

ETHIOPIA

Ethnoarchaeological Research in the Ethiopian Highlands

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Introduction

This report summarises the results of a first season of ethnoarchaeological research on traditional agronomic systems in the Ethiopian highlands near Mekelle, Tigray. As is the situation in many parts of the world, crop germplasm and knowledge associated with traditional cultivars is being lost at an alarming rate in Tigray (Engles et al. 1991). Numerous isolated communities in the highlands continue to practice subsistence farming of indigenous crops, and remain relatively sheltered from the direct effects of modern agrotechnology. As such, this region is an ideal study area in which to undertake a program of ethnoarchaeological research. This project focuses on ethnoarchaeological studies of Tigrean traditional agronomic practices concentrating on cereals (tef, finger millet, sorghum, intercropped wheat and barley) and legumes (grass pea, chick pea, lentil, pea, bean and fenu-greek).

Harvesting and processing of indigenous cereals and several legumes are being examined from two perspectives. The first approach involves actualistic studies of different stages of crop processing and an analysis of residues produced at

each stage. Several prior studies have provided descriptions of Ethiopian agricultural practices (Huffnagel 1961; Westphal 1975), however, they are not sufficiently detailed to aid in archaeological interpretations of similar techniques employed in antiquity. Two important ethnoarchaeological studies have documented the harvesting and processing of wheats and barley in West Asia and southeastern Europe (Hillman 1984; Jones 1984), however, with the exception of some Far Eastern millets (Yabuno 1987), very few data exist on the processing of millet and other small-seeded cereals and legumes (Butler in press, 1992, 1995; D'Andrea 1992, 1995; Reddy 1991). The data that are available suggest that models developed for wheats and barley are not applicable to millets and other small-seeded cereals (Ready 1991). In addition, there are no studies available on the effects of intercropping on archaeological assemblages of plant remains.

The second perspective involves the placement of crop husbandry practices into a broader socio-cultural framework, involving the investigation of gender as an organising principle in the social and economic structure of traditional farming communities. This approach will complement the actualistic studies by situating plant harvesting and processing activities in their social and ideological contexts. Data collection is concentrating on households which are microcosms of relations within society as a whole (Brumfiel 1991; Donley-Reid 1990; Hastorf 1991; Lyons 1989, 1996; Moore 1986; Roberts 1991; Tringham 1991; Wall 1994).

The Study Area

This study is based at Adi Ainawalid, a village (*kushet*) made up of approximately 180 households in Mahbere Genet Tabia in South-Central Tigray. This tabia (village collective) is situated about 10 km northeast of Mekelle in Inderta administrative region (*Woreda*). There are four other villages belonging to this tabia: Adi Akel (180 households), Chin Feras (270 households), Mesahil (250 households) and Tsilwo (300 households). Adi Ainawalid is being used as a base for both household and crop-processing components of the research.

Three environmental zones have been defined for Ethiopia based on temperature and latitude: cooler high altitude or *dega* (>2400 m asl), warmer

medium elevation or *woina dega* (1700-2400 m asl), and hot lowlands or *kolla* (<1700 m asl). In addition there are two rainy seasons experienced by the region: the long *kremt* rains fall from mid-June to early October and lead to the *meher* harvest between November and January while short *belg* rains are experienced from February to April (Westphal 1975). Mahbere Genet Tabia is classified as *woina dega*, or medium altitude, which is the most amenable for agriculture, and where the greatest variety of crops is grown.

At Adi Ainawalid both household and activity-based interviews are being conducted. In the initial survey, 64 households were selected randomly, and members interviewed on the timing and nature of various cropping activities. Of the 64 interviews, 41 were sufficiently detailed to form the basis of the seasonal schedule presented in Figure 1. Specific farming activities that were underway during the field season also were documented. Harvesting and threshing were the main occupations of farmers at that time, and it was possible to observe threshing of several crops in six threshing areas scattered throughout the village.

Preliminary Results

The results of this first season are preliminary, and will undoubtedly be revised as more time is spent in the field. Data on household-based interviews are presented below, followed by observations made on agricultural activities in progress at Adi Ainawalid.

Household Interviews

The household interviews have two components. The first priority is to compile a seasonal schedule for major crop activities, and the second goal involves the study of social and spatial patterning of crop remains within households.

The results of 41 detailed interviews on activities carried out over the course of one calendar year are presented in Figure 1. The overlap in the timing of activities exists because farmers were asked when activities normally happen, rather than what took place in any specific year. As a result, the answers are more likely to incorporate variation in the timing of activities over several years,

and this kind of information may be more directly relevant to archaeological applications. The annual cycle can be roughly subdivided into three periods. From January to June the main activities are land preparation and sowing, with residual threshing and harvesting earlier in the year. The nature of activities change from June to September when farmers concentrate first on sowing, and later on tending of crops including weeding and secondary tillage (*gamsa*). During September the maize harvest begins, but from October to December, farmers are occupied exclusively with harvest and threshing. It is important to note that because of poor short rains in this area, farmers have not cultivated *belg* crops for the past several years. The absence of *belg* crop production has been noted by at least one rural economic survey completed in Tigray (Holt and Lawrence 1993).

Inquiries were also made concerning crops or varieties that are no longer grown in the region. To date, four species have been recorded that are either extirpated or grown on a very small scale: *kinkinai* (durum wheat), *ares* (emmer wheat), *gunaija* (hulled ?six-row barley) and *demhai* (naked two-row barley). *Ares* wheat and *demhai* barley are still grown on a reduced scale in the vicinity of Adi Ainawalid, and occasionally, both cereals are sold at the Mekelle market. When asked why these crops were no longer cultivated a wide variety of answers was given, however, several informants did emphasise that *ares* wheat in particular was discontinued because of the large amount of work involved in removing hulls. Some farmers stated that *ares* wheat was intercropped with *burguda* barley, and they viewed this as the traditional method of intercropping. *Ares* wheat and *burguda* barley were sown, harvested and threshed together after which *ares* wheat was separated using a winnowing tray (*mihea*) and pounded to remove hulls. These observations on the part of farmers may be instructive for interpretations of pre-historic changes in crop preferences.

The second component of the interviews concentrates on the social and spatial context in which crops are stored, processed, and distributed within the household. Field study focuses on determining the participation of men and women in production, processing, consumption and distribution of domesticated and non-domesticated plants and animals, as well as on the identification of symbolic relationships between gender and resources. To acquire

Figure 1: Seasonal schedule of major agricultural activities, Adi Ainawalid: Preliminary observations.

(based on 41 interviews[^])

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ploughing	[Solid black bar]											
tef	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+ *	[Solid black bar]											
lentil/flax	[Solid black bar]											
Sowing	[Solid black bar]											
tef	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+	[Solid black bar]											
lentil/flax	[Solid black bar]											
Weeding	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+	[Solid black bar]											
lentil/flax	[Solid black bar]											
Gamsa	[Solid black bar]											
tef	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+	[Solid black bar]											
lentil/flax	[Solid black bar]											
Harvesting	[Solid black bar]											
tef	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+	[Solid black bar]											
lentil/flax	[Solid black bar]											
Threshing	[Solid black bar]											
finger millet	[Solid black bar]											
sorghum	[Solid black bar]											
wheat/barley	[Solid black bar]											
maize	[Solid black bar]											
grass pea+	[Solid black bar]											
lentil/flax	[Solid black bar]											

[^] All responses are included in this figure except in cases where only one informant indicated that a particular activity took place during a given month

*Grass pea + includes grass pea, chick pea and fenugreek

this kind of information, individual house floor plans in Adi Ainawalid are being mapped. The spatial location of men's and women's activities in the household are being examined in terms of where and when certain food processing tasks occur including seasonal and periodic variability. The nature and volume of artifactual, floral and faunal debris produced in both gender specific and mixed tasks are being recorded. Of particular importance is determining differential treatments of plants and other items during certain stages of processing. Such differences affect site formation processes which must be considered in the interpretation of both the archaeobotanical record and in the inference of gender relations in domestic contexts based on material remains.

In this initial study, spatial organisation of domestic buildings, food processing areas, and crop storage facilities were mapped and photographed in three compounds. Compounds generally consist of a main house where crops, fodder, and personal effects are stored, food is consumed, and where the family sleeps. While the buildings are constructed of stone, primarily non-cropped plants are selected for roofing materials, with the exception of kitchen roofs which are made from sorghum stalks. Other non-cultivated plants are used to make paint for walls and granary decoration. In addition to the main house, compounds have separate kitchens for food processing and preparation, as well as substantial stone structures for housing and feeding chickens and livestock. Additional investigation will examine the nature of plant remains in each of these locations, and how these areas are maintained.

Household members were interviewed to determine the involvement of men and women in building construction, interior finishing, and building maintenance. Information collected assessed the age of extant buildings, the amount of time invested in construction, nature of the foundation, the anticipated life-expectancy of different types of structures, and changes in house construction observed in each informant's lifetime. Of interest is the fact that kitchens are considered secondary buildings to the main house. Kitchens lack the subterranean foundations for walls and floors described for the main house. This requires further investigation as the spatial impermanence of kitchens vis-a-vis other domestic buildings has important implications regarding the potential of recovering botanical re-

mains archaeologically and of understanding site formation processes of households in the region. While only three households have been examined, there is some indication that the main house has a specific cardinal orientation.

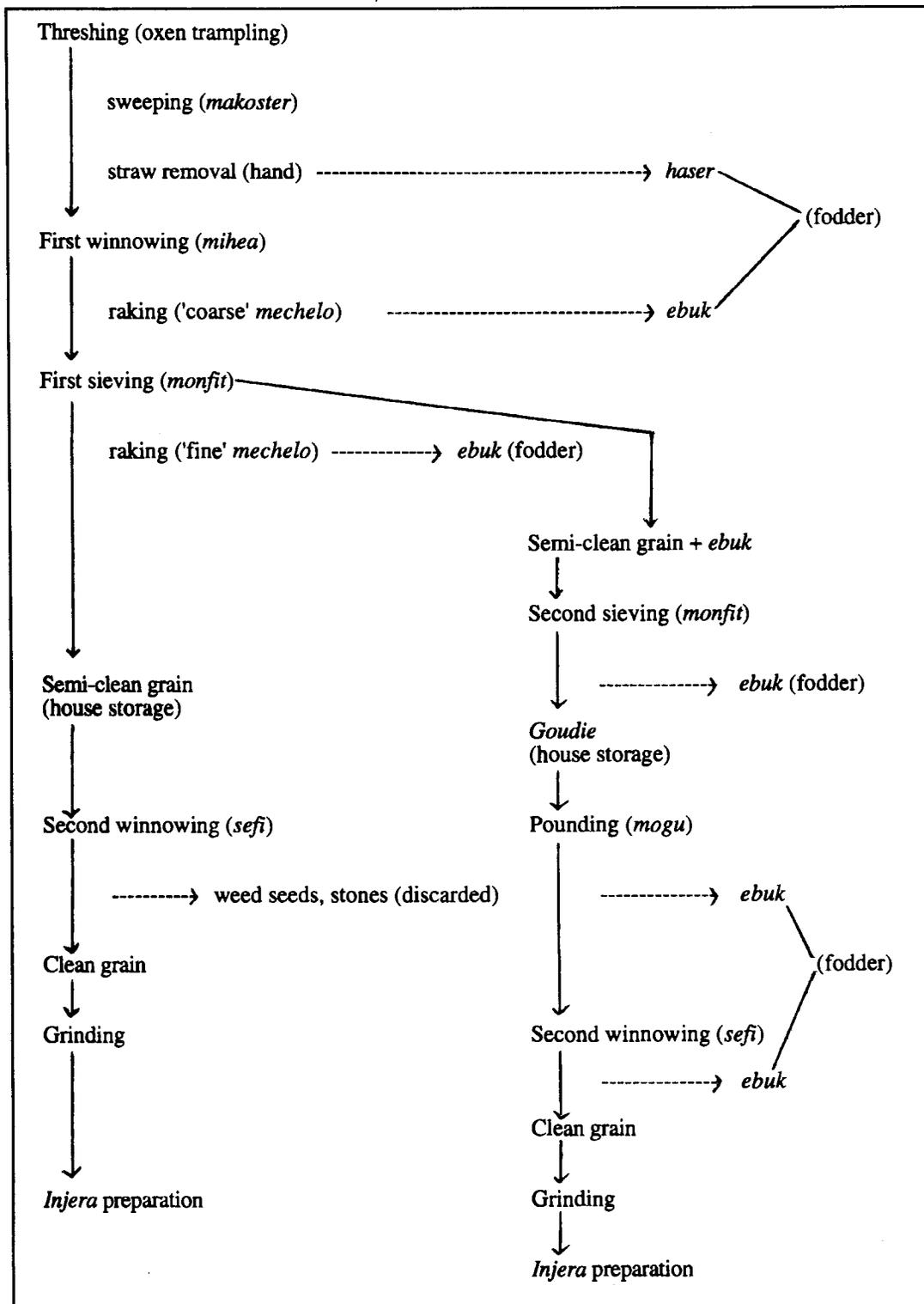
Crop Processing Studies

Several crop processing activities were observed during the field season, however the main occupation of farmers was threshing. Different stages of threshing were described and photographed for tef, intercropped wheat and barley, sorghum and grass pea, and a preliminary flow chart for tef processing is illustrated in Figure 2. This diagram is based on observations made on two incomplete and one complete threshing episode, and the steps will probably be revised with additional observations. In upcoming field seasons systematic sampling of crop products and by-products are planned involving the study of products and by-products of each processing stage (harvest, drying, threshing, pounding, winnowing and other tasks). These samples will be examined in the laboratory for the composition of grains, weed seeds, and chaff fractions. The proportions of these elements will be statistically quantified in order to characterise each stage of processing.

The following is a description of the processing of tef. It should be pointed out that we have not yet finalised the spelling of Tigrinya names, including the names of tools, processes, and crop varieties.

Tef is the only crop that requires special preparation of the threshing floor. This is accomplished the day before threshing begins when a thin coat of a dung and water mixture is placed on the ground within a circular area surrounded by stones. This creates a hardened and smooth surface which reduces seed loss because tef grains are exceedingly small. During the complete threshing episode recorded, the farmer and one assistant began threshing tef by oxen at 8:05 am, winnowing commenced at 12:00 pm, and the final product was bagged for home delivery by 3:30 pm (with approximately ½ hour for lunch). The tef in this sample came from 1/16 hectare of land, and the informant estimates this will provide enough food for his family of six for just over one month.

Figure 2: Tef processing, Adi Ainawalid: preliminary observations.



Tef is harvested by an interesting combination of uprooting using a sickle. This method of harvest has been described for legumes and some cereals in Turkey and the Near East (Hillman 1985). Plants are not left to dry in the field, but are transported to threshing yards immediately after harvesting. Entire tef plants are piled on the floor, and threshing is by oxen trampling. As threshing proceeds, the pile is gradually reduced, and the assistant moves straw toward the centre using a fork (*meshe*) and a clump of dried plant stems (*makoster*). Straw (*haser*) is removed by hand with shaking to release more grain. The first winnowing involves the use of a tray (*mihea*) where material is gently poured into the wind. At the feet of the farmer using the *mihea*, a pile of grain and chaff accumulates, and after every basketful the assistant gently rakes the fine chaff away using a coarse brush (*mechelo*). The pile of chaff immediately adjacent to the main pile is re-winnowed to obtain more grain. The chaff (*ebuk*) is combined with the straw (*haser*), bundled up in a cloth, and placed onto a donkey for transport to the residential compound where it is stored in a fenced yard.

The first sieving is accomplished using a coarse riddle (*monfit*) whereby materials are sieved into the wind. This produces semi-clean grain which is placed into sacs and transported home via donkey for storage. The pile of chaff (*ebuk*) immediately adjacent to the pile of semiclean grain is sieved a second time, and the product is called *goudie*. It also is transported home for storage but is always kept separately from semi-clean grain.

In the home, both semi-clean grain and *goudie* are processed in small amounts as required. The semi-clean grain is winnowed a second time using a tray (*sefi*), when seeds and stones are removed and discarded. After grinding the flour is used in *injera* preparation. Processing *goudie* is somewhat different. It must be pounded in a wooden mortar (*mogu*) and winnowed a second time using a tray (*sefi*) before being ground to make flour.

Conclusion

The results from this field season provide an indication of the nature and timing of seasonal crop-related activities taking place at Adi Ainawalid and nearby areas. Documentation of processing techniques was initiated for several crops, although a detailed analysis of residues was not completed at this stage. Consequently, it is not possible to make comments regarding the nature of crop residues and applications to archaeobotany and archaeology, beyond the general comments provided above. In subsequent field seasons, additional interviews and observations will be conducted on crop processing activities, the role of animal husbandry, household food preparation and associated social dynamics. Furthermore, attempts will be made to locate and interview farmers who are still growing *ares* wheat (emmer) in the vicinity of Adi Ainawalid. The documentation of cultivation and processing of this ancient cereal in Tigray will add to the growing database on glume wheats compiled by Hillman and others (e.g., Hillman 1984; Nesbitt and Samuel 1996). Future work also will involve the clarification of terminology for implements, crop names, and producing proper transcriptions of Tigrinya into English, as well as the mapping of Adi Ainawalid, including the location of households, threshing areas, fields and pastures.

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References

Brumfiel, E.M.

1991 Weaving and Cooking: Women's production in Aztec Mexico. In J.M. Gero and M. Conkey (eds.) *Engendering Archaeology: Women in Prehistory*. Oxford: Blackwell, pp. 224-251.

Butler, E.A.

1992 Pulse agronomy: Traditional systems and implications for early agriculture. In P. Anderson-Gerfaud (ed.) *Préhistoire de l'Agriculture; Nouvelles approches, expérimentales et ethnographiques*. Paris: Editions du CNRS, pp. 67-78.

1995 The Role of small legumes as a resource in prehistory with particular reference to Temperate Africa. In K. Wasylikova, editor, *Proceedings of the 1st International Workshop on the Archaeobotany of North Africa*, Mogilany, Poland, May, 1994. *Acta Palaeobotanica* 35(1): 105-115.

in press Traditional seed cropping systems in the Temperate Old World: Models for antiquity? In C. Gosden and J.G. Hather, editors, *Change in Subsistence Systems: Social Theory and Biological Processes*. London: Routledge

D'Andrea, A.C.

1992 *Palaeoethnobotany of Later Jomon Cultures of Northeastern Japan*. Ph.D. Dissertation, University of Toronto.

1995 Later Jomon subsistence in Northeastern Japan: New evidence from palaeoethnobotanical studies. *Asian Perspectives* 34(2): 195-227.

Donley-Reid, L.W.

1990 Structuring structure: The Swahili house. In S. Kent, editor, *Domestic Architecture and the Use of Space*. Cambridge: Cambridge University Press, pp. 114-126.

Engels, J.M.M., J.G. Hawkes and W. Melaku

1991 *Plant Genetic Resources of Ethiopia*. Cambridge: Cambridge University Press.

Hastorf, C.A.

1991 Gender, space, and food in prehistory. In J.M. Gero and M. Conkey, editors, *Engendering Archaeology: Women in Prehistory*. Oxford: Blackwell, pp. 132-159.

Hillman, G.C.

1984 Interpretation of archaeological plant remains: Ethnographic models from Turkey. In W. van Zeist and W.A. Casparie, editors, *Plants and Ancient Man*. Rotterdam: A.A. Balkema, pp. 1-42.

1985 Traditional husbandry and processing of archaic cereals in recent times: Part II, the free-threshing cereals. *Bulletin on Sumerian Agriculture II*: 1-31.

Holt, J. and M. Lawrence

1993 *Making Ends Meet: A Survey of the Food Economy of the Ethiopian North East Highlands*. London: Save the Children.

Huffnagel, H.P.

1961 *Agriculture in Ethiopia*. Rome: FAO.

Jones, G.E.M.

1984 Interpretation of archaeological plant remains: Ethnographic models from Greece. In W. van Zeist and W.A. Casparie, editors, *Plants and Ancient Man*. Rotterdam: A.A. Balkema, pp. 43-62.

Lyons, D.E.

- 1989 Men's Houses, Women's Spaces: the spatial ordering of households in Doulo, North Cameroun. In S. MacEachern, J.W. Archer and R.D. Garvin, editors, *Cultures in Conflict*. Calgary: Archaeological Association of the University of Calgary, pp. 28-34.
- 1996 The Politics of house shape: Round vs. rectilinear shaped domestic structures in Dela households, Northern Cameroon. *Antiquity* 70: 341-367.
- in prep. *Men's Houses, Women's Spaces: An ethnoarchaeological study of gender and household style in Dela, North Cameroon*. Cambridge: Cambridge University Press.

Moore, H.

- 1986 *Space, Text and Gender: An anthropological study of the Marakwet of Kenya*. Cambridge: Cambridge University Press.

Nesbitt, M. and D. Samuel

- 1996 From Staple Crop to Extinction? The archaeology and history of the hulled wheats. In S. Padulosi, K. Hammer and J. Heller, editors, *Hulled Wheats*. Rome: International Plant Genetic Resources Institute, pp. 41-100.

Reddy, S.N.

- 1991 Complementary approaches to Late Harappan subsistence. In R.H. Meadow, editor, *Harappa Excavations 1986-1990*. Madison: Prehistory Press, pp. 127-135.

Roberts, M.

- 1991 *Living in a Man-Made World*. London: Routledge.

Tringham, R.E.

- 1991 Households with faces: The challenge of gender in prehistoric architectural remains. In J.M. Gero and M. Conkey, editors, *Engendering Archaeology: Women in Prehistory*. Oxford: Blackwell, pp. 93-131.

Wall, D.D.

- 1994 *The Archaeology of Gender: Separating the spheres in urban America*. New York: Plenum Press.

Westphal, E.

- 1975 *Agricultural Systems in Ethiopia*. Wageningen: Centre for Agricultural Publication and Documentation.

Yabuno, T.

- 1987 Japanese barnyard millet (*Echinochloa utilis*, Poaceae) in Japan. *Economic Botany* 41(4): 484-493.