphology: Each family normally had from 1 to 4 pits. There were three common types - 1. The most common and oldest was globular in shape and somewhat restricted at its neck. The bottom and sidewalls were lined with shredded cedar bark. The top of the produce was covered with a layer of bark, a stone slab, and one foot of earth. "All signs of the pits were obliterated. Globular pits averaged 6' in depth (Hill 1938: 42-43). This type of pit was used to store corn (Hill 1938: 43-45).
2. Semi-subterranean storage bins - first the pit was dug, then a circular wall of stone and adobe was added. Two thirds of the storage space was below ground. The above ground portion of the structure was enclosed by a wall. The average dimensions of these pits were 6-8' deep with a 3' diameter (Hill 1938: 43). These pits were not concealed.
3. The third type of pits were rectangular. This type of pit was used for the storage of squash. The average dimensions were 5' deep x 3' wide x 6' long (Hill 1938: 43, 45). A) The bottom and sides of this type of pit were lined with cedar bark, then the pit was filled with produce to within a few inches of the top of the pit. The pit was covered with a frame of sticks, a layer of cedar bark, and a foot of dirt. (Hill 1938: 43). These pits appear to have been concealed. B) Recently, the covering of these rectangular pits has been altered. Rectangular pits are now covered with earth-covered roofs. They are not concealed. Morphology: support posts were set at each end of the pits. The posts were connected with a crosspole. The Navajo built a roof over the pit by leaving sticks against the crosspole, which were than covered with a layer of dirt and bark (Hill 1938: 43).

Group: Navajo (NT13)

Pit morphology, continued: * Mature squash was wrapped in cedar bark or corn husks and was stored in both pit types with corn. It kept until February. Mature and dry melons were stored in pits. Beans were stored with corn in pits and were kept seperate from the corn by bark partitions. Dried peaches were placed in buckskin sacks and stored in pits. Pits used for peach storage were lined with rocks (Hill 1938: 45, 49-50).

* Corn is stored in a "round hole in the ground" that is lined with shredded juniper bark and is covered with bark, a flat stone, and a layer of soil. Squash and flower seeds are stored like corn in pits that are 3.5 feet deep with a 20 inch diameter. Like corn pits, the locations are only known to family members (Bailey 1940: 290).

* Roots and seeds are dried out over a fire and are stored in unlined pits, either loose or in sacks (Bailey 1940: 290).

* Pits are covered with dirt. Crops are stored in pits in the fall, and used in the spring when they move to their spring camps (Dyk 1938: 27, 81-82). Crops were processed and stored in pits 10 days after they were harvested. Squash and pumpkins were apparently stored in seperate pits (Dyk 1938: 212-213, 220-221).
* Stored corn was taken from pits in the spring. Pits were covered with boards, a blanket, and dirt. Had two corn pits: one for blue corn and one for yellow corn (Dyk 1947: 27). Shelled corn, dried melons, and squash were cached in pits in the fall after the fall hunt. 57 sacks were stored in three pits (Dyk 1947: 64).

Illustrations: Drawings and photos (Hill 1938: 43-44).

Pit locations: * In pits in fields or near summer hogans (winter corn supply stored here). Selected dry ground for their pit locations.

* Pits were located a day's ride from their spring camps (Dyk 1938: 81-82). Squash and pumpkins were stored in pits located at their agricultural fields (Dyk 1938; 220-221).

Group: Navajo (NT13)

Pit locations, continued: * The bulk of their corn was stored at their farms; some was moved and stored in pits or sand drifts at other localities (Dyk 1947: 39-40).

Pit preparation: Built fires in the pits before they put in the food. The fire dried and hardened the pit's surfaces (Hill 1938: 42-43).

Pit dimensions: See pit morph.

Other:

Comments: * Hardest and most perfect squash was selected for storage. Each squash was wrapped in cedar bark or corn husks. The wrappings kept the squash from bruising or freezing. The squash was preserved in this manner until Feburary. Mature and dry melons were stored like squash. Kept for a shorter period than squash (Hill 1938: 45).

* When they were getting ready to move their camps, they dug pits and put their corn in them. They covered the pits and concealed the locations in order to keep people from stealing their corn. They carried a supply of corn with them when they moved. When this supply was exhausted, a family member went back to the pits for more (Brewer 1937: 58).
* In the spring, they moved to "Aspens Coming Down." When they arrived, the women went to get their corn from where it was buried the previous fall. The pit was a day's ride away; the corn had molded (Dyk 1938: 81-82).

* Sent them to get squash from storage pits located at their agricultural fields. All of the squash was rotten. Pumpkins that stored in another pit were good. Squash and pumpkins were apparently stored fresh (Dyk 1938: 220-221).

Group: Navajo (NT13)

Comments, continued:

* Went for their stored corn in the spring. The corn was damp when it was removed, so it was spread on blankets to dry. After it was dry, it was returned to the pits, covered with boards, a blanket, and dirt. Had stored 13 sacks the previous fall (Dyk 1947: 27).

* The corn was first shelled, which took 4 days; then it was stored in pits in sacks. They filled two pits with the corn and covered them over. Some sacks were moved to two other localities and cached. Two sacks were placed in pits and one was put in a sand drift. The bulk of the corn was stored at the farm (Dyk 1947: 39-40).

* They went on the fall hunt, and then shelled and cached their corn in pits (57 sacks were put in 3 pits). Dried melons and squash were put in the pits as well. Some pits were located near their fields. The bulk of the corn was stored in another location. 30 sacks were carried to their winter camps (Dyk 1947: 64). The corn they took to their winter camps may not have been stored in pits.

HRAF Information Leslie E. Raymer

Group: River Yumans (NT15) Maricopa.

Location:

Other Names:

Data Quality: Excellent (Spier 1933) - All.

Why store: Preservation (sometimes concealed) (p.65).

What store: Melons, pumpkins, squash, similar foods (pp. 64-65, 90).

Importance as storage technique: Winter preservation and occasionally concealment (p. 90). Basket granaries half-buried in the ground to protect stored commodities from vermin (p.90).

Other storage techniques: Basket granaries and pots in houses - mesquite kept in both (p. 51). Corn kept in basket granaries (p. 63). Wheat and berries stored in pots (pp. 53 & 65). Beans kept in basket granaries. Pumpkins and squash dried and put in the storehouses (pp. 51, 64).

Importance of stored commodity: Important fresh food in winter (p. 65).

Pit morphology: Watermelons - stored in semi-subterranean, roofed storehouses or buried in sand (pp. 64-65). Gable roof built over a pit. Pit planview is oval. Post was set in pit near each end, and a ridgepole connected the two. Willow poles encircled each pit. Arroweeds used for thatched roof (p. 89-90). Roof was 3'-4' above the ground level. Roof covered with layer of dirt.

* Storage houses were built 3'-4' above ground over pits. Dirt was banked around thatched roofs and sidewalls. Ridgepole ran E-W, entrance on eastern side (pp. 89-90).

* Basket granaries (3'-5' diameter, 3'-4' high) were set on low platforms or were half buried in a pit (to protect better from foxes and gophers). Pit dug - waist deep; lined with brush. Basket set in. Top half covered thickly with dirt (p. 90-91).

Illustrations: None

Group: River Yumans (NT15) Maricopa

Pit locations: Storehouses adjacent to dwellings (p. 65). Each dwelling had one (p. 89).

Pit preparation:

Pit dimensions: 6'-8' long, knee deep. 3'-5' diameter, knee deep (p. 89).

Other: Each family averaged one basket granary (p. 51). "Watermelons weren't ordinarily stored by burial in sand in the fashion of the Lower Colorado tribes, but was resorted to if they were to be hidden from enemies (p. 65)." Men made storehouses for pumpkins and melons at harvest time (p. 60).

Man working alone took a month to build (p. 90).

Melons that were in storehouses next to houses; "may have been covered with sand to keep through winter." Melons were not usually buried in the sand, unless they had to hide from enemies (p. 65).

<Special purpose storage structure for the preservation of particular foods.>

HRAF Information Leslie E. Raymer

Group: Southern Paiute (NT16)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment (Steward 1941: 231, 333)

What store: Kaibab: surplus from fall harvest (Manners 1974: 81).
Kaibab: Meat (buried in winter, about November) (Kelly 1964: 49).
Moapa: Dried, compressed mesquite meal (Stuart 1945: 133, 134). Pinyon nuts (Shutler 1956: 70).
Common to most Paiute groups: Pine-nuts, sunflower seeds, sand grass, seeds, and roots (Steward 1941: 231).
Chemehuevi: seeds, agave, meat, maybe dried melons and squashes (Laird 1976: 6).
Shivwits, San Juan: mesquite (Stewart 1942: 250, 252)
Shivwits, Kaibab, San Juan: pinyon (Stewart 1942: 250, 252)
Antarianunts, Shivwits, Kaibab, San Juan: other plant foods (Stewart 1942: 250, 252)
Chemehuevi (Ash Meadows Paiute): Mature mesquite pods, pinyon nuts, seeds (Steward 1941: 279-281).
Antarianunts: dried meat (Stewart 1942: 253).

Importance as storage technique: Kaibab, Panguitch - Winter storage of food (Kelly 1964: 49, 179).

Other storage techniques: Kaibab - Hide sacks hung from roofs of shades (corn, squash, pinenuts, yucca). Meat stored in hide sack and cached in a tree in summer (buried in November) (Kelly 1964: 40-44, 49).

Kaiparowits - Part of fall harvest of seeds, berries, roots, and pinyon stored in caves near where gathered and used in winter (Kelly 1964: 150).

Chemehuevi (Ash Meadows Paiute) - domesticated plants stored in dwellings. Seeds stored in baskets, pots, and buckskin bags (Steward 1941: 279, 281).

Group: Southern Paiute (NT16)

Other storage techniques, continued: Pinyon stored in baskets (SJ) and skin bags (SS, SK, SJ). Pile pinyon on ground and cover it with bark and brush (SJ). Cave caches (SS, SK, SJ) (Stewart 1942: 250-251).

Steward (1941: 231) assumes seed storage restricted to pits, since they often stored seeds at great distances from dwellings.

Other plant foods - stored in houses (SA, SS, SK), and in trees (SK, SJ). Dried meat stored in trees (SK, SJ) and in caves and rockshelters (SA, SS, SJ). Dried fish stored in houses (SA) (Stewart 1942: 252-253).

Importance of stored commodity: Moapa: famine food (Stuart 1945: 133).

Pit morphology:
Kaibab - Fall harvest surplus is dried, than placed in bark or skin containers and stored in bark-lined pits (Manners 1974: 81).

Kaibab - Some sites had caves that were occupied in winter. Storage pits were handily located in the floors of the caves (Kelly 1964: 6).

Kaibab - Surplus food dried and cached for the future. Wrapped in bark, placed in hide sacks, and cached in bark-lined pits (not jar-shaped), dug in the floors of caves and rock shelters. Pits covered bark, poles, earth, and stones. Each family had one or, more, often widely seperated (Kelly 1964: 37, 39).

Kaiparowits - wrap food in bark or hide sacks and deposit it in bark-lined pits (not jar-shaped). Pits covered with layers of bark, poles, earth, and stone (Kelly 1964: 152).

Panquitch - Winter food placed in pot-shaped hole that is lined with bark and covered with earth and stones (Kelly 1964: 179).

Group: Southern Paiute (NT16)

Pit morphology, continued:
Moapa - Mesquite meal pressed tightly into cone-shaped baskets and dried as large cakes weighing 50-60 lbs. Sometimes placed in pot-shaped pits lined with grass (Stuart 1945: 134).

Chemehuevi (Ash Meadows Paiute) - Mature mesquite pods are stored in pits. Pinyon nuts stored in grass-lined pits covered with brush and stones. Seeds stored in bark or grass-lined pits (Steward 1941: 279-281).

One man's cache pit described: small natural hole in rock (held 8 bushels of pinyon nuts). Had a fitted stone cover (30" x 18" opening) that was sealed shut with heated pitch (Shutler 1956: 70).

Grass or brush-lined pits (Steward 1941: 231). Mesquite stored in bark-lined pits (SS, SJ). SS Store after mesquite ground, moistened, and pressed into cakes. SJ store mature pods (Stewart 1942: 250).

Pinyon - green, unopened cones cached (SJ). Cooked or ripe nuts cached (SA, SS, SK, SJ). Pits stone-lined (SK, SJ), bark-lined (SS, SK, SJ). covered with brush and earth (SJ), brush and stones (SS, SJ), and juniper bark (SS, SK, SJ) (Stewart 1942: 250).

Other plant foods - all four groups stored in pits. Bell-shaped pits used. Bark or grass-lined. Located in caves or rock shelters. Stored in baskets or hide bags that were placed in pits (Stewart 1942: 252).

Dried meat - cached in bark-lined pits (SA) (Stewart 1942: 253).

Illustrations: Photos of one man's cache pit (Shutler 1956: 70).

Group: Southern Paiute (NT16)

Pit locations: Kaibab - some sites had caves occupied in winter. Storage pits located in cave floor (Kelly 1964: pp). In caves or rock-shelters (Manners 1974: 81).

Kaibab: "Wintered nearly to Colorado Canyon. In spring, returned with mescal to own springs." Spent summer there, harvesting seeds and burying stores for following spring (Kelly 1964: 21).

Kaibab, Kaiparowits - dug pits in floors of caves or rock shelters (Kelly 1964: 37, 152, 179).

Moapa - dug in benches along rear walls of rockshelters (Stuart 1945: 134). Common among Paiute to store pinyon in caches near pinyon groves in mountains or near camps in vallies (Shutler 1956: 71).

Chemehuevi - Food caches buried or sometimes hidden in caves. Concealed food stores. Placed pits at home bases (Laird 1976: 6).

Panquitch - pits used for winter storage were located in rock shelters or caves (Kelly 1964: 179).

Caches located near camps in vallies (SS, SK). Pits located near pinyon groves in mountains (SA, SJ). Pits located in caves (SS, SK) (Stewart 1942: 250-251).

Pit preparation:

Pit dimensions:

Comments: Codes of Southern Paiute groups referred to in Stewart 1942:

Antarianunts - SA
Shivwits - SS
Kaibab - SK
San Juan - SJ

Group: Southern Paiute (NT16)

Comments, continued: ** "Seed storage was probably necessarily restricted to pits" to avoid theft and animal predation, since seeds (especially pinenuts) often stored many miles from dwellings. "People were constantly searching for caches to rob" (Steward 1941: 231, 333).

Kaibab: "Surplus was dried and cached against future needs." Each family had one or more such deposits, often in widely seperated places" (Kelly 1964: 37).

* Kaibab: Eat stored food in winter and spring (Manners 1974: 81).

* Kaibab: All camps moved in unison; spent winter and spring at foot of Vermillion Cliffs. Food cached in caves of cliffs for winter (Kelly 1964: 16).

* Kaibab: Example of pit storage: 1. Moccasin people: stored hunted and gathered products in caves and rock shelters at plateau (Kaibab Plateau). When needed, travelled to get stores. 2. Alton people: Winter food cached at winter base camp. Spring food cached at home camps (Kelly 1964: 37).

* Kaiparowits: annual round described. Describes storage localities (Kelly 1964: 150). See Notes.

* Dried meat stored in hide sacks and cached in trees. Meat is buried in winter, in early November (Kelly 1964: 49).

HRAF Information Leslie E. Raymer

Group: Ute (NT19)

Location:

Other Names:

Data Quality: Excellent.

Why store: Concealment (Powell 1971: 49; Smith 1974: 67).

What store: Dried berries (Jones 1955: 215; Lowie 1924: 202); Northern Ute - dried fish (Smith 1974: 64, 331).

Pinyon, other plant foods (all groups) (Stewart 1942: 250, 252). Note - Group codes used in Stewart 1942 are explained in the Comments section.

Importance as storage technique: Preserve for winter use (Jones 1955: 215; Lowie 1924: 202; Smith 1974: 331).

Other storage techniques: Fish dried and stored in caches for the winter (Smith 1974: 331; Lowie 1924: 200). Meat dried and stored in parfleches (Smith 1974: 490). Seeds and other articles in baskets or sacks and covered with stones (Powell 1971: 49)

When pinyon abundant, several families went together to gather. Nuts either stored in caves or roasted until cones popped open and nuts extracted. Ground into meal and stored for winter (Smith 1974: 66).

Stored in platforms in coniferous trees. Sacks of food placed on and covered with cedar bark (Smith 1974: 67).

Acorns eaten raw, unleached (Uu, U2, Uw). Pinyon stored in skin bags (Um, Up, Ut, Uc, U1, U2, Uw). Pinyon nuts stored by piling them on the ground and covering them with bark and brush (Um, Up). Cave caches (Up, U2) (Stewart 1942: 250-251).

Importance of stored commodity: Winter food, when other supplies lacking (Jones 1955: 215; Lowie 1924: 202). Fish are winter food (Smith 1974: 64).

Group: Ute (NT19)

Pit Morphology: In the late summer and fall, dried berries are put in baskets and stored in pits that are covered with dirt (Jones 1955: 215; Lowie 1924: 202).
Food saved for future by caching it. Cached food was common property in the camp.
Procedure: dig a big pit under a cliff overhang; line it with bark; place bark or hide sacks of food in pit; cover with grass, stones, and raked sand; build a fire on top of the pit to destroy evidence of its location and mask the odor of the food (to prevent raiding by predators). Even so, bears sometimes located pits and robbed them (Smith 1974: 67; Powell 1971: 49).

When pits were built, Ute tried to prepare them in such a way that the pits would keep dry when the snows came (Smith 1974: 67).

* Fish are stored inside sacks made of bark or hide, "stored in a hole in the side of a hill. Important winter food (Smith 1974: 64)."

Pinyon caches - Pits grass-lined (Uc, U1); stone-lined (Uu, Ut, Uc, U1,Uw); bark-lined (Um, Uu, up, Uc, U1, U2, Uw). Pits covered with brush and earth (Um, Uu, Ut, U1, U2); brush and stones (U1, U2, Uw); juniper bark (Uu, Up, Uc, U1, U2, Uw) (Stewart 1942: 251).

Other plant foods - Pits bell-shaped in profile (Uu, Ut, Uc, U1) (Stewart 1942: 252).

Other plant foods - Food stored in baskets placed in pits (Um, Uu, Uc, U1, Uw). Stored in skin bags in pits (all groups) (Stewart 1942: 252).

Dried meat stored in grass or bark-lined pits (Uu, Up, Ut, Uc, U1, Uw) (Stewart 1942: 253).

Illustrations: None

Pit locations: Pits dug under overhangs of cliffs (area where snow is not heavy) (Smith 1974: 67). In side of hill (Smith 1974: 64). Many caches placed in caves and crevices (Powell 1971: 49).

Group: Ute (NT19)

Pit locations, continued: Pinyon caches - Caches located near camps in vallies (all but U2). Caches located near pinyon groves in mountains (all but Uw). Pits located in caves (U2, Uw) (Stewart 1942: 250-251).

Other plant foods - Pits located in caves or rockshelters (Um, Uc, U1, Uw) (Sterwart 1942: 252).

Pit preparation:

Pit dimensions:

Other: References in Jones (1955) and Smith (1974) refer to the Northern Ute.

Group names and codes recorded in Stewart (1942):

Maonunts - Um
Tompanowotsnunts (Uintah) - UU
Pahvant - Up
Taviwatsiu - Ut
Mowataviwatsiu - Uc
Mowatci (Moache) - U1, U2
Wimonuntce (Southern Ute) - Uw

* Pinyon is carefully cached when green, important staple (Lang 1954: 68).

* "People of the same tribe never disturb a cache belonging to one of their own number. Although it seems that no pains are taken to conceal their situation, but they are probably so thoroughly hidden that others would rarely discover them (Powell 1971: 49)."

Women collect berries in mountains. Dry when returned home. Placed in baskets and stored until winter in pits (Jones 1955: 215; Lowie 1924: 201-202).

HRAF Information Leslie E. Raymer

Group: Washo (NT20)

Location:

Other Names:

Data Quality: good

Why store:

What store: Pinyon (Lowie 1939: 326; Price 1962: 58). Acorns processed in pits (Stewart 1941: 374). Pinyon nuts, seeds (Stewart 1941: 374).

Importance as storage technique: Dried nuts keep in pits for a year (Lowie 1939: 326).

Other storage techniques: Large brush and pine-needle covered caches of cones with nuts still in them were constructed as the nuts were collected. Wide variability of size. Average: 15' long x 6' wide x 4' high. Each family had rights to about 4 caches, each with 300-600 lbs. of pinyon. About 300 lbs. per person (Price 1962: 58).

Pinyon nuts piled on ground and covered up. Seeds stored in baskets and buckskin bags. Food stored in houses in storage bags (Stewart 1941: 376, 379).

Importance of stored commodity: Winter food (Lowie 1939: 326). Stored into next year as "stored margin of safety in case next seasons crop was poor" (Price 1962: 57).

Pit morphology: Pinyon pits - Pits were constructed for storage in the spring. In the winter, food was taken out for consumption (Lowie 1939: 326). Few hundred pounds eaten immediately or cached in pits (stone and grass lined). Mixed with dry pine needles to keep them dry and free of mold (Price 1962: 58).

Acorn pits - Acorns were leached in sage-lined pits (Stewart 1941: 374).

Group: Washo (NT20)

Pit morphology, continued: Pinyon pits - stored green, whole cones in stone-lined circular pits. Nuts that were removed from cones were stored in pits that were covered with brush and stones. Pits were lined with various materials (grass, pine-leaf soil, juniper bark) (Stewart 1941: 376). Seeds stored in bark or grass-lined pits (Stewart 1941: 376).

Illustrations: Photograph (Price 1962: 23, 59).

Pit locations: No pits located within houses (Stewart 1941: 379).

Pit preparation:

Pit dimensions:

Other: Men and women gathered pinyon cooperatively. Dried nuts kept for a year (Lowie 1939: 326). "Accumulated surpluses generally small" (Price 1962: 20). " Pinyon surpluses an exception" (Price 1962: 20).

Pinyon was collected from September to October (Price 1962: 58). Large quantities of pinyon were lost to rot and predation (Price 1962: 58).

"Pinenuts were difficult to store for more than a year or to transport." "Surplus was set aside for consumption, not trade." "If one family had surplus, all families tended to have a surplus" (Price 1962: 58).

In years with abundant pinyon, more would be gathered than could be eaten (Price 1962: 20).

"At rate of one pound of nuts per person, per day; this gave each household enough pinenuts for roughly half of their total food for two years." "Much was lost to rot and predation" (Price 1962: 58).

Pinyon groves privately owned. Notes overproduction (Price 1962: 59).

HRAF Information Leslie E. Raymer

Group: Western Apache (NT21)

Location:

Other Names:

Data Quality: Good.

Why store:

What store:

Importance as storage technique: Winter storage (Goodwin 1942: 160).

Other storage techniques: Caves near where gathered. Caves, tree caches, and wickiups at winter camps (Goodwin 1942: 160). "Corral-like food shelters at base-camps (Basso 1966: 135-136)." Baskets and jugs in dwellings (Basso 1970: 3; Reagan 1930: 293).

Importance of stored commodity:

Pit morphology: Described as ground caches (Goodwin 1942: 160).

Illustrations: None

Pit locations: Near home locality (farming site) (Goodwin 1942: 160).

Pit preparation:

Pit dimensions:

Other: Practice seasonal mobility: have seasonal residences in other places; locate base camps at farming sites (Goodwin 1942: 160).

* Some gathered plants are stored in caves near where they are collected. Most are brought home and stored for winter use in pits, caves, tree caches, or wickiups (Goodwin 1942: 160).

Group: Western Apache (NT21)

* Residential camps contain wickiups, shades, and food shelters ("corral-like," illustration in Basso 1966: 135-136).

* Storage pits: husband and wife dug food caches; women brought food to cache; youths did not help with storage until married (Goodwin 1942: 472).

* Mescal shoots stored in branches of trees around camp (Goodwin and Basso, 1971: 98).

* Subsistence farming; most of subsistence based on hunting and gathering:
25% from agricultural crops
75% hunting and wild plants
Sedentary at the fields in the early spring and early fall; Mobile the rest of the year (Basso 1970: 3).

* Had seasonal residences in other places, home localities at farming sites. Gathered food was occasionally stored in caves, most was packed home and stored in "ground caches", caves, tree caches, or wickiups, where were available all winter.

HRAF Information Leslie E. Raymer

Group: Western Shoshone (NT22)

Location:

Other Names:

Data Quality: Excellent

Why store: Concealment (Steward 1941: 231, 333)

What store: Roasted pinyon nuts (Steward 1938: 121); roots and seeds gathered in summer (Steward 1938: 142); Dried roots. Meat, dried insects, seeds, and roots. Recent times - apples, jerked meat (Clemmer 1972: 315).

Acorns, mature mesquite, pinyon nuts, seeds (Steward 1941; 279, 281, 332).

Importance as storage technique: Steward assumes seed storage restricted to pits, since Shoshoneans often stored seeds at great distances from their dwellings. Above ground storage was unconcealed, and therefore, more subject to theft. Additional support - observation that fights occurred when pinyon caches were plundered (Steward 1938: 73; 1941: 231).

Other storage techniques: Storage bags, pots, and baskets only used in villages (Steward 1941: 231). Mesquite stored in bags in caves (Steward 1941: 332). Pinyon stored in dry places among rocks (Coville 1892: 353).

Goshute (Gosiute) - Pinyon stored in hide bags. Also cached near pinyon groves in the mountains. Piled on the ground and covered with bark and brush (Stewart 1942: 250, 253).

Stored green pinyon in stone circles. Seeds stored in baskets, pots, bark bags, buckskin bags, and in rock crannies. Meat stored in sage bags. Storage bags were kept in dwellings. Had seperate above ground storehouses (Steward 1941: 279, 281, 184).

Importance of stored commodity:

Group: Western Shoshone (NT22)

Pit morphology: When had a surplus of pinyon, roasted nuts and buried them in the mountains (Steward 1938: 121).

Gathered roots and seeds in the spring and summer Cached surpluses in pits (Steward 1938: 142). In recent times, kept apples and jerked meat in stone-lined pits (lined with stone slabs) (Clemmer 1972: 315).

Pine Creek and Diamond Valley - Roots that were not eaten immediately were sun-dried and cached in pits. Roots were gathered during the summer (Steward 1938: 142).

Goshute (Gosiute) - Pinyon stored in pits covered with brush and earth or brush and stone. Located winter camps among the pinyons (Stewart 1942: 250). Other plant foods stored in bark or grass-lined, bottle-shaped pits. Food kept in skin bags in pits (Stewart 1942: 252).

Little Lake Shoshone - gathered acorns in Sierra Nevada Mountains, pounded in mortars and leached in sand craters lined with lacking and boiled into mush (Steward 1941: 332).

Mature mesquite pods stored in pits. Whole pinyon cones stored green in caches. Pinyon sited in unlined pits and pits lined with grass, pine leaf soil, and juniper bark. Covered with stone and brush. Seeds stored in bark and grass-lined pits (Steward 1941: 279, 280, 281).

Battle Mountain Shoshone - "Pit is partitioned for each kind of seed, each of which is placed in old hide or sage-bark bags. Pits preferred to storage houses because could be concealed, as people were constantly searching for caches to rob (Steward 1941: 333).

Illustrations: None

Pit locations: Seeds were cached in grass and brush-lined pits (Steward 1941: 231). Caches of meat, insects, seeds, and roots located near summer camps (Clemmer 1972: 315). Stone-lined pits located near springs or streams (Clemmer 1972: 315). Gosiute located winter camps near where pinyon cached (Stewart 1942:250).

Group: Western Shoshone (NT22)

Pit locations, continued: Railroad Valley - When had a surplus, pinyon nuts were roasted and buried in cold places in the high mountains (Steward 1938: 121)

Storage pits located in dwellings. Seeds for immediate use kept in these pits (Steward 1941: 284, 335).

Pit preparation:

Pit dimensions:

Other: After the harvest, some pinyon nuts were carried to the winter villages located along streams in the low vallies. Rest of the nuts are cached in the mountains. Theft of the cached nuts led to fights.

Practically all seeds were stored in some quantity for winter use. Pinyon nuts gathered by individual families. In good years, they were able to collect enough for 2 years (Steward 1938: 73, 104, 121).

Pinyon was collected in the fall (Steward 1938: 142).

Lone Valley, Reese River, and Smith Creek Valley - "Practically all seeds were stored for the winter." Most roots were dried and stored (Stewart 1938: 104).

Railroad Valley - Pinyon gathered by independent families. In good years, could gather enough to last two years. When had surplus, roasted nuts and buried in cold places in the high mountains (Stewart 1938: 104).

Steptoe Valley - Indians gathering pinyon in the Shell Creek Mountains cached all through the pinyon gorves to save carring them too far (Steward 1938: 122).

Group: Western Shoshone (NT22)

Other, continued: Group codes used in Steward 1941:

Death Valley - DthV
Beatty, Nev - Bty
Lida, Nev - Lida
Great Smoky Valley - GSmV
Smith Creek - SmCr
Upper Reese River - RsRi
Morey - Mor
Hamilton - Hmlt
Ely, Nev - Ely
Spring Valley - SprV
Elko - Elko
Egan Canyon - Egan
Ruby Valley - RubV
Snake River - SmRv
Battle Mountain - BtlM

HRAF Information Leslie E. Raymer

Group: Jicarilla (NT26)

Location:

Other Names:

Data Quality: Good

Why store:

What store: Crops: corn, beans, squash (Thomas 1974: 47).

Importance as storage technique: Preserved after harvest through winter. Protected while hunting (inferred) (Thomas 1974: 47).

Other storage techniques: "Cached the food in caves in the side of banks and covered it up. The Jicarilla did not use a ground cache, for it would get wet when it rained (informant) (Opler 1938: 68)." "Stored surplus food in cave caches." (Opler 1938: 178). Part of the corn was left as whole kernels and stored "in family cave caches in the mountains, in sacks made of buffalo hide (Opler 1971: 323)." Cave or crevice was lined with thick layer of dry grass. Sacked corn piled on. Entrance sealed with sticks and mud. Food in dry cave lasted two years (Opler 1971: 323).

Importance of stored commodity:

Pit morphology: Crops reaped in July or August. Maize was dried. After harvest, buried enough corn for the winter before "setting out to hunt buffalo on the eastern plains." Storage practices from circa 1598-1888 (Thomas 1974: 47).

Jicarilla did not use ground caches (Opler 1938: 178).

Illustrations: None

Pit locations:

Pit preparation:

Group: Jicarilla (NT26)

Pit dimensions:

Other: Raised squash, beans, and corn in irrigated fields. Crops were sown in April/May and harvested in July/August (Thomas 1974: 47) ca. 1598 -1888.

"When the harvest was over they buried a sufficient supply for winter before setting out to hunt buffalo and other animals on the eastern plains" (Thomas 1974: 47).

HRAF Information Leslie E. Raymer

Group: Mohave (NT28)

Location:

Other Names:

Data Quality: Good

Why store: Preservation (pits not concealed).

What store: Watermelons, pumpkins (Castetter and Bell 1951: 127, 165; Drucker 1941: 96).

Importance as storage technique:

Other storage techniques: Corn and mesquite always stored in basket granaries that are raised off of the ground (Castetter and Bell 1951: 161). Corn stored in basket granaries (Stewart 1983: 58).

Melons dried and hung from rafters of dwellings (Castetter and Bell 1951: 112).

Mesquite a staple. Dried and stored in bird's nest granaries of arroweed (Kroeber 1974: 121).

Pumpkins dried for storage. Whole pumpkins piled on ground and covered with vines (Drucker 1941: 96).

Granary types: Bird's nest granaries that were covered with branches and dirt were built on raised platforms (used for maize, teparies, and mesquite). Rectangular granaries were built and covered with brush and dirt (Drucker 1941: 102).

Importance of stored commodity:

Pit morphology: Watermelons sometimes buried in sandy spots, or placed in pits that were dug in dry sandy soil and lined with dried tepary plants or arrowweed. Melons covered with same material as lining, on top of which a layer of earth was placed (Castetter and Bell 1951: 127).

Watermelon pits often covered with a low dirt-covered shed that is constructed over the pits (Castetter and Bell 1951: 165).

Group: Mohave (NT28)

Pit morphology, continued: Pumpkins sometimes placed in large pits that were the depth of a man and of variable length and width. A bower was built over the pits that consisted of an upright and cross-poles that were covered with arroweed and dirt. Lined and covered with cornstalks and arroweed (Castetter and Bell 1951: 165).

Watermelons and pumpkins stored in pits covered with vines and leaves (Drucker 1941: 96).

Mesquite and screw beans collected in large quantities, cured in pits, and stored in large coiled baskets (Hrdlicka 1900: 18-19). Screw beans ripened in pits (Drucker 1941: 96).

Illustrations: None.

Pit locations:

Pit preparation: Pits dug in soil.

Pit dimensions:

HRAF Information Leslie E. Raymer

Group: Papago (NU28) Papago

Location:

Other Names:

Data Quality: Excellent (Castetter and Bell 1942) - all.

Why store: Concealment (Papago prefer to hide their food) and preservation (watermelon pits not hidden, have a roof) (p. 184).

What store: Pumpkins (average family had 60-100), watermelons.

Importance as storage technique: Melons kept 3 to 4 months in pits (p. 207).

Other storage techniques: 1. Didn't use basket granaries like Pima. Granaries are hive-shaped and placed outdoors on stones or boards (4' diam, 3' high) (p. 184).

2. Hide food in jars. Much jar storage (p. 184).

3. Much food kept in storehouses close to village (crops) (p. 184). Above ground wattle and daub storage structures (maize, wheat, wild seeds, household goods, and clothes stored there) (Lumholtz 1912: 86-87).

4. A few basket granaries were located near their houses Beans were kept in basket granaries. Globular basket granaries were coiled and woven, and sealed with mud. Used to store maize, beans, wheat, wild seeds (pp. 184-185).

5. Papago did not use nest-like roof bins (p. 184).

Importance of stored commodity: Pumpkins a staple. Watermelons a delicacy

Pit morphology: 1. Pits are used as supplementary storage. Each pit was dug deep enough to hold a number of jars and baskets. The pits were covered with brush and dirt (p. 184).

Group: Papago (NU28) Papago

Pit morphology, continued: 2. Pits for storing pumpkins were same as for Pima. Watermelons were not buried in sand like lower Colorado tribes. Watermelons were originally stored in oval pits; now stored in cubical pits that slant in on all sides at the bottom. Pits were built on a hill if possible. Cubical pits had poles at bottom, than cornstalks, than melons. Sides were unlined. Covered with an arroweed and dirt roof. Watermelons stored in this manner kept for 3-4 months (pp. 206-207).

Illustrations: None

Pit locations: 1. "Supplementary storage places were located in flats near base of mountains within reach of winter camp." Often a pit (p. 184).

2. Melon pits built on hills if possible (p. 206).

Pit preparation:

Pit dimensions: 4' x 4' x 4'

Other: Patriarchal families had several storage locations.

During their winter travels, family member occasionally sent back to storehouse for food, but tried not to draw on this supply at the village until spring, when food was scarce (p. 184).

Pimans - Average family had crop of 60-100 pumpkins. Stored fresh immediately after harvest (p. 188). Sometimes piled outside and covered with corn stalks. More often put in storehouse. Kept until February, some cases as late as April (p. 189).

Pimans stored a goodly supply of watermelons for winter use. Did not bury in sand as lower Colorado River tribes. Formerly stored in oval pit with a gable roof, more recently put in cubical underground pit about 4' in each dimension, that slanted inward at bottom on all sides and built on a hill if possible (p. 189).

HRAF Information Leslie E. Raymer

Group: Papago (NU28) - Pima

Other names:

File quality: Excellent

Why store: Preservation - "Crops were never hidden by the Pima for portection from enemies" (Castetter and Bell 1942: 183)

What store: Pumpkins, watermelons (oval pits), pumpkins only (cubical pits) (Castetter and Bell 1942: pp 183)

Imp. as storage technique:

Other storage techniques: Nestlike arroweed bins on roofs or log platforms. Roofed with cone-shaped arroweed roof covered with dirt (corn) (Castetter and Bell 1942: 183).

Coiled, globular basket ganaries were sealed with mud. More carefully made than nestlike arroweed basket granaries. Largest were 6' x6', while smaller were bell-shaped (pp. 184-185).

Smaller, bell-shaped basket granaries kept in storage houses, never on roofs or outdoors on platforms. Storage houses were 8'-9' high, had rectangular walls made of ocotillo or saguaro cactus ribs, with a dirt-covered roof. These storage houses are comparatively modern (p. 185).

Importance of stored commodity:

Pit morphology: Two types of pits: 1. Ancient pit form: Oval pit, covered with a gable roof made of willow branches thatched with arroweed. A mesquite pole was set at each end. These were used anciently and are still in use. Used for pumpkins and in historic times, for watermelons (Castetter and Bell 1942: 189).

2. Modern structure: cubical pit. Floored with a layer of logs covered with cornstalks. Has a rough arroweed or cornstalk roof covered with dirt. Used excusively for pumpkins (Castetter and Bell 1942: 189).

Pit locations: Each dwelling had one storage pit (Castetter and Bell 1942: 189).

Group: Papago (NU28) Pima

Pit preparation:

Pit dimensions: Oval pit: 8' long x 2' deep. Cubical pit: 3' deep and as wide and long as required for the supply (Castetter and Bell 1942: pp).

Other: For information from Castetter and Bell (1942) that is common to both the Pima and Papago, see the Other category on the Papago data form.

HRAF Information Leslie E. Raymer

Group: Yucatec Maya (NV10)

Location:

Other Names:

Data Quality: Excellent

Why store: Processing, now. Concealment, in past.

What store: Zapotes, bananas processed (ripened) in pits (Gotthilf 1982: 154, 157). Corn and people hidden in pits in past (Gotthilf 1982: 151). Alcoholic beverages fermented in pits.

Importance as storage technique: A. Small, bell-shaped pits used for ripening fruit and fermenting alcoholic beverages. B. Large, bell-shaped pits used in past to hide corn for short periods in times of unrest. Corn apparently kept well in pits for 1 to 2 months. The environment in the pits was too moist for the long term storage of corn (Gotthilf 1982: 152, 160).

Other storage techniques: Large number of above ground storage structures presently used to store corn (Gotthilf 1982).

Corn often stored in dwellings, at end of room across from the firplace (kept loose on floor, in sacks, or in bins). Beans kept in house, hung from ceiling. Corn stored in corn cribs in specially constructed granaries located at the farmer's milpas or in bins in their houses (Steggerda 1941: 16-17, 108-109).

Importance of stored commodity: Corn is a staple

Pit morphology: 2 types of bell-shaped pits used. A. Small, bell-shaped pits: 20 - 50 kilos of zapotes ripened in each pit. Walls and floors of pits lined with twigs and leaves, which are burned. When the pit walls are warm, trash is scooped out and zapotes are placed in pits on a bed of corn husks. Zapotes are covered with leaves, sand, and a board lid. After 3 days, the ripe fruit is removed (Gotthilf 1982: 155, 157). B. Large, bell-shaped pits: dug in soft limestone. Generally were not lined.

Group: Yucatec Maya (NV10)

Pit morphology, continued: Pits were used mostly during the dry season, in times of social unrest. Each pit held about 500 kilos of corn (Gotthilf 1982: 159 - 160).

Illustrations: Photographs

Pit locations: A. Small pits: located in patios in compounds adjacent to dwellings. In one instance, situated 3 m. from "owner's home" (Gotthilf 1982: 155). B. Large pits: located in bush at some distance from towns (up to 4 km.), in milpas, and "in compound patios close to primary structures" (Gotthilf 1982: 159).

Pit preparation:

Pit dimensions: A. Mouth diam. 20-60 cm.; basal diam. .47-1.00 m.; depth .50-1.00 m.. B. Mouth diam. 40-50 cm.; basal diam. .60-3.00 m.; depth 2.0-10.0 m.

Other: Environmental conditions: flat, hot, and dry. Below 50 m. above sea level. Mean annual temperature: 25.2 degrees C. and mean annual rainfall: 893 mm. (Gotthilf 1982: 152).

Ripening pits owned by individual families. One pit per family. Each families' pit is reused for many years. Zapote harvest ripened in pits once each year (Gotthilf 1982: 155, 157).

Many people interviewed mentioned past use of bell-shaped pits to conceal corn and people "during times of political unrest." These pits were used for concealment as recently as 1910 in the village of Chemax (Gotthilf 1982: 159).

From 23 January to 2 February 1982, Gotthilf (1982: 152) visited 12 villages and interviewed inhabitants on the outline, size, function, location, number, and lifespan of pits.

HRAF Information Leslie E. Raymer

Group: Murngin (OI17)

Location:

Other Names:

Data Quality: Fair (Thompson 1949: 24) - all.

Why store:

What store: Dried Nonda plum fruit (Parnarium nonda).

Importance as storage technique: Storage of any sort not of major importance.

Other storage techniques: Don't store. This instance of pit storage is only one of two instances of pit storage known to author.

Importance of stored commodity:

Pit morphology: Deep holes sunk in dry sand, where kept for some time (dried fruit).

Illustrations: None.

Pit locations:

Pit Preparation:

Pit dimensions:

HRAF Information Leslie E. Raymer

Group: Lau (006)

Location:

Other Names:

Data Quality: Good.

Why store: Preservation and processing (fermentation technique).

What store: Banana, taro (Hocart 1929: 139); manioc, breadfruit, and banana (Thompson 1940: 157-158).

Importance as storage technique: Fermentation preserves surplus food for a year or more for times of scarcity (Thompson 1940: 157-158).

Other storage techniques: Yams never fermented (Hocart 1929: 139).

Importance of stored commodity: Dietary staples? (Thompson 1940: 157-158).

Pit morphology: Pits lined with leaves. Food taken out from pits when required (Hocart 1929: 139). Pits lined with three thicknesses of plaited fresh coconut leaves. Layer of banana leaves put in next. Scraped manioc placed on leaves (holds approx. 100 lbs.). Top of pit covered with banana and coconut leaves that are weighted with rocks (Thompson 1940: 157-158).

Illustrations: None.

Pit locations:

Pit preparation: Same pits used repeatedly (Thompson 1940: 157-158).

Pit dimensions: 1m. deep x 2m. diam. (Thompson 1940: 157-158).

Group: Lau (006)

Other: If stored long, must change leaf liner often (Thompson 1940: 157-158).

Manioc - soak in salt water then bury in the ground (Thompson 1940: 157-158).

HRAF Information Leslie E. Raymer

Group: Marshalls (OR11)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation and processing (fermentation pits).

What store: Breadfruit (Kramer and Nevermann 1938: 190-191). Arrowroot (Stone 1951: 15).

Importance as storage technique: Preserves breafruit for 5 months to 2 years (Kramer and Nevermann 1938: 190-191). Breadfruit preserved for consumption during lean season until next crop (Stone 1951: 15). Last up to one year (Murai 1954: 156).

Other storage techniques: Breadfruit is stored in palm leaf baskets and packed in heavy tied rolls (Finsch 1893: 39-40).

Importance of stored commodity: Staple (implied).

Pit morphology: Green breadfruit sunk in ocean, mashed, and placed in pits lined with breadfruit leaves. Fruit kneaded after 7-8 days. Changed leaves in pits once per week and kneaded fruit once per month (Kramer and Nevermann 1938: 190-191; Erdland 1914: 33). Breadfruit kept in pits lined with coral stones and leaves (Finsch 1893: 39-40). Tightly pack in leaf-lined pits covered with leaves that were frequently changed (Stone 1951: 15).

Illustrations: None

Pit locations: "Arrowroot stacks sometimes stored for a short time in the pits along the beach but soon sprout" (Stone 1951: 15).

Pit preparation:

Pit dimensions:

Group: Marshalls (OR11)

Other: Pits controlled by families, who take food from it "from time to time" (Erdland 1914: 33).

Seemingly only small quantities stored (Stone 1951: 15)."

HRAF Information Leslie E. Raymer

Group: Truk (OR19)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation and processing (fermentation technique). - Not concealed. Pits easy to recognize because of stones piled on top of them (Bollig 1927: 60).

What store: Fermented breadfruit (Goodenough 1951: 23; LeBar 1963: 195; Gladwin and Sarason 1953: 34).

Importance as storage technique: Preserves staple for the lean season (Goodenough 1951: 23; LeBar 1963: 117). Keeps for a year (LeBar 1963: 195; Murai 1954: 158). Keeps for several years (Matsumara 1918: 54).

Other storage techniques: Fish preserved for a few kays with salt (LeBar 1963: 204). Breadfruit, taro, and Cyrtosperma sp. tubers pounded into doughy loaves and wrapped in leaves - stored in houses (Hall and Pelzer 1946: 46).

Importance of stored commodity: Breadfruit chief source of food. Available 6 months fresh. Stored in pits all year (LeBar 1963: 117).

Staple food. Seasonal crop, thus fermented and preserved in pits for the lean season (Goodenough 1951: 23; Murai 1954: 156). Off-season staple (Gladwin and Sarason 1953: 34). Famine food (Hall and Pelzer 1946: 53; Matsumara 1918: 53).

Pit morphology: Breadfruit peeled and put in shallow pits (lined with banana and coconut leaves. Breadfruit covered with banana leaves and weighted with rocks (to keep pigs out). Ferments and preserves in edible form (Gladwin and Sarason 1953: 34; Hall and Pelzer 1946: 53; Matsumara 1918: 54; Murai 1954: 156).

Pits funnel-shaped (Bollig 1927: 60).

Group: Truk (OR19)

Pit morphology, continued: Two types of pits: 1. Smaller pits, filled with better grades of breadfruit. Pits constructed and contents consumed cooperatively by lineage members. Pits constructed and filled in May and June. Pits 3' in diameter.

Lined with banana leaves. Breadfruit cut up and placed in pits. Covered with banana leaves and rocks. Pits inspected periodically and linings replaced if necessary.

2. Second type constructed later in season and contained greater proportions of inferior fruits. Consumed after contents of Type 1 pits used up (LeBar 1963: 195-197).

Three types of pit: A. Smallest pits - best fruit put in filled every year. Dimensions - 1 M. diam. x .8 M. deep. B. Intermediate size - filled in years of bumper crops and kept for several years as famine food. Dimensions - 2M. diam. x 1.2 M. deep. C. Largest pits - filled every year. Inferior fruit stored here. Dimensions - 4 M. diam. x 2 M. deep (Hall and Piezer 1946: 53).
Illustrations: None

Pit locations: Located on lineage lands near large stands of breadfruit (LeBar 1963: 195). Pits located where there is no danger of groundwater (Hall and Pelzer 1946: 53)

Pit preparation:

Pit dimensions: 3'-5' diam x 2' deep (Murai 1954: 156). 1.3 M. diam. x 1.2 M. deep (Matsumara 1918: 54).

Other: In season, breadfruit plentiful and eaten to exclusion of other starchy foods. Supply exceeds demand (Gladwin and Sarason 1953: 34).

HRAF Information Leslie E. Raymer

Group: Woleai (OR21)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation and processing (fermentation pits).

What store: Breadfruit (Bates and Abbott 1958: 74; Burrows 1949: 35-36; Kramer 1937: 46; Senfft 1905: 55; Spiro 1949: 9).

Importance as storage technique: Stored breadfruit eaten in season when fresh breadfruit unavailable. Lasts several years (Burrows 1949: 35-36; Spiro 1949: 9). Eaten in seasonal food shortages (spring and fall famines) (Damm, et al 1938: 27). Keeps many months and years (Kramer 1937: 46). Preserved for years; lots prepared each year to insure the food supply in case of disasters like typhoons (Bates and Abbott 1958: 74).

Other storage techniques: None discussed.

Importance of stored commodity: Only long-term stored food. Used when no fresh breadfruit was available to vary diet of taro (Burrows 1949: 35-36). Dietary staple (inferred).
Breadfruit is a favorite starch food that was stored and eaten during the season when it could not be eaten fresh, since it had a seasonally restricted growing period (Spiro 1949: 9).

Pit morphology: Breadfruit processed and stored in the following manner -- 1. Fruit cut up and mashed. Placed in net and soaked in ocean for 24 hours. 2. Placed in pit lined with Barringtonia asiatica leaves. After one day, some of the breadfruit was removed and eaten. 3. Pits next sealed for long term storage. "Pits covered with coconut leaves weighted down with lumps of coral" (Burrows 1949: 35-36; Bates and Abbott 1958: 74).

Group: Woleai (OR21)

Pit morphology, continued: Ripe breadfruit soaked in saltwater, then kept 24 hours in shallow pits. Pits lined with leaves and covered with earth. 24 hours later, taken out of shallow pits and placed for long-term storage in deep, lined pits; covered with stones and breadfruit leaves (Kramer 1937: 46). <Processed in shallow pits, stored in deep pits.>

* Breadfruit has a seasonally restricted growing period. Therefore, salted breadfruit lumps were wrapped in leaves and stored in pits (Spiro 1949: 9).

* Breadfruit an important food. Made "breadfruit jam" by kneading fruit and "burying it in their groves which they seal hermetically with stones and leaves." "Consume when trees do not bear fruit" (Senfft 1905: 55).

Illustrations: None

Pit locations:

Pit preparation:
Pit dimensions:

Other: All households preserve breadfruit (Burrows 1949).

Notes seasonal food shortages in March, October, and November (Kittlitz 1858: 148-149).

Notes storage of breadfruit in "hermetically sealed pits" (Senfft 1905: 55).

HRAF Information Leslie E. Raymer

Group: Yap (OR22)

Location:

Other Names:

Data Quality: Fair (Muller 1917: 122) - all.

Why store: Preservation (fermentation pits - don't appear to be concealed).

What store: Breadfruit.

Importance as storage technique:

Other storage techniques: Other staples - fish and coconut.

Importance of stored commodity: Major food (staple).

Pit morphology: Remove fruit from shell, soak in sea water, and store in pits covered with leaves.

Illustrations: None.

Pit locations:

Pit preparation:

Pit dimensions:

HRAF Information Leslie E. Raymer

Group: Tikopia (OT11)

Location:

Other Names:

Data Quality: Fair

Why store:

What store: Mature taro, banana, breadfruit.

Importance as storage technique:

Other storage techniques: Turmeric and masoa flour stored in bags (Firth 1939: 75). Fish not preserved (Firth 1939: 35). Manioc stored in the ground (dug up as needed) (Firth 1939: 75). Yams, mature coconuts, and Canarium almonds stored in racks or piles (Firth 1939: 75). Coconuts kept in round inclosures in the groves (Firth 1939: 273-274).

Importance of stored commodity:

Pit morphology: Grated into a paste and stored in pits, where taken as occasion demands, perhaps months afterwards. (Firth 1939: 75, 273).

Illustrations: None.

Pit locations:

Pit preparation:

Pit dimensions:

Comments: Notes "marked scarcity" of food in May and June (Firth 1939: 75).

HRAF Information Leslie E. Raymer

Group: Samoa (OU8)

Location:

Other Names:

Data Quality: Good.

Why store: Preservation and processing (fermented).

What store: Ripe breadfruit (Coulter 1941: 36); mature and green bananas (Grattan 1948: 77-78); breadfruit (Buck 1930: 132).

Importance as storage technique: Preserves food up to a year. Pit storage is used to preserve food for times of expected shortage, and provided a stored surplus (Grattan 1948: 78). Surplus breadfruit stored, keeps a year (Buck 1930: 132). In past, stored bananas and breadfruit for use in time of hurricane and famine (Coulter 1941: 36).

Other storage techniques:

Importance of stored commodity: Famine food.

Pit morphology: Pits dug and lined with banana leaves. Whole or split ripe breadfruit or ripe an mature bananas thrown in and pressed down with weights and fermented for about a month; they are then ready to eat. New breadfruit is added to the pit as the old is consumed, and the leaves are "changed regularly to prevent rotting (Grattan 1948: 77-78)." "Pits are lined with coconut leaves and an inner layer of banana leaves." After the mature breadfruit is thrown in, the pit is covered and made airtight (Coulter 1941: 36; Buck 1930: 132).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Group: Samoa (OU8)

Other: Banana and breadfruit conserves were made frequently in past (Grattan 1948: 77). Pits are not used much now (Grattan 1948: 78). Storage is rare now -- government commodities (Coulter 1941: 36).

HRAF Information Leslie E. Raymer

Group: Tonga (OU9)

Location:

Other Names:

Data Quality: Good.

Why store: Preservation (fermentation).

What store: Breadfruit (Collocott and Havea 1922: 52).

Importance as storage technique: Used in time of famine (Gifford 1929: 179).

Other storage techniques: Yams stored in cook hut and under raised dwellings or special storage huts ("usually eaten up in 3 months") (Koch 1955: 159).

Importance of stored commodity: Famine food (implied).

Pit morphology: During famine, food obtained from two large storage pits "of which there were many on the tract (Gifford 1929: 179)." Fermented fruit (breadfruit most common) prepared by burying it in pits (Collocott and Havea 1922: 52).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: Falling into disuse. Was a common preservation method (Collocott and Havea 1922: 52).

HRAF Information Leslie E. Raymer

Group: Marquesas (OX6)

Location:

Other Names:

Data Quality: Excellent

Why store: Preservation and processing (by fermentation)

What store: Breadfruit (Handy 1923: 8)

Importance as storage technique: Communally owned pits hold breadfruit that is kept in reserve for famine food (Handy 1923: 59, 183). Communally owned pits were "hidden" outside of villages so would not be discovered in case of an enemy raid (Linton 1939: 139). Breadfruit was preserved for years in pits (Handy 1923: 189).

Other storage techniques: Raw fish is staple, recently some of it is preserved for several months by salting it and wrapping it in leaves (Handy 1923: 196-197).

Importance of stored commodity: Breadfruit is primary staple food (Handy 1923: 8).

Pit morphology: Four breadfruit harvests in good years. First crop was gathereed communally. Chief organized harvest. Crop was gathered, cut up, and stored in communal pits. Only opened in time of famine. Second crop stored in household pits and used throughout year by individual families (Linton 1939: 139).

When harvested, breadfruit first peeled and laid on a bed of leaves to ripen. After it ripens, breadfruit was placed in temporary, shallow pit lined with plaited coconut and banana leaves or in a large, above ground coconut leaf basket. After fermentation started, the breadfruit was tranferred to permanent pits. Permanent pits lined with banana leaves. Partially fermented breadfruit paste tightly packed in. Pit covered with mats, banana leaves, and stones (Handy 1923: 187, 189).

Group: Marquesas (OX6)

Pit morphology, continued: Two types of pits: 1. Family owned pits. Each family had one for daily use. Average size 4' diam. x 3' deep. Held enough breadfruit for a year. 2. Communally owned pits. Located in hills, where safe from attack. Dimensions 15' - 20' diam. x 30' deep (Handy 1923: 188-189).

Illustrations: Photos (Handy 1923: plates V and VI

Pit locations: Large communal pits cut into rocky soil (Linton 1939: 139). Communal pits located away from dwellings in vallies (Handy 1923: 183). Family owned pits located near dwellings (Handy 1923: 188-189). Communal pits located in hills where safe from attack (Handy 1923: 188-189). Pits always dug into clay soil. Watertight clay soil essential for the preservation of breadfruit (Handy 1923: 188-189).

Pit preparation:

Pit dimensions:

Other: Breadfruit harvested communally. 4 harvests in good years. Chief coordinated. First crop belonged to chief. Second, more abundant crop was used to fill private family pits. first crop used to fill chiefs household pits and communal pits. communal pits filled in years of good harvests as provision against famines (Handy 1923: 183).

Notes continuous warfare, droughts, and famines. Breadfruit preserved in holes in ground - most prolific food in islands (Handy 1923: 8).

Land belonged to chief; first fruits of crops were his. first breadfruit harvest went to chief. Partly for his consumption, but mostly "for storage in" communal tribal pits "as a precaution against famine time, when tribe was fed from pits maintained by chief" (Handy 1923: 59).

Fresh breadfruit eaten at every meal during the growing season. Fermented breadfruit used in the off-season (Handy 1923: 187).

Group: Marquesas (OX6)

Other, continued: Famines fairly frequent. Land was overpopulated and irregularly watered (Handy 1923: 187).

HRAF Information Leslie E. Raymer

Group: Easter Island (OY2)

Location:

Other Names:

Data Quality: Fair (Routledge 1920: 431) -- All.

Why store:

What store:

Importance as storage technique:

Other storage techniques:

Importance of stored commodity:

Pit morphology: Small pits that are lined, floored and roofed with slabs. Nodules of volcanic ash are frequently found in them, used for heating.
First reported used for cooking and later reported as storage pits, author favors storage pit idea.

Illustrations: Photos and illustrations
Pit locations: Located outside houses, "a few feet from the door and in line with it.

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Pukapuka (OZ11)

Location:

Other Names:

Data Quality:

Why store: Processing

What store: Bananas ripened in pits; taro is briefly preserved in pits.

Imp. as storage technique:

Other storage techniques: Coconuts stored on the high platform of a storage house. Nuts stored for five years or more (Beaglehole and Beaglehole 1938: 85-86).

Surplus fish is preserved by sun-drying. Last indefinitely. Shellfish are dried and stored in baskets (Beaglehole and Beaglehole 1938: 105).

Above ground storage houses used to store coconuts, fishing gear and old canoe sections. Often built far enough from village to be safe from fire but near enough to be easily accessible (Beaglehole and Beaglehole 1938: 116).

Imp. of stored commodity:

Pit morphology: Uncooked taro is preserved for about three weeks in pits located near the cook house. Taro rots after about 3 weeks (Beaglehole and Beaglehole 1938: 103).

Bananas not abundant on the island. Not important in daily diet. Ripened by hanging or burying. Green fruit is placed in 2' deep pit that is lined with coconut husks. Covered with coconut mats, husks, and earth. Ripen after three days (Beaglehole and Beaglehole 1938: 104).

Illustrations: None

Pit locations:

Pit preparation:

HRAF Information

Leslie E. Raymer

Group: Pukapuka (OZ11)

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Ukraine (RD1)

Location:

Other Names:

Data Quality: Poor (Mirchuk 1949: 30) - All.

Why Store:

What Store: Grain

Importance as storage technique:

Other storage techniques: Granaries, straw containers (used in the steppe).

Importance of stored commodity:

Pit morphology: Pear-shaped (used in the steppe).

Illustrations: None

Pit locations:

Pit preparations:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Turkistan (RL1)

Location:

Other Names:

Data Quality: Poor (von Schwartz 1900: 77) - All.

Why store:

What store: Threshed grain.

Importance as storage technique:

Other storage techniques:

Importance of stored commodity:

Pit morphology: "Same kind of underground pits as the nomads use."

Illustration: None.

Pit locations:

Pit preparation:

Pit dimensions:

Other: * "Historians of Alexander the Great already mention these underground storage granaries... as a characteristic of the Bactrians and the Sagdians who were the inhabitants of Turkestan at this time ."

* "Curtias writes in Chapter 17 of Book VII concerning the presence of underground granaries in Bactria..."

HRAF Information Leslie E. Raymer

Group: Siberia (RR1)

Location:

Other Names:

Data Quality: Poor (Theil 1953: 122) - All.

Why store:

What store: Fish

Importance as storage technique: Winter storage of meat

Other storage techniques:

Importance of stored commodity:

Pit morphology: "Fish buried in the earth and there becomes sour, hence there is a kind of fish silo from which fish can be fetched during winter as needed

Illustrations: None.

Pit locations:

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Chukchee (RY2)

Location:

Other Names:

Data Quality: Good.

Why store: Preservation (inferred). There is evidence they conceal the volume and makeup of the pit contents [Maritime Chukchee were reluctant to allow Veya men with Nordenskiold (1882: 467) to enter their pits].

What store: Reindeer meat (Reindeer Chukchee) (Bogoras 1904-1909: 178, 195). Frozen vegetable (berries, herbs, leaves, young branches) (Maritime Chukchee) (Nordenskiold 1882: 481-482). Dried meat (sea mammals, deer), roots, berries, oil (Maritime Chukchee) (Sauer 1802: 253). Walrus-meat, whole seeds, whale-skin (Maritime Chukchee) (Bogoras 1904-1909: 196). Frozen walrus and seal meat and fat (Antropova and Kuznetsova 1964: 813).

Importance as storage technique: Both Reindeer and Maritime Chukchee dry some meat (Bogoras 1904-09: 196).

Other storage techniques: A) Reindeer Chukchee: Winter storage -- Blood and oil kept in skin bags outside of the tents and meat and tallow kept in the space in their tents behind their sleeping rooms. Blood was mixed with meat and stored in skin bags for winter use. Meat was fermented in the summer and frozen in the winter (Bogoras 1904-1909: 178, 195-196).

* Maritime Chukchee store blubber in skin bags (Bogoras 1904-1909: 196). Also store herbs, leaves, and young branches of many different plants (Nordenskiold 1882: 481).

Importance of stored commodity: Summer food supply for Reindeer Chukchee (Bogoras 1904-1909: 178, 195).

Pit morphology: B) In summer: Reindeer Chukchee dug small holes in the middle of their tents and stored meat there to preserve it from decay. Covered hole with skins and grass. Usually only 2 feet deep (bottoms out on the permafrost layer, which Chukchee can't dig into).

Group: Chukchee (RY2)

Pit morphology, continued: * All Chukchee villages: Food kept in these pits decays while it is stored (Bogoras 1904-1909: 178, 195). Chukchee use underground cellars to store their provisions. They have whalebone supports in walls. Entrances are square frames with shoulderbone covers. Sometimes use vacant pithouses (Bogoras 1904-1909: 183). Maritime Chukchee stored vegetables in these cellars (Nordenskiold 1882: 481-482). Entrances to Maritime Chukchee cellars commonly covered with driftwood and stones. Apparently had hatch like entrances which in one case was covered with a whale shoulderbone (Nordenskiold 1882: 467).

* Main food of the Coastal Chukchee was walrus and seal meat and fat. Walrus was preserved by cutting up the meat, sewing it into the hide; then freezing it and storing these walrus-hide bags in "special pits." The "low temperature in the pit prevented decay, but was not sufficient to fully preserve meat, which fermented while it was stored." Winter food supply (Antropova and Kuznetsova 1964: 813).

Illustrations: None

Pit locations: B) In summer Reindeer Chukchee dug small holes in the middle of their tents (Bogoras 1904-1909: 178). Reindeer people drove herds to summer pasture, then slaughtered and stored meat in shallow pits covered with sod that were located in their tents (Bogoras 1904-1909: 195). Maritime Chukchee place cellars near dwellings. Often excavated on sites of old pithouses (Nordenskiold 1882: 467).

Pit preparation:

Pit dimensions:

Other: All Chukchee villages use underground cellars (Bogoras 1904-1909: 178). Cellars ill-protected, provisions soon begin to rot in both Reindeer and Maritime pits (Bogoras 1904-1909: 195).

Group: Chukchee (RY2)

Other, continued: Maritime Chukchee "dig cellars in which they keep their supplies of food and oils" (Sauer 1802: 253).

Maritime Chukchee -- "descent is commonly covered with pieces of driftwood which are loaded with stones. At one place the entrance consisted of a whale shoulderbone. We were surprised to find them unwilling to give the Veya men admittance to their storehouses" (Nordenskiold 1882: 467).

<Evidence of concealment of contents if not location.>

HRAF Information Leslie E. Raymer

Group: Kamchadal (RY3)

Location:

Other Names:

Data Quality: Good.

Why store: Preservation and processing (fermentation). "Pickled in pits (Antropova 1964a: 877)." "Prefer meat in an advanced state of decomposition (Guillemard 1886: 93)."

What store: Fresh fish (Jochelson 1928; Antropova 1964a: 877); decomposed salmon (Guillemard 1886: 93).

Importance as storage technique: Winter food supply (Jochelson 1928: 17). Method of fermentation (preserved food) (Antropova 1964a: 877).

Other storage techniques: Above ground storage buildings on stilts. Built like dwellings (Krasheninnikov 1764: 182; Guillemard 1886: 106).

Importance of stored commodity: Winter food supply (Jochelson 1928: 17).

Pit morphology: "[They] have no time during the short fishing season to dry or smoke all of their fish for the winter. The greater part is placed in holes covered with stones and earth (Jochelson 1928: 17)." "Fish was cured and pickled in pits (Antropova 1964a: 877)." "Salmon was buried 3 to 4 months in pits (Guillemard 1886: 93)."

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: "[They] prefer their fish in an advanced state of decomposition." "Salmon are buried for 3-4 months in pits." Same preservation method as in Lappland (Guillemard 1886: 93).

Group: Kamchadal (RY3)

Other, continued: Villages appear larger than they are because of the large proportion of storage buildings (Guillemard 1886: 106).

Kamchadal found it hard to dry their meat for winter use because of the wet climate. When the fish were set out in the air to dry, it quickly rotted and became filled with maggots. Much meat was lost in this manner (Cochrane 1824: 391; Krasheninnikov 1764: 630).

HRAF Information Leslie E. Raymer

Group: Koryak (RY4)

Location:

Other Names:

Data Quality: Fair.

Why store: Preservation and processing (fermentation). Above ground storage of fish is the main preservation of fish.

What store: Pickled fresh fish (Antropova 1964b: 857).

Importance as storage technique: Method of fermentation.

Other storage techniques: Maritime Koryak: Storehouses were built on platforms set on poles that were 4-6 M. above the ground. These structures kept dogs, bears, and other predators away from their food stores (Jochelson 1908: 466). They put dry fish in storehouses (tents on pilings) -- covered with dry grass (year-round staple food) (Antropova 1964b: 857).

Imp. of stored commodity: Source of dogfood in the winter.

Pit morphology: Hole in the "ever-frozen soil as a cellar to preserve their provisions (Jochelson 1908: 398)." Freshly caught fish piled into a pit, covered with earth and left to ferment until needed (Antropova 1964b: 857). "Pickled fish" wasused as dogfood. Fresh fish was put in pits and covered with earth. The buried fish fermented and thus was preserved (Antropova 1964b: 857).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other:

Group: Koryak (RY4)

Comments: Most of the salmon catch was dried and put away in storehouses. Dried fish was the main food and also was used as dogfood (Antropova 1964b: 857).

Fish (including salmon) were dried in the summer and preserved for winter use. Were sun-dried. Weather conditions make drying process difficult because 1. on hot days without wind flies lay eggs in the meat and maggots devour. 2. in wet weather, the meat cannot dry and much of it rots (Jochelson 1908: 572).

HRAF Information Leslie E. Raymer

Group: Mosquito (SA15)

Location: East coast of Central America.

Other Names:

Data Quality: Good (Conzemius 1932: 91) -- All.

Why store: Preservation and processing (fermentation). Corn stored in houses after processed in pits.

What store: Green bananas, plantains, and palm fruit; boiled maize among the Sumu.

Importance as storage technique: Preserves bananas and plantains for six months. Corn processed in pits (by fermentation) for several months, after which it is kept "in baskets over smoke until needed."

Other storage techniques: Fish stored above ground; corn in houses in smoke of fires.
Importance of stored commodity:

Pit morphology: "Green bananas, plantains, and palm fruit are buried in ground on a layer of bijaqua leaves and then covered up with another layer of leaves and earth. Hole is not uncovered until required for food." Sumu: rarely use pit processing except for maize. "Steep corn in lye of wood ash and buried for a few months;" next kept in baskets in smoke of fire.

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Caingang (SM3)

Location:

Other Names:

Data Quality: Fair.

Why store:

What store: Pinyon (Henry 1941: 101; Paula 1924: 7).

Importance as storage technique:

Other storage techniques:

Importance of stored commodity:

Pit morphology: What they cannot use immediately, they bury in stream beds to preserve ("in yard-deep baskets"). Theft of the buried nuts is from the preservation beds in the streams is common (Henry 1941: 101). They place pinyon in special baskets, well sealed and previously lined with cactus leaves. They immerse them in the streams for a month and a half (Paula 1924: 7).

Illustrations: None

Pit locations:

Pit preparation:

Pit dimensions:

Other: Man and wife gather pinyon (Henry 1941: 101).

HRAF Information Leslie E. Raymer

Group: Tucano (SQ19)

Location:

Other Names:

Data Quality: Good (Silva 1962: 325) - All.

Why store: Processing and Preservation (fermentation and preservation of abundance) no info on concealment. May be concealed.

What store: Pupunha (ornamental palm). Tree fruits - twice each year. Japura (a dicotyledon - "like an almond").

Importance as storage technique: Keeps food from spoiling during the year. Used for preparation of caxiri. Praparation takes several months.

Other storage techniques: Fish is smoked and dried; keeps a long time. Stored at home. Caterpillars are roasted and stored in baskets in smoke chambers (pp. 314, 322).

Importance of stored commodity: Prized food

Pit morphology: When abundant prepare a large quantity ... dig a pit, which is lined with banana leaves, and there they introduce the mass of ornamental palm fruit, which is pressed so that all of the air is expelled, and afterwards it is covered with banana leaves and a layer of soil a span or more thick." Japura and Pupunha palm preserved like this.

Illustrations: None

Pit locations: Near the dwellings.

Pit preparation:

Pit dimensions:

Other:

HRAF Information Leslie E. Raymer

Group: Yaruro (SS19)

Location:

Other Names:

Data Quality: Fair (Pertrullo 1939) - All.

Why Store: Concealment and preservation (p. 201, 214)

What Store: Chanquango (potato-like roots), turtle eggs (for a few hours), baskets and other tools, and roasted chigua seeds (gathered in rainy season) (p. 201).

Importance as storage techniques: Chanquango is gathered in the dry season. Chigua is collected in the rainy season.

Other storage techniques:

Importance of stored commodity: Chanquango is the only food they can keep for a few days during the dry season by burying it in the sand (p. 201).

Pit morphology: Caches are located on sandbars. Pits are dug and roots are placed in them. Pits are covered with sand and the wind soon removes all traces of digging. Relocate pits by thrusting a stick in ground at some distance away from the pit. Used to aid in triangulating with known landmarks to relocate. Also relocated pits without sticks (p. 214).
Store roasted chigua seed in small quantities in pits on sandbars, "provided a spot is found high enough to keep it dry." (p. 215)

Illustrations: None

Pit locations: On sandbars.

Pit preparation: Pit dug in soil.

Pit dimensions:

Other: Gathered by women. Stored in dry season (p. 201).