HEARTH FUEL ACQUISITION AND USE IN MOROCCO'S IMNANE VALLEY

By

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The thesis: “Hearth Fuel Acquisition and Use in Morocco’s Imnane Valley” is hereby approved in partial fulfillment of the requirements for the Degree of MASTER OF SCIENCE IN FORESTRY.

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TABLE OF CONTENTS

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LIST OF FIGURES

LIST OF TABLES

Chapter 1: Introduction

Wood and woody biomass are the main sources of domestic energy for most rural communities in developing countries. Increasing population pressure has resulted in a local depletion in the world's supply of wood fuels, especially those wood supplies located near human communities that depend on them for energy. This deforestation causes loss of water and soil quality through erosion, decreased biological diversity, and can result in fuelwood shortages for the communities that depend on wood for cooking food. When a community experiences a fuelwood shortage, it is necessary to implement coping strategies in order to manage resources and insure the availability of sufficient domestic energy.

The purpose of this study is to examine how individual households implement resource use coping strategies to manage decreasing fuelwood availability. My study draws from my experience and work as a Peace Corps Volunteer in Morocco. During my two years of Peace Corps service I worked with Toubkal National Park, which assigned me to live and work in the small village of Ouanskra in the Central High Atlas Mountains.

As a Peace Corps Volunteer, my job was to work with the village community and assist them in implementing community based development projects. As a component of my broader work I conducted a domestic energy survey to determine how village households acquired and used biomass and butane fuels. My survey included interviews with each household, and although limited to one village, provides a complete representation of the fuel use behavior of all village households.

In the next chapter (Chapter 2) I discuss basic background information for Morocco in terms of the country's political, physical and human geography. The political geography orients the reader to the spatial location of Morocco and describes the country's regional associations. The physical geography briefly describes the country's landforms and climate. The section regarding human geography describes some of the country's historical, cultural, and economic background. It also includes a description of some differences between Morocco's urban and rural environments.

In Chapter 3 I discuss the regional background for the Central High Atlas Mountains. First, I describe the physical geography and the features that distinguish it from other regions in Morocco. Next I describe the human geography in terms of how human communities utilize the resources of different altitudinal environments. Then I focus on communities in the region's upper river valley environments and describe them in terms of culture and resources. Following this, I discuss my study area, the village of Ouanskra, in terms of those factors that distinguish it as a specific community relative to other upper river valley communities. Finally, I finish the chapter with a section on the resources and economy of Ouanskra. This section includes a description of the village's farm systems, the significance of labor, the relationship between labor, gender and age, the role of energy in the community and the relationship between energy and fuel.

In Chapter 4 I discuss the background for information and literature regarding fuelwood use and acquisition. I begin with a broad description of the significance of fuelwood globally and proceed to a more narrowed focus on the consumption of fuelwood in Morocco. Next, I discuss the role of gender in fuelwood acquisition and

labor. Then I describe the relationship between labor and fuel resources. Finally I describe some of the coping strategies communities use to manage fuelwood shortage.

In Chapter 5 I discuss my study methods. I begin with an introduction describing how my research began. Next, I discuss my informal research techniques. Then, I discuss my formal research techniques. Finally, I describe my method of data analysis.

In Chapter 6, I discuss the results of my study. This chapter includes a description of the factors found to be associated with fuel acquisition, factors found to be associated with fuel use, factors found to be associated with fuel technologies, and a summary describing the relationship between those factors.

Conclusions and recommendations are discussed in Chapter 6. First, I discuss my results in the context of broader fuel wood conceptual framework. Then I describe my recommendations for further study and research relating to fuel use in the Central High Atlas Mountains. Following this is an appendix containing the results of my statistical analysis.

Chapter 2: Country Background for Morocco

Physical Geography

Political Geography

Morocco, the western most of the North African countries (Algeria, Egypt, Libya, Morocco and Tunisia), is located between 27° and 36° north latitude (Figure 1). It is bounded by the Mediterranean Sea to the north, Algeria to the east and the Atlantic Ocean to the west. Covering an area of 446,550 sq km Morocco is comparable in size to the state of California. Located within Morocco on the Mediterranean coast are two small Spanish enclaves, Ceuta and Melilla (which occupy 20 and 12 sq km, respectively) (CIA 2002).

To the south Morocco is bounded by the Western Sahara, a country that Morocco effectively occupies and over which it claims sovereignty. The Western Sahara covers an area of 266,000 sq km, comparable in size to the state of Colorado. It is bounded by Morocco to the north, Algeria to the east, Mauritania to the east and south and the Atlantic Ocean to the west (CIA 2002).

Morocco is closest African country to Europe. The Strait of Gibraltar, a 58 km (36 mi) long channel connecting the Mediterranean Sea with the Atlantic Ocean, separates Morocco from Spain. It narrows to 13 km (8 mi) between Point Marroquí, Spain, and Point Cires, Morocco, and has long been of great strategic and economic importance.

Figure 1. North Africa (UT Library Online, 1995)

Landform and Climate

Morocco contains the broadest plains and the highest mountains in North Africa and can be divided into the following four physiographic regions: the Er Rif Mountains, the coastal plains and the Taza Gap, the Atlas Mountains, and the southern plains and valleys (Figure 2).

The Er Rif, or Rif Mountains, comprises the northern highland area of Morocco's Mediterranean coast with only a few narrow coastal valleys suitable for agriculture or urban settlement. In geological terms the Rif Mountains are a continuation of Spain's Sierra Nevada Mountains, which have become separated by the Strait of Gibraltar and squeezed into the African plate. The higher peaks are snowcapped in winter, reaching their apex at the summit of Jbel Tidiquin, 2,448m.

The Taza Gap separates the Rif Mountains to the north and the Atlas Mountains of the south. Geologically, the Taza Gap is a product of the collision of the Eurasian and African plates, which gives rise to the mountain ranges on either side. The Taza Gap is oriented generally east-west and joins the coastal plains of Morocco's Atlantic shore. The Taza Gap and the coastal plains are among Morocco's most productive agricultural areas.

The Atlas Mountain system extends some 2400 km from southwestern Morocco, through northern Algeria, and to northern Tunisia. Morocco is home to three distinct mountain ranges of the Atlas system, which dominate the landscape of the country's interior. The three ranges run roughly parallel to each other and are oriented northeast to southwest. The northernmost of Morocco's Atlas ranges is the Middle Atlas, reaching its apex at the summit of Bou Naceur, 3354 m (11004 ft). South of the Middle Atlas are

Figure 2. Moroccan topography (UT Library Online, 1979)

the High Atlas Mountains. The High Atlas are the tallest of the Atlas Mountains, reaching their apex at North Africa's tallest mountain Djbel Toubkal, 4165 m (13665 ft). The southern most range of the Atlas Mountains is the Anti Atlas, which reaches its highest point in Morocco at the summit of Djbel Aklim, 2531 m (8304 ft).

South of the Atlas Mountains, Morocco's landscape becomes flatter and drier. The southern extremes of the country reach the Sahara desert where extreme temperatures, limited precipitation, and scarcity of water make agriculture, and thus human habitation, difficult. Communities in these arid zones are generally restricted to isolated oases.

Morocco's climatic zones correspond generally to the physiographic regions described above (Figure 3). Likewise, these zones result from the influence of the major geographic features that characterize those regions: the Mediterranean Sea and Atlantic Ocean, the Rif and Atlas Mountain systems, and the Sahara Desert.

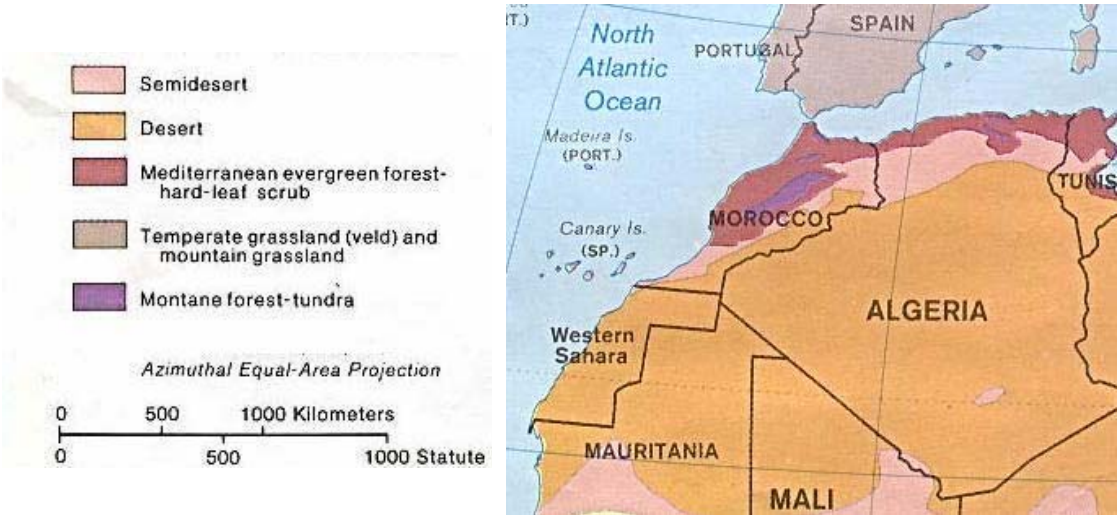

Figure 3. Moroccan climatic regions (UT Library Online,1986)

The northern hills and coastal plains are dominated by a Mediterranean climate and characterized by cool, wet winters and warm, dry summers. As a result, these are Morocco's most productive agricultural environments. The interior of the country is characterized by greater extremes of temperature with much of the precipitation in the Atlas Mountains falling as snow. In Morocco's southern and eastern portions, the country becomes gradually drier with the Atlas Mountains forming a climatic barrier between the Mediterranean Sea and the Sahara Desert. Morocco's deserts are characterized by minimal precipitation (less than 100mm annually) and greater diurnal temperature variation.

Human Geography

History

Unlike many African countries, Morocco as a nation is not the product of European colonialism but the result of a country that has been continuously inhabited by the same group of people for thousands of years. The Berbers are the indigenous people of North Africa. Berber tribes have witnessed the presence of foreign civilizations in their homeland since as early as the 12th Century BC when Phoenician trading posts were established along Morocco's Mediterranean cost. After the fall of Carthage in 146 BC Morocco became an ally of Rome, and in 46 AD it was annexed by Rome as part of the province of Mauretania (Brett and Fentress, 1996).

In the 7th century AD, the rise of Islam generated Arab armies that swept across North Africa spreading the extent of both their empire and their faith to the indigenous Berbers. Although they effectively conquered all of North Africa and southern Spain, their power fragmented and left an independent dynasty to rule Morocco and Moorish (Muslim) Spain. United by empire and religion, the Arab and Berber populations of North Africa began to mingle and mix, a process that presently continues and blurs the distinction between the two groups (Nelson, 1986).

The Moroccan empire was to pass through a series of Berber and Arab dynasties until 1649 when the Alaouites, an Arab dynasty, established itself as the ruling family. The Alaouite dynasty claims to be descendent from the prophet Mohammed, the founder of Islam, and holds the throne to this day.

The Alaouite dynasty ruled Morocco until the late 19th century when European power groups began vying for power in North Africa. France and Spain established their

spheres of influence and took control of southern and northern Morocco respectively in 1912. The French protectorate in Morocco became a strategic location for Allied efforts against the Germans during World War II and persisted until 1956 when Morocco finally achieved its independence and Sultan Mohammed V returned to rule the country (Fletcher *et al.* 2001).

Morocco is credited with being one of the first nations to recognize the independence of and seek diplomatic relations with the United States. In 1777 Sultan Sidi Muhammad Ben Abdullah announced his desire for friendship with the United States and declared that all vessels sailing under the American flag could freely enter Moroccan ports. Ten years later the two countries signed the Treaty of Peace and Friendship. The treaty was renegotiated in 1836 and still remains in effect today, constituting the longest unbroken treaty in American history (Wells, 1987).

Culture and Language

The diversity of landform in Morocco's physical landscape is reflected in the peoples of its cultural landscape. Divisions and classifications of culture and society within Morocco are multilateral and virtually infinite, from the simplest level of the household unit to broader identities organized at complex regional and national scales. Likewise this human cultural diversity is evident in linguistic diversity.

The simplest division of culture within Morocco is by language. Morocco is home to native speakers of two distinct native languages, as well as the European languages that arrived through French and Spanish colonial missions in North Africa. Moroccans

use French and, to a lesser degree, Spanish for purposes of commerce and bureaucracy. However, virtually all Moroccans speak either Arabic or Berber as their first language.

A great deal of political and academic discourse surrounds the terms used to describe culture and language, as well as their relevance to larger national identities and interests. The term "dialect" is sometimes used in a diminutive sense to indicate something of less significance than language. Suffice it to say that these issues are outside the scope of this document. Except where otherwise noted, the term language refers to any manner people use to communicate, and dialect indicates language within a specified region. The terms Arabic and Berber refer to both the languages and people speaking those languages.

Arabic is Morocco's official national language and the first language of approximately 60% of the population. The dialect of Arabic spoken in Morocco is distinct from the classical Arabic of the Qur'an (Islam's holy book and definitive source for the classical form of the Arabic language) and modern Arabic as spoken in Egypt and the countries of the Arabian Peninsula. Classical and modern Arabic also have limited use in Morocco. The former forms the foundation for religious education while the latter is the printed form of the language, whereas the Moroccan dialect of Arabic is used in spoken form only.

The remaining 40% of the Moroccan population speak a dialect of Berber. Berber is a European term used to describe the indigenous peoples of North Africa as well as their languages. Activists and scholars seeking to represent and champion the rights and identity of indigenous North Africans refer to Berbers collectively as *Imazighen* (or singular, *Amazigh*), while their language is known as *Tamazight*. Berber is almost

exclusively a spoken language. There is written form with a unique script, called *Tifinagh*, which originates from the Tuareg Berbers of the Sahara. However, its use in Morocco is restricted to activists and scholars who specialize in Berber studies (Crawford, 2001).

In Morocco there are three distinct dialects of Berber. The dialects are generally associated with the different mountain regions and their environs: *Tarifit* spoken among the Berbers of the Rif Mountains, *Tamazight* (not to be confused with the above mentioned collective name for Berber languages) spoken primarily in the Middle Atlas and eastern High Atlas Mountains, and *Tachelhit* spoken in the south-western High Atlas and Anti Atlas Mountains.

I was frequently told by the *Tachelhit* speaking Berbers in and around my study site that although *Tarifit* was very different from their own language, *Tamazight* was not so. They claimed that between *Tachelhit* and *Tamazight* speakers, their languages were mutually comprehensible. The names *Tachelhit* and *Tamazight* are the feminine singular forms of the words *ishlhin* and *imazighen*, which mean the "free people" or the "country people" and are the words Berbers use to refer to themselves.

The words *Tachelhit* and *Tamazight* are used linguistically to describe specific dialects of Berber. In some areas where the local dialect is linguistically described as *Tamazight*, the speakers refer to their language as *Tachelhit* and themselves as *ishlhin*. Speakers of both dialects use the word *tamazight* to mean homeland, a deep concept in rural Berber culture that has formed the basis for a popular genre of Berber country music.

Politics of Language and Culture

There has been a great deal of discourse attempting to define Arab and Berber identities. The political scale of these debates is often national and international in scope. The French colonial occupiers stressed cultural and racial differences between Arabs and Berbers as a means to divide and control Morocco's population. After Morocco gained its independence in 1956 such distinctions fell into disfavor and the Moroccan political and academic elite attempted to create a broad, all-inclusive national identity uniting the population under the three precepts of religion, politics, and homeland. Evidence of this can be seen on many a distant mountain slope where white-washed rocks have been arranged to form a triangular representation of the Arabic words for God, King and Country, arranged around a crown, the Moroccan national seal.

As a challenge to this, some Berber activists and academic elite have issued a counter position claiming a distinct and unifying Berber identity stretching across all of North Africa. The general claims assert that Berbers are the original and therefore rightful inhabitants of North Africa, and Arabs are only the latest of a series of invaders dating back the pre-Roman era. They point to Moroccan government policies of Arabic and French, but not Berber, as official national languages (and thus the only languages taught in the schools) and the ban on certain Berber names as attempts to assimilate Berber culture into a homogenized Arab national identity. These claims generally take the form of information or propaganda, and there are numerous groups both inside and outside of North Africa publishing their various websites, newsletters and manifestos.

Although the distinction between Arab and Berber languages is clear, the distinction between the two cultures is not clear. Crawford (2001) argues that these

discourses and manifestos are outside the reality of rural Moroccan Berbers who are the subjects of, but not participants in, such debates. Identity is defined locally by those factors most pertinent to the reality of community life, namely poverty and labor. In the rural Central High Atlas, to be Berber is to be poor and to work very hard (Crawford 2001).

National Economy and Human Development

In 2000, Morocco's gross domestic product (GDP) was $33 billion, or $1,181 per capita. Of this, agriculture accounted for 14%. As more than 90% of the country's agriculture is rain fed, drought has a serious impact on the national economy (USDS, 2003). The country's main exports include food and drinks, phosphates and fertilizers, and minerals and were estimated to total $8.2 billion in 2001. Morocco's main imports include semi-processed goods, machinery and equipment, food and beverages, consumer goods, and fuel estimated to total $10.9 billion in 2001 (CIA 2002).

In 2002 Morocco ranked 123rd in the United Nations Development Program's Human Development Index, a list of 173 countries ranked by their achievements in three aspects of human development: longevity, knowledge, and a decent standard of living. The UNDP defines human development as a process of expanding people's range of choices. The expansion of people's range of choices is the expansion of what they can do or be in life (UNDP, 2002).

Urban vs. Rural: Morocco's Two Realities

In terms of development and economy, as in many other ways, Morocco is characterized by the dichotomy of rural and urban environments. Poverty, which exists in both Morocco's urban and rural communities, can be thought of as the opposite of human development in that it is a state of existence in which people's choices are limited by unfulfilled basic needs. Although poverty exists in communities of both environments, the experience of that poverty can be markedly different.

Approximately 55% of Morocco's 29,700,000 people live in urban areas (PRB, 2002). Given that agriculture employs about 40% of the country's workforce it is hardly surprising that the country's 23% unemployment rate is particularly evident in Morocco's urban environments (CIA, 2002). Unemployment and the resulting lack of monetary income is one aspect of poverty that limits the ability of urban Moroccans to make choices that improve their quality of life.

However the experience of poverty in some rural communities, especially agricultural communities, is often characterized not by a lack of employment available but by an excess of labor necessary for survival. Labor requirements are especially high in the Central High Atlas Mountains where household and farm systems economies are based on the input of manual labor. The degree of isolation and rugged terrain make mechanized farming difficult or, in some places, impossible. Communities are far from market centers where labor saving technologies are available. Crawford (2001) describes the problem of poverty in the Central High Atlas community of Tagharghist as "super-employment, the continuous inescapable need to expend great physical effort to stay

alive". The same may be said for many other communities in the Central High Atlas region and in particular for Ouanskra, the study site of this document.

Chapter 3: Central High Atlas Mountains Regional Background

The Central High Atlas Mountains are an area of great natural beauty and harsh environments. These mountains are the homeland, or *tamazight*, of many different Berber tribes, their individual villages, and the individual residents of those villages. Like so many mountain cultures around the world, the Berbers of the Central High Atlas have carved out a delicate niche where they survive by means of complex economic and social systems (Bochet 1983). In the Central High Atlas region, these economic systems are based on agricultural practices that include food and cash crops, pastoralism, agro-forestry, and water and soil conservation. The social systems are based on tribal structures and the common faith of Islam.

Central High Atlas

Physical Geography

The Central High Atlas Mountains region, also know as the Grand Atlas or the Atlas of Marrakech, encompasses North Africa's highest elevations and towers over the city Marrakech and the adjoining Haouz plain. The historical development of Marrakech, as Morocco's first imperial capital, founded 1044 AD, was based on the water resources of the Central High Atlas watershed. The extreme elevations collect snowfall, which provide water for the rivers that irrigate the semi-arid Haouz plain and Marrakech itself.

The regional climate of the Central High Atlas is a result of extreme elevation and the relative proximity to Morocco's other major geographical features. Such characteristics are best described in comparison to other parts of the High Atlas range.

Although the Central High Atlas and the Eastern High Atlas are similar in elevation, the former receives a greater degree of precipitation and the latter is more continental in climate. The northern oriented slopes of the Central High Atlas also receives more rainfall than the southern slopes, which are subject to the rain shadow of the northern peaks as well as other desiccating climatic influences that result in the highly arid Sahara Desert. The Western High Atlas, adjacent to the Atlantic Ocean, is less elevated and less humid (Miller, 1984).

Human Geography

Miller (1984) describes the way inhabitants of the Central High Atlas classify the environmental zones of their region. This system recognizes four different zones with distinct patterns of human utilization and corresponding to altitudinal zones and the resulting climatic characteristics of temperature and precipitation.

The lowest zone is the Haouz Plain, located at an elevation of 400 – 900 m (1300 – 3000 ft) at the foot of the region's northern slopes. The Houaz Plain is a semi-arid zone, receiving only 200 – 300 mm (8 – 12 in) of precipitation annually. Agriculture in the zone depends on irrigation from the rivers that flow down from the higher elevations. Natural vegetation on the Haouz Plain is sparse and composed primarily of jujubes (*Ziziphus* spp.) esparto grass (*Stipa tenacissima* L.) and *Acacia* spp.

From 900 – 1200 m is the *dir*, a zone characterized by scallop-shaped alluvial fans. This zone receives more precipitation that the Houaz plain below it, colleting 300 – 600 mm (12 – 24 in) annually. This greater amount of rainfall supports a greater amount of natural vegetation, including the economically important dwarf palm (*Chamaerops*

humilis), thuya trees (*Tetraclinis articulata*), mastic (*Pistacia lentiscus*), and *Juniperus* spp.

Next is the *assif*, a zone of upper river valley cultivation, located at altitudes of 1200 – 3000 m (3900 – 9800 ft) and receiving 600 – 800 mm (24 – 32 in) precipitation. Much of this precipitation falls in the form of snow and extreme winter temperatures make this zone the limit of both human habitation and natural tree growth. Forests in the upper river valley zone are sparse, open and slow growing. They are composed primarily of evergreen oak (*Quercus ilex*), *Juniperus* spp. and oleander (*Nerium oleander*).

At the highest reaches of the Central High Atlas is the *adrar*, a high mountain zone located between 3000 – 4167 m. The *adrar* receives an excess of 800 mm (32 in) of precipitation annually, mostly in the form of snow. Perennial vegetation in this zone is limited to low growing xerophytes such as broom (*Genista* spp.) and woody scrub vegetation. This zone is not inhabited or cultivated, but is comprised of seasonal pastures that contribute significantly to local economies (Ilahiane, 1999).

Upper River Valley Communities

Although each community of the upper river valleys in the Central High Atlas region is unique, there are some characteristics that typify the area and all communities within it. These communities are exclusively Islamic. Ethnically, they can be described as Berber communities in that all native inhabitants speak the *Tachelhit* dialect of Berber as their first language. These communities can also be described as rural and all have economies based on agriculture and pastoralism. They can also be described as existing on the periphery of the region's market economy in that there are no major markets held

in upper river valley communities and the inhabitants must leave their communities and travel to reach markets.

In the upper river valleys of the Central High Atlas society is tribal. Tribes are made up of clans, which are in turn made up of lineages. Lineages are extended families that share a common family name. Among these communities, social division is both a source of identity and a means of resource management. Tribes have specified territories, which are organized around a specific section of their watershed. Within each territory, the watershed's main river and the tribe have the same name. Each territory contains individual villages and their associated spatial resources, such as farmland, pasture and water (Miller, 1984).

Membership within a particular tribe, clan or lineage carries rights of access to the communal resources managed by the group (Ilahiane, 1999). Tribes are organized into confederations that are largely coincident with watersheds. These confederations often manage the summer pastures located in the uppermost elevations of the region and have historically provided a basis for inter-tribal marriage (Crawford, 2001).

Villages in the upper river valleys of the Central High Atlas manage communal resources through a traditional decision-making body known as the *jema'a*. Every village has their own *jema'a*, which includes a male representative from each household. The *jema'a* has its roots in the distribution of water and pasture rights, which it still administers, but also governs any other community wide issues. Typically, the *jema'a* meets weekly at the village's mosque to make decisions regarding the allocation of communal resources or the requirements of communal labor.

The capacity for a *jema'a* to functionally manage communal resources is based on its legitimacy within the community. In those communities that have a greater dependence on communal resources, the *jema'a* is generally stronger in its management capacities. Those communities that have a greater dependence on private resources, such as cash incomes, the *jema'a* is generally less empowered to govern whatever communal resources exist (Petrzelka and Bell, 2000).

Female community members have no direct participation in the *jema'a* and are represented only through their male head-of-household. Female community members can potentially have their concerns addressed to the *jema'a* through their associated husbands or fathers. However, those concerns may or may not be addressed by the *jema'a*, depending on men's perceptions of the significance of the issues.

In some villages the *jema'a* has been adapted to serve as an official association, or *jemaia*, analogous to a community-level non-governmental organization. By completing a series of bureaucratic formalities, a *jemaia* gains official designation as a legitimate and formal institution. This permits the *jemaia* to work formally with other institutions such as development organizations. The formation of a *jemaia* is often the first step towards institutional capacity building taken by Berber communities of upper river valleys of the Central High Atlas.

Some of the significant ways in which these communities differ are based on each community's isolation and accessibility, which are usually a function of the transportation infrastructure. Road development begins at the lower elevations in the region and progresses upward. Thus, there is generally an inverse relationship between a community's altitude and their proximity to roads. Communities that are served by roads

have significantly greater access to important services such as markets, clinics and secondary schools. These communities are also more likely to receive the assistance of extension or outreach workers from various development initiatives.

There is also a general inverse relationship between a community's altitude and the diversity of their agricultural systems. The higher altitudes impose environmental constraints that limit the types of crops and trees that can be cultivated. Temperature extremes limit the success of some crops and trees and exclude others altogether. Walnuts (*Juglans regina*) are an important cash crop in nearly all villages in the upper river valley, while olives (*Olea europaea*) and almonds (*Prunus dulcis*) are only cultivated in the lower elevations of the upper river valley zone.

The contribution of tourism to the communities of the upper river valleys also forms a significant difference in the individual community economies. Foreign tourists visit the area primarily for hiking excursions in the nearby Toubkal National Park and bring a source of cash income that makes a dramatic impact on some of the small mountain community economies. A limited number of Moroccan tourists also visit the area, especially to visit the shrine of Sufi Saint Sidi Chamarouche. The shrine is believed by some to bestow *baraka*, or divine blessing, on visitors and especially those suffering from mental illness.

Ouanskra: The Study Area

The study area of this document is the village of Ouanskra a small Berber village consisting of 31 households inhabited by 291 permanent residents located at 2100 m (6890 ft) in the Imnane river valley. The residents of Ouanskra belong to the Tachdirt

clan, one of three clans in the Imnane tribe. The Imnane tribe is one of five tribes that compose the Reraiya confederation. The village is divided into two distinct parts. The older part of the village (see Figure 4) is composed of 21 clustered homes located on the river's bank. The newer section of the village (see Figure 5) is composed of ten freestanding homes on a higher section of the river valley.

Households in the upper section are generally wealthier than households in the lower section of the village. All households in the upper section have electricity and running water inside the homes, while in the lower section of the village only some of the households have electricity. At the time of my research, there were no households with running water inside the home in the lower section of the village. However, also at the time of my research, a project was undertaken to provide lower section households with running water.

In many ways, Ouanskra is typical of upper river valley communities in the Central High Atlas. It is a *Tachelhit*-speaking Berber community. The religion of Islam provides the basic social foundation and its tenants govern all aspects of human interaction, from the most basic formal or informal greeting to the more complex communal resource allocation or property inheritance. The *jema'a* is the main decision making body in the village. However, it is the not these similarities, but the following differences, that define Ouanskra as a distinct community.

Access to Ouanskra is by way of a gravel road that enters the valley at a northern pass. The road was originally constructed in order to serve a barite mine in the valley. After the mine closed, maintenance of the road became the responsibility of the villages of the upper Imnane Valley. The road terminates near Ouanskra, making the

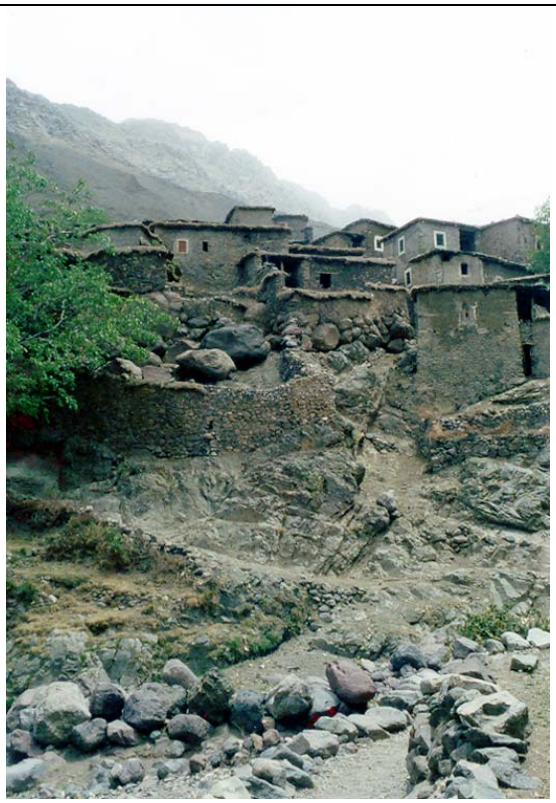

Figure 4. The lower section of Ouanskra

Figure 5. The upper section of Ouanskra

village literally the end of the road. There are two permanent trucks that transport villagers, livestock and other supplies and products between the valley and Asni, the location of the nearest weekly market and regional commercial hub. Normally the trucks leave the valley shortly after sunrise and return shortly after sunset. On Saturday, the day on which the market in Asni is held, the trucks return shortly after midday, leave for a second trip, and return that evening, often after dark.

Ouanskra and the other villages of the upper Imnane are served by a small two-room primary school. The classes are co-ed; however, more boys than girls attend the school. Because the labor of men and boys fluctuates with the seasons, there are times when less labor is required and boys can be spared from a household labor pool. Sometimes only the household's second or third male offspring is allowed to go school, as the older boys are required to help with farming or herding. Because the labor of women and girls is more or less constant throughout the year, girls are frequently kept at home to help with chores. Also, Ouanskra and the other communities of the region are conservative and education is often believed to be unnecessary for girls, who are unlikely to leave the village except to marry.

Classes are taught in modern Arabic, not the native Berber language *Tachelhit.* This language barrier, along with the curriculum's limited relevance to village life, makes the school appealing to a limited number of families. However, the significance of education is growing within the community. As Ouanskra's population grows and field sizes dwindle with each generation's inheritance, more male villagers seek economic opportunities outside of the village. For those that go to the cities to search for already scarce jobs, their education and ability to communicate in Arabic are valuable resources.

Despite this, relatively few students go on to attend secondary school, which requires them to leave their villages and find accommodations in the adjacent Ait Mizane Valley. Ouanskra's nearest healthcare facility is a clinic located Ait Mizane Valley, an hour away by truck and two hours by mule or on foot. In poor weather, such as rain or snow, access to the clinic is effectively cut off. The inaccessibility of healthcare is a major concern of villagers, especially women who bear the responsibility for their children's health and well-being. During my residence in Ouanskra, many women, and some men, expressed the desire for a clinic to be built in the village.

Farm systems and Local Economy

The economy of Ouanskra, like all Berber communities of the upper valleys of the Central High Atlas region, is based on the agriculture and pastorialism of irrigated smallholder farm systems. Beets (1990) defines a farm system as a household "and the resources it manages, involving the direct production of labor and/or animal products". As the name suggests, this farm system type is characterized by intensive cultivation of small parcels and a dependency on irrigation systems.

Farm systems in Ouanskra have many of the other characteristics that typify irrigated smallholder farm systems: a variety of crops that include both subsistence and cash crops, livestock providing a supplementary role, and a high labor input. These farm systems contain both crops and trees. Field crops primarily include barley, maize and, to a lesser degree, potatoes. Crops are rotated seasonally and cultivation continues year-round. Vegetables such as onions and peas are grown to supplement the staple starches. Whereas field crops are both consumed locally and sold for cash, tree crops are almost

exclusively cash crops. Ouanskra's fields are terraced, which is typical of farming systems in the region and are plowed using mule traction (Figure 6).

Figure 6. Ouanskra farmer plowing with mule traction

Although Ouanskra's farm systems are in many ways typical of the region, the community in limited in what it can produce by the altitude and the resulting extreme environmental conditions. Walnuts (*Juglans regina* L.) are an important cash crop in nearly all villages in the upper river valley, but they are vulnerable to late spring frosts during the budding period. During my time in Ouanskra, the walnuts were harvested only one year out of three. Apples are also subject to late frosts, albeit to a lesser degree.

Tourism also contributes to the Ouanskra's village economy. The village is situated near the boundary of Toubkal National Park and has two inns where park visitors can eat and spend the night. Because of its proximity to the park and its location on a popular trekking route, Ouanskra received more tourists than many other villages in the upper river valley area of the Central High Atlas. Another village in the upper Imnane river valley, Tachdirt, also receives many tourists compared to those villages located further from the Park and off the trekking routes. Some enterprising individuals have developed campsites and work with touring companies to host large trekking groups. Some of the innkeepers expressed frustration regarding this because they believed it detracts from their business.

Innkeepers in Ouanskra explained to me that, because their inns provided them with a source of cash not available to other villagers, they contributed part of their income to the village's community projects. It was not clear to what extent they contributed to village projects. If there was any tension within the village regarding this issue, it was never expressed to me.

Labor

Among Berber communities of the Central High Atlas, labor is a resource of primary importance and is managed at multiple levels (household, intra-household, village and intra-village). Labor is of primary importance because, as these are agricultural communities, its availability and input determine the output and productivity of the individual farm systems (Beets, 1990).

Although money is a significant resource in these communities, it is arguably less significant than labor. Labor is the input primarily responsible for the productivity of the farm systems in the Central High Atlas. It is farms systems that are primarily responsible for the livelihood of these communities. The labor requirements of the farm system are, at certain times, greater than the available supply. At such times, farmers and communities must use their judgment to make careful decisions regarding where labor resources will be invested. The shortage of labor, or the excess of work, is a primary constraint on the productivity of Central High Atlas farm systems and thus a major aspect of poverty as it is experienced in Berber communities of the Central High Atlas.

Labor, Gender and Age

In the High Atlas, the most fundamental determinant of what type of labor one will do is gender. Able men and boys do certain types of work, while able women and girls do others. Although the male head-of-household is the primary decision maker regarding the use of household resources, the male realm of concern is primarily outside the household.

Males are primarily responsible for their family's fields and flocks. As the fields are nearly all terraced, it is their responsibility to maintain existing and build any new terraces. They plow, plant and tend their crops (see Figure 6, pg. 25). They weed the fields. They also tend any trees the household owns (Figure 7). They are responsible for negotiating their rights to irrigation waters and then irrigating their fields and trees at their appointed time. When harvest time comes, they cut and thresh their grains. Because harvest requires a great deal of labor, the entire village works communally during this

Figure 7. Ouanskra man harvesting cherries.

time. Males are responsible for grazing. During the summer, some men and boys will leave the village for months at a time to graze at seasonal pastures, or *agdals*, high in the mountains.

Males are responsible for building and maintaining their homes, irrigation canals, roads and paths, retaining walls, bridges and any other local village infrastructure. For those structures that are the responsibility of more than one village, such as roads and some irrigation canal networks, the men of the villages work cooperatively. For all issues that concern the community as a whole, it is the responsibility of the male head-of-household to represent their household at the *jemaia* and negotiate their rights to the resources concerned, or contribution to effort required.

Men are also responsible for any of their family's needs that extend beyond the local environment. Men manage their family's cash resources and, if necessary, leave the village to work for money. Men travel to the weekly markets, or *souq*, to purchase supplies and sell crops.

Excluding trips to *souq*, management of cash, and representation of their household in village negotiations, the labor of males is primarily seasonal, with the greater part occurring during the agriculturally productive times of year. Plowing and planting occur early in spring. Flocks are taken to graze in the *agdals* during the summer. Autumn is the time of harvest and winters tend to be periods of rest as there is less work to be done.

The work of able Berber women and girls in a High Atlas village is not seasonal, but constant throughout the year, and is primarily centered in the household kitchen around the hearth, or *takat*. In the Berber language the word *takat* refers not only to the hearth, but also to the home generally. The *takat* is the heart of the home. When it is strong and healthy, the home is as well. But if there are problems with the *takat*, the entire home has problems.

Females are responsible for childcare. It would be nearly impossible to describe all that is included in this aspect of female labor, but it can be said that childcare labor is continuous and concurrent with all other labor. Berber children spend much of their first year or two in and around the *takat,* bound to their mother's backs, passively participating in all the various tasks the women perform.

The female residents of a household are responsible for preparing and serving meals. To this end, women awake early before sunrise to prepare *kah'wa* and *askeef*, or

coffee and flour soup, for the men who rise shortly after and prepare for their day's labor. After the breakfast is served, women begin preparing the day's bread. Bread is prepared in a variety of forms and is the staple of the High Atlas diet. It is eaten with nearly every meal, with the exception of couscous. Couscous is traditionally served as the mid-day meal on Fridays, the Islamic holy day.

Some of the first bread to be ready is served for a mid-morning meal, along with *a'tay*, or Moroccan tea. Like bread, the significance of tea in the Berber world cannot be underestimated. Morocco is famous for their super-sweet mint tea, which is the country's unofficial national beverage. Made with Chinese green tea and generous amounts of sugar, the tea may also contain fresh Moroccan green mint (*Mentha spicata* L.) or other aromatic herbs, depending on their availability and the time of year. Mint is associated with "cold", and thus is avoided in winter months when there is an excess of cold. During winter other herbs, such as wormwood (*Artemisia absinthium* L.), are added to the tea for their "warm" properties.

Berbers drink *a'tay* several times a day and it forms the foundation for a great deal of social activity. Oftentimes it is not women who prepare the *a'tay* but men, especially when visitors are present in the household. During such occasions, preparation of *a'tay* is the prerogative of the male head-of-household (Figure 8), who may chose to demonstrate his own brewing skills or bestow that privilege on an honored guest.

After bread has been prepared and mid-morning tea served, women begin preparing the mid-day meal, which is the main meal of the day. Typically this is *duez*, a thick, potato based stew. Bread is served with *duez* and is used to scoop out the stew. If available, it will have a bit of meat, which is removed at the beginning of the meal. After

the stew is finished, the meat is divided among the diners and eaten last. As noted above, couscous is the mid-day meal on Friday and is not served with bread.

Figure 8. Ouanskra man with tea service.

If necessary, the women will prepare more bread for the mid-afternoon and evening meals that are also typically bread-based. Although there is not a great deal of variety in High Atlas cuisine, there are some deviations from the standard potato-based *duez* and bread. Rice or spaghetti smothered in olive oil is sometimes eaten for mid-morning meals. Lentils are occasionally substituted for *duez* and eggs, though nearly as scarce as meat, are sometimes available.

In addition to preparing the household meals, Berber women clean their homes and wash their family's laundry. In an American society where so much has become automated and mechanized, it may be difficult to conceive how much labor and time

input is required to wash clothes by hand. Washing clothes is hard and time-consuming work. During winter the water is bone-chillingly cold.

There are many miscellaneous household tasks that fall to women. They are responsible for mending clothes. They tend to cows and pregnant sheep and goats, milking, grazing, and stock feeding as necessary. Women contribute to the harvest process by gathering the straw, wrapping it into bundles, and transporting it back to the household to use as stock feed. After harvests women make grain suitable for storage by cleaning it of debris (Figure 9).

Figure 9. Ouanskra women cleaning grain.

Although the labor of Berber women is primarily centered on the household, some chores take them far from their homes, such as the collection of fodder and hearth fuel. The former is usually grass and plants cut from favorable growing areas near the

river, streams or irrigation canals. Due to the complete absence of forest trees, the latter almost exclusively takes the form of *ifskan* (sing. *ifski*). *Ifskan* is a *Tachelhit* word used to describe xerophytic woody scrub vegetation and includes *Genista flordia* L., *Cytisus purgans* (Boiss.) Ball, and *Bupleurum spinosum* Gouan (Donadieu *et al*., 1976 as cited in Montès *et al*. 2002). The collection of hearth fuel is the physically hardest and most time-consuming labor which Berber women in Ouanskra perform.

After gender, age is the next most significant factor influencing the individual's relationship to the division of labor. For those that are too young or old, certain tasks are not physically possible. Age also carries status that determines what type of work an individual will do. Older household members delegate tasks to younger members. Young males must generally take their turn spending a summer grazing the flocks in the high mountain pastures. Girls may be old enough to do certain jobs, such as grazing cows, but not others, such as collecting fuel.

Energy

There are a variety of forms of energy used in Ouanskra. The energy of human and animal labor is essential to nearly every aspect of the farm system. Petroleum is used to power the trucks that transport villagers to and from the valley. The village generates electricity with two generators, one hydro-powered and one diesel-powered.

For the better part of my stay in Ouanskra, and at the time of my departure, the hydro-generator was broken, despite attempts by technicians from Marrakech to fix it. Some households use electricity to power lights, televisions, radios and occasionally VCRs. Households that don't have electricity illuminate their homes with candles and

butane lanterns. Although some homes in the upper river valleys use solar panels to generate electricity, none were present in Ouanskra during my time there.

The energy used to prepare food is essential to Ouanskra and the community cannot survive without it. In contrast to this, the energy of petroleum and the trucks it powers can be considered important, but not essential, for the community. Although life without motorized transport would be significantly more difficult for Ouanskra, it would not be impossible. Electrical energy and the associated technologies can be considered useful, but not essential, because it provides a convenience that may improve quality of life but is not essential to the well being of the Ouanskra's households or the community as a whole. Many homes do not use electricity because they cannot afford to pay for the wiring necessary to bring it into the home. These households use alternate energy sources and technologies to provide light, just as all households do when the electricity fails. Yet energy for processing food is essential to every household in Ouanskra. It is essential because food is essential. Energy is necessary to make food fit for consumption.

Many forms of energy go into the production, processing and preparation of food. Human and animal energy are the basis for crop cultivation. Hydraulic and diesel energies are used to mill the grain produced. Yet more human energy is required in the food preparation process, such as the kneading of bread and the churning of butter. When the food is available in a form fit for cooking, it requires heat. In Ouanskra, households produce this heat by burning either biomass fuels or butane gas.

Hearth Energy and Fuels

Inasmuch as hearth fuels are necessary to the survival to the community, hearth energy and fuels are as significant as any other element of Ouanskra's farm systems. Hearth energy is the heat used to cook food. Hearth fuels are those that are used to produce hearth energy. Households procure hearth fuels by gathering it from the local environment, as in the case of biomass fuel, or by purchasing it, as in the case of butane fuel. The former requires the investment of time and labor, while the latter primarily requires the investment of money.

In Ouanskra *ifskan* (Figure 10) is the primary biomass fuel used for cooking. *Ifskan* grows in small round clusters generally about 45 – 60 cm (12 – 15 in) in diameter. The individual branches are thin to tiny and the main stems no more than 1.5 cm (0.6 in) in diameter. When burned in significant quantities, *ifskan* releases considerable heat. However, it burns very quickly leaving virtually no coals, which makes it difficult to use for food that needs to be simmered at a low temperature for a prolonged period of time. Wood from trees is used when it becomes available, such as when trees die or are pruned, although this is rare and makes negligible contribution to hearth energy.

Butane in Morocco is available in cylinders of three and twelve kg. Nearly all households utilize the small 3 kg cylinders, which typically fit a single burner affixed directly to the top. The larger 12 kg cylinders, less frequently used in Ouanskra, are generally used for multi-burner stoves or ovens. Villagers normally buy butane at the weekly market, but it can also be purchased in Ouanskra's small shops in the event household supplies are unexpectedly depleted. The government fixes the price of butane and all merchants charge the same price.

Figure 10. Ouanskra girls carrying *ifskan* fuel.

In Ouanskra *ifskan* has the benefit of being noncommercial. It does not cost money but it is not free in the absolute sense because it requires a significant input of time and labor to procure. Figure 11 shows the area where villagers are permitted to collect fuel. Although the distance to the collection area is approximately two km, the steep and rocky terrain make travel difficult and a fuel trip time can require between 3 and 4 hours. This labor requirement, along with the poor heat value, represents significant drawbacks to the use of *ifskan* as a hearth fuel. Biomass fuels also have the drawback of smoke. The kitchens of Ouanskra's homes are often poorly ventilated and easily become filled with smoke. Prolonged smoke inhalation has a significant adverse affect on respiratory health (WHO, 2002). The collection of *ifskan* also has a negative environmental impact of increased soil erosion, which results in decreased soil and water quality.

Figure 11. Imnane Valley with permitted fuel collection area indicated by arrow.

Photo taken from upper section of village.

Another problem households face with regard to biomass fuel acquisition is the potential of an encounter with forest guards. The government employs forest guardians to protect parks and other government land from the illegal cutting of trees or grazing of livestock. During interviews I was told that when forest guards catch someone illegally harvesting fuel they demand a bribe with the threat to report the violator to higher authorities if that payment is not forthcoming.

Although they primarily patrol areas in the region where there are still forests to protect, forest guards occasionally visit the Imnane valley and confront women for collecting *ifskan* biomass fuel if they are collecting it in places where collection is forbidden. Villagers told me that guardians would demand the equivalent of US$10 - $20. In Ouanskra, the local currency equivalent of US$10 is enough to purchase six small canisters of butane fuel or 20 trips to market in local transport.

In each household, women must decide whether to travel further to collect biomass fuel, expending more time and effort but alleviating the threat posed by the forest guardian, or to collect biomass fuel in the closer, but forbidden, areas that require less labor but increase the probability of an encounter with the guard.

In Ouanskra, the advantages of butane are the absence of those disadvantages associated with *ifskan*. Butane is labor saving. The substitution of butane for *ifskan* allows valuable time and labor that would be necessary for collection to be invested elsewhere. Heat produced from butane is easily controlled by a simple knob on the gas valve, making it easier to cook with, especially those foods that need to be simmered at lower temperatures for long periods of time. Butane also has the advantage of being smokeless. There is no forest guard threat associated with butane fuel acquisition.

The drawback of butane is that it costs money, which is of limited availability to all of Ouanskra's households. For each household, there are many essential things that require the expenditure of money, including clothing and food purchased at market, medicine, school supplies, and transport costs. Money spent on butane is money that cannot be spent elsewhere.

Fuel use, preference and decision-making

Women also make fuel use decisions with regard to the economic and cultural values associated with fuel types. The economic values associated with hearth fuels take into account the resource cost associated with acquiring and using a fuel type. The cultural values associated with hearth fuels are based on non-economic qualities that fuel types are perceived to possess, which are further perceived to influence the quality of food produced with those fuel types.

Fuel use decisions based on economic and cultural values represent households' efforts to achieve the highest possible efficiency of resource use while producing the highest possible quality of food. Economic values associated with fuels form the basis of rational decisions made with the purpose of maximizing the efficiency of the cooking process. Cultural values associated with fuel types are based on the villager's preferences and perceptions of how a given fuel type influences the quality of food cooked in terms of taste and nourishment.

The preferences and cultural values associated with fuel types are arguably of equal significance to the economic values, although the two are not entirely distinct. Economic and cultural values are interrelated and either or both may be modified by

household efforts to cope with a shortage in hearth fuel resources. In the next chapter I will discuss background information regarding hearth fuel use and coping strategies involved to manage fuel shortages.

Chapter 4: Woodfuel and Domestic Energy Literature Background

There has been a great deal written about the acquisition and use of biomass fuels in developing countries. The subject has become so broad that it has developed its own lexicon. For example, the term fuelwood is used to refer specifically to wood that is directly used for fuel in its natural state without first being processed into some other form. Woodfuel, on the other hand, refers to all fuels that are derived from wood and includes fuelwood, as well as charcoal and other processed wood-based fuel products.

One reason for the vast literature on this topic is that woodfuel is an important primary energy source for much of the world's population. An estimated 60% of the world's total annual wood harvest is used for energy. The use of woodfuel for primary energy is associated with developing countries. While developed countries use an estimated 30% of the total wood production for woodfuel, in developing countries this figure reaches 80%. (FAO, 1995)

Developing countries consume an estimated 77% of the world's total woodfuel, comprising 15% of their total primary energy consumption. Among the developing countries there is significant regional variation in the percent of wood produced that is used for woodfuels. Africa burns the greatest share with 89% of its wood production consumed as fuel, while Asia and Latin America burn 81%, and 66% of their respective total wood production. (FAO, 1995)

The use of woodfuels as primary energy sources is generally associated with a lack of cash resources that could be used to purchase alternative fuels. At the national level, the *share* of primary energy provided by biomass fuels is generally found to

decrease with increasing GDP per capita. While the *share* of biomass fuel derived energy may decrease, in some countries the *total* amount of biomass fuel consumed has been found to increase with increasing GDP per capita. (Hulsher, 1997)

In 1980, average annual consumption per inhabitant in the countries of North Africa and the Middle East was estimated to vary from 0.02 to more than 1 m^3 of woodfuel. Some of the greatest discrepancies in woodfuel use in the region were found between those countries that possessed significant fossil fuel oil resources and those that did not. Within the region, countries that produce oil generally consume less woodfuel, while those that do not consume more. However, this is not always the case. Low budgetary resources for much of the Algerian population results in high woodfuel consumption despite the country's significant oil production (de Montalembert and J. Clement, 1983).

Among North African countries, Morocco has the highest rate of woodfuel consumption per capita and accounts for 61% of the region's total woodfuel use. Fuelwood accounts for 89% of Morocco's woodfuel consumption, while the remaining 11% is consumed primarily as charcoal. (Akyol and Rivero, 2000)

There is a tendency among woodfuel studies that are broad in scope to analyze woodfuel production and consumption as abstract phenomena. Evaluation of woodfuel use patterns at the continental, regional and national scale frequently omit the role of women and their labor input inherent to the process of woodfuel acquisition and consumption in rural environments (Anderson and Fishwick, 1984). As a result, policies developed at this level may possess serious shortcomings in their potential functionality at the community level. For example, efforts to implement woodlots as a source of

woodfuel may omit considerations regarding the economic value of the wood produced relative to the value of the labor that was used to acquire biomass fuel before the woodlot. In effect, wood produced by a woodlot may have a greater economic value as a cash commodity than as a fuel source (Dewees, 1989).

In most communities that rely on fuelwood for domestic energy, female community members generally perform the labor associated with fuelwood collection and use. Fuelwood is primarily used for cooking, but also for many other important domestic activities. Fuelwood may be used to heat homes, provide light, and heat water for tea, bathing or washing laundry, and provide energy for other household activities specific to the individual communities (Sontheimer, 1988).

The use of fuelwood for cooking has the additional risks of indoor air pollution resulting from biomass smoke that has been shown to cause respiratory diseases and other illnesses (WHO, 2002). The negative impact of biomass smoke has been shown to be a motivational factor influencing women's decisions regarding types fuelwood use (Hessen, 2001).

The labor of fuel collection is significant and especially difficult and time consuming in places where local fuelwood supplies have been depleted. When local fuelwood supplies become depleted it is necessary for collectors to adapt fuel collection strategies to acquire the amount necessary to meet household needs. When this occurs, the lack of fuelwood availability is frequently only part of the household's energy problem. The added labor burden of increased travel time to fuel collection areas generally results in a shortage of women's labor that is available for other activities. This potential labor shortage represents a shortage of human energy at the household level. In

developing countries, the inaccessibility of fuelwood is oftentimes only a small factor among broader issues of poverty and the unequal distribution of income and land that limit the human energy and labor potential of women (Thrupp, 1984).

For communities that rely on it for preparing food, fuelwood is an essential component of each household's subsistence scheme. Shortages in fuelwood can compromise a household's ability to secure adequate nutrition, which is detrimental to the health and security of household members. When faced with a fuelwood shortage, women implement strategies to cope with the decrease in availability based on the resources they have available. Because the primary resource associated with fuelwood collection is labor, it is most frequently the resource behavior modified or reallocated in order to meet fuelwood needs. If labor reallocated to fuelwood collection is done so at the expense of other labor activities, a fuelwood shortage effectively becomes a labor shortage.

Brouwer *et al.* (1989) have identified three potential strategies that primary actors in woodfuel collection (women) may use to overcome wood fuel shortages. These coping strategies are: increased time and energy spent in fuel collection, substitution of fuelwood by alternative fuels, and economizing on the consumption of fuelwood. Some coping behavior may effectively combine different strategies. All of these strategies have the potential to limit the quality and quantity of food produced within the household.

To increase time and energy spent on fuel collection women either allocate more time to collecting fuel personally or supplement fuel collection activities with the labor of others not usually involved in the collection process. Girls especially may be incorporated into fuelwood acquisition activities. Both methods of increasing labor

typically occur at the cost of other activities for which that time and labor would be utilized, such as decreasing the amount of time women have to care for children or the amount of time girls have to attend school (Brouwer *et al* 1989).

The second strategy is to substitute for woodfuel with alternative fuels. These fuels may be either non-commercial or commercial in origin. Non-commercial fuels are those that are freely available and are not paid for and may include animal dung, agricultural residue, and fuelwood of inferior quality. These fuel types may have the disadvantage of diminishing soil fertility, fodder availability, and cooking efficiency as a result of inferior fuels. Commercial fuels are those that are acquired through a purchase or trade. This has the drawback of the cost associated with the fuel. Fuel shortages can also increase the commercialization of traditionally non-commercial fuel (Brouwer *et al* 1989).

The third strategy is to economize on the consumption of available fuels. This may involve adapting food preparation techniques and/or changing to foods that need less cooking. If food preparation techniques are inadequate or substitution food less nutritious this will result in an overall diminished quality of household food consumption. Women may also economize on non-cooking fuel using activities, such as space heating and the preparation of water for bathing. Decreased fuel use for these activities has the potential to result in a lowered household quality of life (Brouwer *et al* 1989.)

In a subsequent study, Brouwer *et al.* (1997) found that larger households consume more fuelwood, on both a per capita and total consumption basis. This was found to be to due to a greater availability of fuelwood collection labor. Households with greater labor availability spent more time on fuel collection and as a result consumed

more fuelwood. Households with less labor availability spent less time collecting fuel and consumed less fuel and implemented coping strategies to economize on fuel use. With increasing distance to fuelwood collection areas, women returned to near-by collection areas where fuel was of poorer quality. The study concluded that fuel availability is relative to labor availability and that increasing time invested in fuel collection is not a reliable indicator of fuelwood shortage.

As the literature concerning fuelwood acquisition and use in rural community places primary significance on understanding fuel behavior at the household level, I decided to implement a series of interviews to determine how households in Ouanskra acquire and use biomass fuel. The following chapter discusses the methods I used to conduct my research, the type of data collected and the manner in which the data were analyzed.

Chapter 5: Methods

Introduction

I lived in Ouanskra for the period between August 2000 and October 2002. Living in the village provided the foundation for my research as well as my work as a Peace Corps Volunteer. By living with the community, I established rapport with and gained acceptance by community members. Although I remained an outsider, I became an outsider on the inside and this allowed me participation in and observation of daily village life and activity.

In order to establish a trusting relationship between community members and myself, I endeavored to establish a basis of transparency to my research as well as my work as a Peace Corps Volunteer. During my first meeting with Ouanskra's *jemaia* I explained that I would both assist with community projects and conduct research. I explained that this research would probably take the form of a survey, although at that time I did not know what the subject of the survey would be. I also explained that my research would collect information for academic purposes only and that it would not jeopardize anyone in the village. After some discussion, we agreed that I should begin collecting data after the completion of our first project, which was to be the construction of a concrete footbridge.

Concerns about fuel were never expressed to me by the *jemaia* even though it was obvious that complete deforestation of the local environment had resulted in a dearth of high-quality biomass fuel. It was partially this lack of concern on the part of the *jemaia* that caused me to be interested in the issue of hearth fuels and energy. In the year

between my arrival and completion of the bridge I observed village life and spoke with village women about collecting and using biomass fuel. I determined that difficulty in acquiring biomass fuel for hearth energy was a significant concern for Ouanskra's households, albeit a concern that was primarily borne by women and thus not represented by the exclusively male *jemaia*. Because I judged this issue to be important to well-being to the community as a whole and it was not being dealt with by the village's primary decision making body, I chose this for my research topic and decided to conduct interviews to determine the village's domestic energy requirements and those factors that influence the availability of energy sources.

During my first year in the village I identified not only the research topic, but also those aspects of that topic most relevant to needs of Ouanskra's households. Through continuous dialog with community members I determined what information was most pertinent to the study and used this information to design a formal interview guide to collect data on the acquisition and use of hearth fuels.

During the course of my research I remained conscious of the fact that, despite the rapport and trust established, I was outsider and this as well as the very nature of the interview process had the potential to influence my subject's responses. I sought to minimize the degree to which my interviews conditioned the women's responses through the transparency of my research goals and objectives. Through open discussions, I informed the villagers the nature of the information I was attempting to collect and what I would use that information for.

My long stay in Ouanskra enabled me to form meaningful relationships and understanding with the villagers, establishing a basis of trust on both sides of that

relationship. By understanding the norms of village life, I was able to collect information and analyze it in the context of what was normal for the village environment. If I asked a question and received an answer that seemed unusual, I was able to recognize that there was potentially a misunderstanding and ask my question in a different manner or at a different time.

The extended duration of my fieldwork also permitted me to focus on listening to the women whom I interviewed, as opposed to focusing on specific questions. In essence, I allowed my subjects to assist me in defining the parameters of my research by helping me to identify which questions were important and to eliminate those that were not. I began with the broad, open topic of domestic energy use and proceeded through thorough and consistent participatory research methods to the specific question of how women make decisions regarding fuel use and acquisition.

Research Techniques

Data were collected using both informal and formal social survey research techniques. The informal research methods included participant observation, discussions with key informants and informal interviews. These techniques were used primarily during the exploratory stage of my research to build rapport and develop and develop a broader understanding of my research topic. My formal research methods included unstructured and semi-structured interviews that I utilized to explore those issues I identified as most relevant to my topic through my informal research methods. All data were collected through discussions in the local *Tachelhit* dialect of the Berber language.

Informal Research Techniques

Participant observation involves living in a subject community for an extent of time sufficient to allow the researcher to participate as fully as possible in community life. This technique combines observation, discussion and informal interviews to tap the continuous flow of information present in the daily life of the subject community. It requires careful documentation on the part of the researcher to record the information that results (Nichols, 1991). Participant observation involves establishing rapport and behaving in a manner so that one's research subjects behave as they normally would when in the researcher's presence. Participant observation also involves intellectually removing oneself from the research environment in order to process the information accessed (Bernard, 2002).

For me, participant observation was a natural and essential component of my Peace Corps service. I was the only foreigner living in a small isolated mountain village and it was necessary for me to participate in village life simply to have contact with other human beings. By observing what went on around me I began to understand the community better, assisting me in everything from basic communication to the more complex aspects of my work with community projects. By living with a host family I experienced domestic life first-hand. My host family also assumed the task of introducing me to the other families in the village and helping me to learn my way around the area. It was through participant observation that I lived as well as worked in Ouanskra.

I became curious about hearth energy and fuels after I observed village women returning from their fuel collection trips carrying giant bundles of *ifskan* on their backs. I conducted informal interviews with the women in my host family, questions about what

types of fuels they used and where they went to collect it. Because it was easiest to speak with them while they went about their kitchen chores, I began spending time in the kitchen where I watched my host mothers preparing the meals and asked them about fuel collection and cooking.

After I had spent more time in my village and a trusting relationship had been established, I began visit other households where I observed how they used hearth fuels and asked questions regarding how they collected those fuels, as well as which fuels were preferred for what and why. During this exploratory phase I utilized discussions with key informants to broaden my understanding issues related to fuel use and collection.

Key informants are people within the subject community that are both particularly knowledgeable about the researcher's topic and willing to disclose that knowledge to the researcher (Bernard, 2002). Information from key informants can be extremely useful for a participant observer, but must be evaluated in the context of broader community research (Nichols, 2000).

My key informants comprised five female head-of-households with whom I had developed close relationships. Although my relationships were primarily close with the male head-of-household, their acceptance of and welcoming attitude towards me allowed me to communicate openly with all members of the household. The friendship and understanding I shared with these families made it easier for me to ask questions and express what I was interested in, especially during the early stages of my time in the village when my language skills were still developing. The key informants helped me to identify not only those issues pertinent to my research topic, but also the vocabulary necessary to discuss that topic.

I lived at in the village for approximately six months before I chose domestic energy use as my research topic. Having identified my topic, I asked the *jemaia* if it would be all right for me to ask women questions regarding fuel use. I explained that this was the topic I was interested in for my research, but that I would not begin formal interviews until after completion of the bridge project and that this would not hamper the project's progress. The *jemaia* told me that the questions would be fine as long as Ouanskra got its bridge.

To gain a deeper understanding of the issues relating to fuel use, I conducted informal interviews with each of the 31 village households. Informal interviews collect information through unstructured discussions based on those topics of interest to the researcher. By keeping the discussion open, neither the interviewer nor the subject is constrained by a specific format or list of questions and both are able to guide the flow of information to those topics they feel are important. The informal aspect also precludes taking notes during the interview and requires the researcher to record the information later from memory (Bernard, 2002).

Informal interviews typically began with me visiting the family and sharing lunch with the male head of household. Meals in traditional Berber communities are often segregated by gender, especially when an unfamiliar visitor is present. It is the male head of household's responsibility and privilege to dine with the guest. During my meal I would conduct an informal interview, explaining my interest in hearth energy and fuels and discussing fuel issues such as the rate of fuel consumption, types of fuel used, and the different energy technologies.

These initial interviews would typically last for approximately the length of the meal, typically about an hour. Afterwards I would ask to visit the kitchen. Although it was sometimes difficult for the men to understand why I was interested in the kitchen, and thus the affairs of women, the rapport I had established enabled them to trust me to meet the female side of their family.

The initial meetings with the women were kept short and used mostly as an introduction and an opportunity for me to explain what I was trying to accomplish. After I became more familiar with some of the basic aspects of kitchens and biomass fuel collection I would use this information to help the women to understand that I was interested in what they were doing.

In order to establish rapport between the women and myself, I would ask the women a few basic questions relating to some of the biomass fuel collection. Sometimes I made jokes. For example, I often told the women about how I once attempted to lift and carry a fuel bundle, nearly to fall from the weight of it. These questions and comments were used as a means for me to express to the women that I was interested in their labor, their lives, their opinions, and that I was willing to listen to them talk about these things.

After I had interviewed a significant number of villagers, women began asking me when I would visit their kitchen. These informal interviews were essential to the exploratory stage of my research because they aided in identifying the issues important to the women with whom I spoke. It also helped to establish an understanding of what I was attempting to do. I used the information gathered from these informal interviews to compile a list of topics for my unstructured interviews.

Formal Research Techniques

In May 2001 Ouanskra's bridge project was completed (Figure 11). During a feast to celebrate project completion, the *jemaia* jokingly told me that now that the important work was finished I could begin my research. I began conducting unstructured interviews the following month.

Figure 12. Ouanskra's bridge.

Unstructured interviews are based on a clear plan and defined set of ideas to be explored, yet retain a degree of openness and flexibility that allow the researcher and subject to explore those ideas in any order or deviate from the plan. Unstructured interviews differ from informal interviews in that they are to a degree formal. During an unstructured interview it is clear to both the researcher and the subject that the interview discussion has a deliberate purpose to collect certain information. The researcher initiates the interview with questions about specific topics and then allows the subject to respond

freely, leading the course of the discussion. When a researcher has the opportunity to spend a long time in the subject community, unstructured interviews are ideal because topics can be explored in depth and subjects can be re-interviewed if more questions arise or previous data are found to be inadequate. (Bernard, 2002)

I conducted unstructured interviews with the female head-of-households for each of Ouanskra's 31 households over a three-month period. To conduct these interviews I typically visited the household and explained the purpose of the interview to both the male and female head-of-household. I described the type of information I wanted to collect (Table 1) and what I would do with that information. I assured the subjects that all information would be kept confidential. I conducted all research within appropriate Human Subject Research guidelines after Michigan Technological University's Institutional Review Board approved the study proposal.

In order to conduct the interviews it was necessary for me to work within the cultural norms of the community. Traditionally, the male head-of-household represents and speaks for his family in formal matters. I explained to the men that, because biomass fuel collection and use was primarily the responsibility of women, I wanted the women to answer the questions. For various reasons, including both concern and curiosity, men often decided to sit in on the interviews. If they answered questions for the women or told them what to say, I would remind them that I wanted the women to speak and asked the question again. If I still felt that the men influenced the women's responses, I made note of that question and repeated it later in the interview. If still I were not satisfied with the response I would ask the question again on another day.

Table 1. Unstructured interview topics

Labor
Women's household labor requirements
Fuel types
Fuels used by household
Benefits and drawbacks of fuel types
Fuel types and preference
Availability of fuel types
Energy technologies
Household energy technologies
Communal energy technologies
Energy technologies and preference
Biomass Fuel collection
Who collects biomass fuel
How much fuel is collected
Where biomass fuel is collected
Where biomass fuel is *not* collected
Time spent on biomass fuel collection
Rules and norms concerning fuel collection
Problems related to fuel collection
Perceived changes in biomass fuel availability during subject's lifetime

During interviews I asked the women questions and took notes about their responses, usually conducted in the women's kitchens. I would begin the interviews by asking the women general questions about biomass fuel collection, such as which members of the family collected fuel, how frequently they collected, and how much time was spent on collection trips. These questions were usually enough to generate a discussion about fuel and energy issues in general and I would use this dialog to address the specific questions of the interview. My strategy was to cover all the questions while allowing the women to speak freely and openly.

The data collected through unstructured interviews formed the foundation for my final data collection phase using semi-structured interviewing. Semi-structured interviews

are based on an interview guide that details specific questions to be covered in a certain order. Semi-structured interviews are useful for collecting data that are consistent and comparable between subjects. (Bernard, 2002)

I designed my interview guide to collect qualitative information about rates of energy consumption, types of energy technologies present in and used by households, and those issues I believed to be important based on the literature and my own observations in Ouanskra. In order to refine my interview guide I used a focus group to discuss the questions I wanted to include in the guide. Focus groups are, as the name suggests, group discussions that focus on a particular topic. Groups are comprised of those people that have an understanding of the topic of focus. An interviewer conducts a focus group discussion by asking the group predefined questions, allowing all members an opportunity to respond openly. Focus groups are useful in survey or interview guide design because they allow the subjects to express their opinions about the questions, as opposed to answering the questions. (Bernard 2002)

My focus group consisted of four women. I decided to discuss the issue with women at a place near the river where they wash clothes. I chose this location because it was a place where the women regularly convened and thus solved the problem of bringing together a group. I described the questions and elicited their feedback about the relevance of the question. This process helped me to redefine the questions included in my interview guide and to eliminate irrelevant questions. For example, I initially included questions about how much they paid per canister of butane fuel, but they explained to me that everyone paid the same price because the government fixed the price of butane. The

discussion was especially helpful in formulating specific wording of the questions in the local language that would be clear to the subjects.

The focus group aided me in formulating the final question list for my interview guide (Table 2). The guide consisted of questions aimed at collecting quantifiable data regarding the number of occupants in each household, number of occupants who collected biomass fuel, type of energy technologies present in the household and the frequency of their use, and energy preferences for preparing specific foods. In order to collect quantifiable data about frequency and preference, I asked the subjects to rank them on a defined scale.

Table 2. Summary of questions asked in semi-structured interviews.

Household Information
Number of household members
Age of household members
Electricity present in home
Fuel collection information
Number of household members who collect fuel
Amount of fuel collected by different household members
Number of household members who collect fuel during normal trip
Time spent on fuel collection
Number of fuel collection trips per week/month
Fuel and technology preference and use
Which energy sources are preferred for cooking specific foods
Which energy sources are most frequently used for cooking specific foods
Which technologies are preferred for cooking specific foods
Which technologies are most frequently used for cooking specific foods
Rate of fuel consumption
How much biomass fuel does this household use per week/month
How much butane fuel does this household use per week/month

Utilizing this interview guide, I conducted the semi-structured interviews in each of the 31 households over a ten-week period. The interview setting was much the same as

it was for the unstructured interviews. The interviews were conducted in the kitchen of the subject household, again often while the women were going about their chores. In order to determine quantity of biomass fuel consumed I utilized a hanging scale to weigh what the women described as a normal biomass bundle. A summary of the data is shown in the appendix.

Data Analysis

Data were partially evaluated in the study area and partially after I returned to Michigan Tech. While in the study area I organized my field notes and qualitative data in a series of topics and quantitative data into a spreadsheet. After my return to Michigan Tech, I conducted a comprehensive analysis of the data.

I analyzed the quantitative data collected through my semi-structured interviews with the SAS program to calculate the correlation coefficient. The Pearson correlation coefficient r measures the variance between two variables and r^2 represents the proportion of variance in one variable that can be explained by the variability of the other. The correlation values range from –1 to +1. A negative correlation indicates that as the value of one variable increases, the value of the other variable decreases, whereas a positive correlation indicates that as the value of one variable increases the other variable also increases. A correlation of 0 indicates there is no linear relationship between the variables (Snedecor and Cochran, 1989; Steel and Torrie 1960). I used a significant value of .10 in order to ensure 90% or greater confidence in the correlation values. Correlation variables are listed in Table 3. Results are listed in the appendix and discussed in the following chapter.

Table 3. Correlation Variables

Variable	Unit
Section of Village	upper section = 1, lower section = 2
Household Members	
Men	number present in household
Boys	
Women	
Girls	
Elders	
Infants	
Total People	
Women Biomass Collectors	
Girl Biomass Collectors	
Total Biomass Collectors	
Fuels Preferred for Cooking	
Fuel Preferred for Bread	biomass = 1, butane = 2
Fuel Preferred for Couscous	
Fuel Preferred for *Duez*	
Fuel Preferred for Lentils	
Fuel Preferred for Rice	
Fuel Preferred for Pasta	
Fuel Preferred for Soup	
Fuel Preferred for Tea	
Fuel Preferred for Bath Water	
Fuels Used for Cooking	
Fuel Used for Bread	biomass = 1, butane = 2
Fuel Used for Couscous	
Fuel Used for *Duez*	
Fuel Used for Lentils	
Fuel Used for Rice	
Fuel Used for Pasta	
Fuel Used for Soup	
Fuel Used for Tea	
Fuel Used for Bath Water	

table continues on following page

Table 3. (cont.) Correlation Variables

Variable	Unit
Hearth Technologies: Presence and Frequency of Use	
Traditional Stove	1 – 5 by frequency of use; 5 = most frequent or daily use, 1 = technology present but infrequently used and 0 = technology not present in household
Improved Biomass Stove	
Single-burner Butane Stove	
Multi-burner Butane Stove	
Household Butane Oven	
Communal Butane Oven	
Electricity	electricity present in household = 1, electricity not present in household = 0
Butane Acquisition	
Total Butane Cost per Month	Moroccan dirhams (1 dh = US $0.10),
Total Butane Cost per Month per Person	Moroccan dirhams (elderly and infants = 1/2 person)
Butane Consumption	
Small Butane Cylinders consumed per Month	number consumed
Large Butane Cylinders consumed per Month	number consumed
Total Butane consumed per Month	kg
Total Butane consumed per Month per Person	kg / household member (elderly and infants = 1/2 person)
Biomass Acquisition	
Number of Collectors per Trip	number collectors
Biomass Collection Trips per Month	number trips
Total Collection Labor-hours per Month	number hours
Problem with Forest Guardian	1 = problem indicted, 2 = no problem indicted
Problem with Distance	
Problem with Fighting	
Biomass Consumption	
Biomass Bundles Consumed per Month	number bundles consumed
Average Bundle Weight	kg
Total Biomass Consumed per Month	kg / month
Total Biomass Consumed per Month per Person	kg / month / household member (elderly and infants = 1/2 person)

Chapter 6: Results and Discussion

Hearth fuel acquisition and use are interrelated parts of each family's domestic energy scheme. A household's capacity to use hearth fuel is based on its capacity first to acquire the fuel. Likewise, the household's necessity and motivation to acquire hearth fuel is a function of its level of fuel use. However, to the extent that hearth fuel acquisition and hearth fuel use are separate and different processes, the factors associated with them are separate and different. By examining the processes of hearth fuel acquisition and use separately, one can more clearly determine the individual factors that influence the overall domestic energy scheme of Ouanskra's households.

Although all of Ouanskra's households are subject to the same basic factors influencing the hearth fuel acquisition and use, each family experiences those factors as they relate to the specific economic and cultural variables present in each household. The constraints that limit the efficiency and productivity of hearth fuel acquisition and use are issues that the residents of Ouanskra, and especially the female residents, manage every day.

Women bear the responsibility of ensuring sufficient biomass fuel for their families, but it is girls (non-adult females) who perform much of the community's fuel labor. As most families include two married couples and their children, there is more variability in the number of girls present in a household than there is for women. The variability in number of girls present in a household is the most significant factor influencing a household's potential to acquire biomass fuel.

In this chapter I will describe the factors associated with hearth fuel acquisition and use. First, I will focus on those factors that are associated with acquiring hearth fuel. Next, I will discuss those factors associated with using hearth fuel. Then, I will discuss the factors associated with using hearth energy technologies. Finally, I will summarize the information and describe how the different factors associated with the hearth fuel acquisition and use and hearth energy technologies relate to household's holistic hearth energy scheme.

Factors associated with hearth fuel acquisition

Ouanskra's households invest an estimated 1587 total labor-hours per month collecting biomass fuel. This represents an average of 51.19 labor-hours per household, 13.33 labor-hours per biomass collector (women and girls), and 5.45 labor-hours per community member each month. They invest an estimated total of 1223 dirhams (US$ 122.25) in purchasing butane fuel each month. This represents an average of 39.45 dirhams (US$ 3.95) per household, and 4.2 dirhams (US$ 0.42) per community member each month.

However, these averages do not truly represent the fuel acquisition behavior of individual households. Families in Ouanskra invest household resources in hearth fuel acquisition based on the economic potential within individual households. A household's economic potential for fuel acquisition is the availability of specific resource inputs necessary to acquire a specific hearth fuel type. Biomass fuel is acquired through the input of women's and girl's labor into the collection process. Butane fuel is acquired through the expenditure of cash at market. The availability of these resources is specific

to each household and a shortage in those resources can result in problems associated with fuel acquisition.

In Ouanskra, the number of potential biomass fuel collectors per household is the sum of the number of women and girls present in that household (excluding elderly and infant females). Among households, there is more variation in the number of girls present than there is for women. There is a 0.55 correlation ($p < .01$) between the number of women present in a household and the total number of biomass collectors present in a household. The correlation between the number of girls present in a household and the number of total biomass collectors is 0.93 ($p < .01$). This indicates that the relationship between number of girls and total biomass collectors is more direct than that of women and total biomass collectors.

Households that consume more fuel, both biomass and butane, invest more resources in acquiring the fuel. There is a 0.88 correlation ($p < .01$) between biomass collection hours per month and total biomass consumed per person per month indicating that households that use more biomass per household member invest more labor-hours into the collection process. Likewise, a 0.63 correlation ($p < .01$) between household expenditure on butane per month and total butane consumed per person per month indicates that those households that use more butane fuel per person invest more money into purchasing the fuel.

Households with more labor available to collect biomass fuel generally invest more labor-hours in the collection process. There is a 0.65 correlation ($p < .01$) between the number of total biomass collectors per household and number of biomass collection hours per month per household. Female labor is a prerequisite to biomass fuel collection.

The more female labor within a household, the greater the potential to collect and therefore utilize biomass fuel.

Within households, the number of labor hours invested in fuel collection per month has a more direct relationship with the number of girl biomass collectors than with the number of women biomass collectors. There is a 0.58 correlation ($p < .01$) between collection hours per month and number of girl biomass collectors, while the correlation between collection hours per month and women is only 0.44, ($p = .01$). This indicates that the number of girls in a household has more influence on the labor input into collecting biomass fuel that does the number of women

Households with more fuel collection labor available also generally invest less money into purchasing butane fuel. There is a –0.32 correlation ($p = .08$) between the number of household biomass collectors and household monthly expenditure on butane per person. This is consistent with information I gained through informal interviews with people in the village. One man told me that, because he had no daughters to help his wife collect biomass fuel, it was necessary for him to spend a lot of money on butane. He told me that sons were very good, but that daughters were important too, especially for helping their mothers, and that he hoped to have daughters in the future.

With regard to butane fuel acquisition, my data also indicate that wealth is a determining factor. There is a –0.69 correlation ($p < .01$) between section of village and total butane cost per month per household. This indicates that households in the upper, wealthier section of the village generally invest more cash into acquiring butane fuel than those households in the lower, poorer section of the village.

Households with more infants spend more money on butane fuel. There is a 0.35 correlation ($p = .05$) between the number of infants in a household and the total amount of money spent on butane per month. One particularly small family composed only of one adult male, one adult female and a newborn girl used almost exclusively butane fuel, supplementing it only occasionally with biomass that was given to the family by other villagers. The woman told me that before she became pregnant she cooked about half her food with butane and the other half (mostly bread) with biomass fuel. Since the birth of her child, it was necessary for her to stay at home with her baby, preventing her from going out to collect fuel.

Households with more biomass fuel collectors were less likely to indicate distance as a problem associated with biomass fuel collection. There is a –0.41 correlation ($p = .02$) between the number of biomass collectors per household and the interview subject's indication of distance to fuel collection area as a problem. While there is no significant correlation between the number of women (adult females) and the indication of distance to collection areas as a problem, there is a –0.49 correlation ($p < .01$) with the number of girl (non-adult females) biomass collectors and the indication of distance as a problem.

The negative correlation between girl biomass collectors and citing distance as a problem associated with biomass collection suggests that women are less likely to perceive distance to collection areas as significant if there are girls in the household to whom the task of collection may be delegated. This theory is supported by information I gained through unstructured interviews. A woman with a large family told me that she had no problems acquiring enough *ifskan* because she had plenty of girls to help her and the other woman living in the household. This woman had three daughters and another

woman living in the household had a daughter as well, providing a labor pool of six potential biomass fuel collectors.

Factors associated with hearth fuel use

Each month, Ouanskra's households consume an estimated total of 5697 kg of biomass fuel. This represents an average of 183.77 kg per household, or 19.58 kg per community member, per month. The village also consumes an estimated total of 213 kg of butane fuel each month. This represents an average of 6.87 kg butane fuel consumed per household, or 0.73 kg per person, per month.

As with hearth fuel acquisition, these numbers represent only averages and do not describe how individual households experience fuel use in Ouanskra. Households make decisions regarding the use of hearth fuels based on the combination of economic and cultural values associated with specific fuel types. The system through which these decisions are made and how these values are expressed at the individual household level is not a fixed process, but one that is dynamic and subject to the influences of economic and cultural factors both inside and outside the household.

The total fuel quantities listed at the beginning of this section do not include the amount of butane used by a newly introduced communal oven located in the lower section of the village. At the time of my interviews, use of the communal butane oven was still in its trial stages. As a management system for the oven was still in the planning stages, there was no accurate way to measure the amount of fuel used per household.

My data suggest that households in the upper section (Section 1) of the village use both more butane fuel and more biomass fuel than the lower section households (Section

2). There is a –0.31 correlation ($p = .08$) between village section and biomass consumption per household member and a –0.56 correlation ($p < .01$) between village section and butane consumption per household member.

However, because the data include only those fuels used within the household, and not the fuel used by the communal bread oven, it should be interpreted carefully. There is a 0.44 correlation ($p = .01$) between fuel use for baking bread and village section. This indicates that the use of butane for baking bread occurs primarily in the lower section households. There is a 0.73 correlation ($p = < 0.1$) between village section and use of the communal bread oven, indicating that lower-section village households are the primarily users of the communal butane oven. This is what one would expect given that only households in the lower section of the village have access to the communal oven. There is, however, no significant correlation between village section and use of conventional household butane ovens. Collectively, this suggests that the use of butane for baking in the lower section of the village is primarily with the communal oven.

The preference and use of fuels for baking bread is significant because bread is a dietary staple in Ouanskra and is served with virtually all meals (with the exception of meals with couscous). Through participant observation and informal interviews, I learned that baking bread was the single greatest hearth-fuel-using activity in Ouanskra. Bread is prepared several times every day, typically in the morning for breakfast, mid-morning and mid-day meals and then again in the afternoon for mid-afternoon and evening meals.

In the upper section of the village, biomass fuel is generally preferred for baking bread over butane fuel. There is a 0.41 correlation ($p = .02$) between fuel preference for baking bread and village section. This, along with the aforementioned 0.44 correlation (p

= .01) between fuel use for baking bread and village section, suggest that households in the upper section of the village both prefer and use biomass fuel for cooking bread.

During an informal interview, two women from the upper section of the village told me that they used biomass almost exclusively to bake bread and butane for other types of food preparation. They said that fuel type was most important with bread, both because of the way it is cooked and the amount of bread they consumed daily.

Traditionally, bread is baked in large (approx. 45 cm diameter), flat rounds on a broad, flat earthenware dish atop the cook stove. Because the dish is open, smoke from the cooking fire affects the flavor of the bread. Also the cooking surface area produced by a biomass fire is larger than that of a single burner butane cooking fire. Because of this, a biomass fire cooks bread more quickly and more evenly than butane fire.

The women also told me that bread baked on a biomass fire is higher quality, in terms of both flavor and nourishment. They also believed that bread prepared with biomass fuel stays fresh longer than bread prepared with butane fuel. The women said that these qualities were especially important because they eat so much bread.

Women in the lower section agreed that biomass fuel produces superior bread, but said the labor-saving value of the communal oven outweighed the loss of bread quality. When asked if this was also the case for household butane ovens, the women said that standard household ovens use too much fuel and were thus too costly. At the time of the survey, the communal oven was using fuel that was supplied with the oven at no cost to the villagers. It remains to be seen if the communal oven will prove efficient enough to warrant its use over that of traditional biomass stoves.

Another significant association between fuel preference and fuel use is found in tea preparation. Within the village as a whole, there is a 1.00 correlation ($p < .01$) between fuel preference and fuel use for preparing tea. Eleven respondents gave biomass as their preferred fuel for tea preparation, while 20 indicated butane. All households use the fuel that they prefer for tea preparation.

One woman said that butane is superior for tea preparation because tea is often prepared quickly, for unexpected guests or when men return from working in the fields. She said that using butane was faster, because it was not necessary to spend time preparing a biomass fire. Another woman told me that butane was used most frequently because men often prepare tea for guests (or allow guests to prepare it) and typically do so in a room other than the kitchen. She said it is easier for men to move a butane cylinder to a room where guests are being served, than it is to put hot coals into a *mijmar*, or clay brazier, and move it. One woman who indicated biomass as the preferred and most frequently used fuel for tea preparation said her husband preferred it because it was more traditional and (in his view) less costly.

These examples suggest that gender influences fuel use and preference with regard to tea. Men are typically the primary decision makers within a household and they make decisions regarding their personal fuel use according to their personal preferences. There is a –0.79 correlation ($p < .01$) between fuel preference for tea preparation and number of biomass collectors. This indicates that households with more biomass collectors are more likely to prefer biomass for preparing tea. It also suggests the fuel preferences for those preparing tea, oftentimes men, are influenced by the availability of

biomass fuel. Where men perceive a greater availability of biomass fuel, they are more likely to use it for tea preparation.

For the preparation of some food types, there is little variability in the types of fuels preferred or flexibility in the types of fuels used. For preparing couscous, all subjects indicated a preference using biomass fuel, which all but two said they normally used to prepare the food. Women told me biomass was preferred because the flame area is larger and it cooks faster than butane. For preparing *duez*, the stew-type dish made with potatoes, onions and sometimes vegetables and meat if available, nineteen out of a total of 31 subjects claim to prefer using butane, but all subjects gave butane as the fuel type they normally use.

One woman said she prefers biomass fuel for cooking *duez* because it makes better food, but uses butane because of the long cooking time involved. She said that *duez* often requires cooking for an hour or more and would consume too much biomass fuel. Also, she said, *duez* cooking on butane can be left unattended because it is not necessary to add fuel, as it is with a biomass fire. This allows her to do other things while the *duez* is cooking. A woman who both preferred and used butane for cooking *duez* said it was better because it was easier to adjust the flame for a slow simmer.

Women told me that some foods cooked at medium to high temperatures for short to medium durations can be prepared using either biomass or butane fuel. The data indicate that there is nearly even split among households for fuel preference for cooking lentils, rice and soup. However, there are discrepancies between fuel preference and fuel use. There is a –0.39 correlation ($p = .02$) between fuel preference and fuel use for cooking lentils, a –0.36 correlation ($p = .04$) between fuel preference and fuel use for

cooking rice, and a –0.42 correlation ($p = .02$) between fuel preference and fuel use for cooking soup. This suggests that these foods are most frequently prepared with the fuel type that is not preferred.

Because these foods have a greater degree of flexibility in their cooking requirements, these are the food types for which women often substitute less preferred fuel types for those that they would prefer to use. A woman from an upper section household told me that she prefers cooking lentils and rice with biomass fuel because biomass fuel is "free", but usually uses butane fuel because she saves biomass fuel for baking bread. A woman from a lower section household told me she prefers to cook everything other than bread and couscous with butane fuel because she does not have to tend the cooking fire, which allows her to do other work while the soup cooks. She went on to tell me, however, that she rations most of her weekly supply of butane fuel for cooking *duez* and tea, and uses only a small portion for other foods such as rice, lentils and soup.

Hearth energy technologies

In Ouanskra, hearth energy technologies are the means by which hearth fuels are utilized. Like hearth fuels, these technologies are fundamental components to each household's domestic energy scheme in that they are essential to the cooking process. All hearth energy technologies currently used in Ouanskra burn specifically either biomass or butane fuel, but not both. Because no hearth energy technologies are produced locally, they are all acquired through the expenditure of cash in a market setting. Like butane fuel, hearth energy technologies require the investment of money. Also, like the purchase

of butane fuel, men are the primary decision makers with regard to acquiring hearth energy technologies. However, unlike fuel, hearth technologies are permanent fixtures once acquired. As a result of this, the technologies are acquired relatively infrequently compared to the fuels they burn.

There is a significant variety in the technologies used in Ouanskra. The hearth technologies present in and used by Ouanskra's households represent the application of different cultural and economic values similar to those that influence choices regarding fuel use. Some, but not all, of these technologies have been shown to be appropriate for the community and improve the efficiency of household hearth energy schemes.

Some hearth energy types are virtually universal in that they are found in all of Ouanskra's households. Each home owns a least one traditional stove and at least one single-burner butane stove. These two hearth energy technologies form the basis for all cooking. Other types of technologies have been added to individual households in efforts to enhance the efficiency of hearth energy use.

Households that consume more biomass fuel are more likely to use improved biomass stoves (Figure 12). There is a 0.38 correlation ($p = .04$) between use of an improved biomass stove and biomass fuel consumption per person. Likewise, households that invest more labor into collecting biomass fuel are more likely to use improved biomass stoves. There is a 0.52 correlation ($p < .01$) between the use of an improved biomass stove and total collection hours per month.

It is logical that households using more biomass would have more use for an improved biomass stove. However, from my informal and unstructured interviews I

learned that improved biomass stoves were not really an improvement over the traditional variety. The improved stoves had been introduced to the village by a program promoted

Figure 13. Ouanskra children with improved biomass stove

by the national park in an effort to conserve park resources by increasing the efficiency of hearth fuel use. Twenty-one households purchased the stoves. But many women told me that the improved stoves were actually less efficient. They said they use more fuel than the traditional stoves. I found few households that used them regularly. Those households that did use the improved stoves regularly did so as substitution for traditional stoves. One woman used her improved stove temporarily because her traditional stove was

broken. Another used her improved stove as a secondary cooking surface, used only when the traditional stove was already occupied.

Households that use more butane fuel are more likely to use multi-burner butane stoves. There is a 0.80 correlation ($p < .01$) between butane consumption per month per person and the use of multi-burner butane stoves. Like the improved biomass stoves, one would expect that households using more butane would have more use for multi-burner butane stoves. As greater butane consumption is associated with the wealthier section of the village, so are multi-burner butane stoves. There is a –0.54 correlation ($p < .01$) between village section and use of multi-burner butane stoves. Multi-burner butane stoves use the large (12 kg) butane cylinders, and both the stoves and the cylinders require a significant cash investment.

Households that have less labor available to collect biomass fuel are more likely to use standard butane ovens. There is a –0.55 correlation ($p < .01$) between the number of biomass collectors and the use of standard butane ovens. Households that use standard butane ovens invest less time into the collection process. There is a –0.35 correlation ($p = .05$) between biomass collection hours per month and the use of standard butane ovens. Households that use standard butane ovens invest more money in butane fuel per person. There is a 0.70 correlation ($p < .01$) between household expenditure on butane per month and the use of standard butane ovens.

Standard butane ovens are used relatively infrequently in Ouanskra. Like multi-burner butane stoves, they require large (12 kg) butane cylinders. Also like the multi-burner butane stoves, the investment into purchasing standard butane ovens and the large butane cylinders is significant by village standards. However, where multi-burner butane

stoves use fuel at a level of efficiency equal to that of single-burner butane stoves, the standard butane oven is not generally perceived to be as efficient as traditional stoves. The households that used standard butane ovens said they did so because they did not have enough people (women and girls) in the household to collect biomass fuel.

The manner in which bread is baked in Berber villages in the Central High Atlas depends on local custom. The fact that Ouanskra and other villages in the upper Imnane Valley bake bread in flat rounds means that households can potentially prepare bread with either stove or oven technologies, using either biomass or butane fuels. This gives households a greater degree of flexibility in the manner in which they produce an important dietary staple.

In many traditional Berber communities in the region, bread is virtually never baked with butane fuel. A common type of bread prepared in these communities is called *tanoort*, which is made by pressing the bread dough onto the inside of the traditional stove (Figures 13 and 14). With this method of preparation, a traditional biomass stove is required and it would be extremely difficult to encourage the substitution of butane ovens for biomass stoves.

The flexibility in fuels and technologies available to Ouanskra's method of bread preparation indicates that they have the potential to benefit from the communal butane oven that was introduced to the village at the time of my interviews. It was this flexibility that prompted the villagers to request the oven. Although villagers in the lower section of the village expressed approval of the oven, at the time of the survey it was too soon to evaluate its real efficiency.

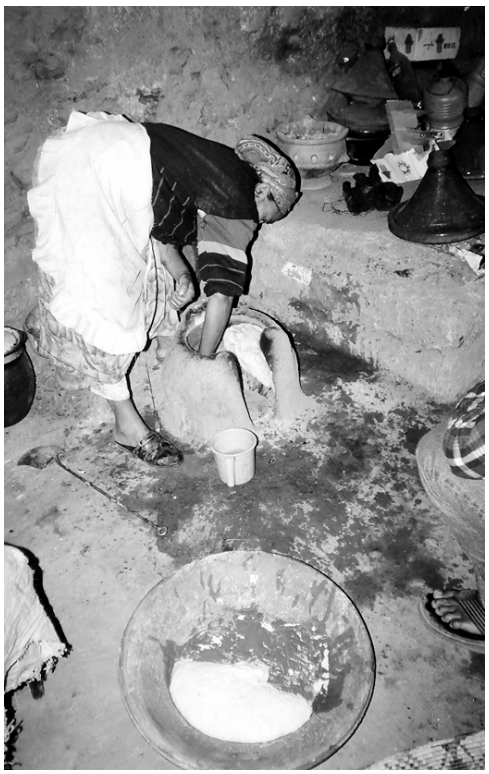

Figure 14.

Berber woman preparing *tanoort* bread in traditional stove

Figure 15.

Berber woman with finished *tanoort*

Summary

All of Ouanskra's households invest resources into fuel acquisition. Those households that consume more fuel must invest more resources in acquiring fuel. Female labor forms the foundation for domestic energy acquisition. When there is more female labor available, more is invested into collecting biomass fuel and less money is invested into purchasing butane fuel. Both gender and age are significant to the collection biomass fuel. Women delegate fuel collection labor to girls in the household. Because the number of girls varies more from household to household than does the number of women, the

number of girls living in a household has a more direct relationship to the total number of biomass collectors available than does the number of women living in a household. Also, the total hours invested in fuel collection labor has a more direct relationship to the number of girls available to collect biomass fuel than the number of women. Women are more likely to perceive problems with the distance to fuel collection areas when there are fewer girls in the household to help them collect fuel. Wealthier households invest more money into acquiring butane fuel, which gives them more options for fuel use. When there are infants to be cared for, women must reallocate fuel collection labor-hours to childcare and substitute butane fuel for biomass fuel. As a result, families with more infants spend more money on butane.

For the preparation of some foods, village households typically use the fuels they prefer. Bread and tea are the dietary staples in Ouanskra and a high cultural value is placed on their method of preparation. Women typically use their preferred fuel type for bread, while men often prepare tea and make decisions about fuel use based on their preferences. For some foods such as *duez* and couscous, all households typically use a certain fuel type. For reasons specific to the preparation of some foods, there are limited flexibility in fuel types that can be used to prepare them. For other foods, such as lentils, rice and soup, there is a greater degree of flexibility in the fuels that can be used. For these foods households often substitute less preferred for more preferred fuel types in order to conserve the more preferred fuel types for other cooking activities. Such fuel substitutions represent efforts by households to economize on resource inputs that go into fuel acquisition. When there is a shortage of fuel collection labor, biomass fuel is

substituted for butane fuel. When money is in short supply, biomass fuel is substituted for butane.

Hearth energy technologies represent both the fundamental means by which hearth fuels are used and efforts by households to economize their fuel use. A household that consumes a greater amount of a fuel type is more likely to invest in a hearth technology using that fuel type. Methods of food preparation are part of the community's local culture, and these methods can influence which technologies are appropriate to the community. Some alternative technologies have the potential for being more efficient, such as the communal butane oven. Others, such as multi-burner stoves, may facilitate the cooking process but use the same amount of fuel as the standard variety. Still other alternative technologies may prove to be less efficient than the traditional version, such as the "improved" metal stoves.

Chapter 7: Conclusions and Recommendations

Research Conclusions

The village of Ouanskra is experiencing a biomass fuel shortage. Individual households manage the shortage by implementing coping strategies that increase the amount of labor invested into fuel collection, substitute commercial non-biomass fuels for the traditionally free biomass fuels, and economize on fuel consumption. Households delegate biomass fuel collection to girls in order to increase the amount of fuel collection labor available. As a result of complete deforestation, there has been a community wide shift from high-quality wood fuel to the lower quality *ifskan*. Households with more money purchase more butane to substitute for biomass fuel. Virtually all households have economized on biomass fuel use by cutting back on the fuel used in "non-essential" activities such as heating living space and water for laundry.

Brouwer *et al.* (1997) caution against using these coping strategies as indicators of biomass fuel shortages and argue that limited observations are no substitute for substantive research and detailed data. One may conclude that, through meaningful dialog with community members, an understanding of households' capacity to acquire and utilize hearth fuels is the most significant indicator of relative abundance and shortage of these fuels at the community level. My experience as a Peace Corps Volunteer in Ouanskra afforded me the opportunity to know the community and individual households at an intimate level and thus gave me the capacity to understand the domestic energy issues at work in the community. From my research the following conclusions can be drawn.

The significance of the current biomass fuel shortage is relative to the resources available in each household. To the extent that labor can be exchanged for biomass fuel at the household level, a shortage of labor leads to a shortage of biomass fuel. Female labor is the foundation for each household's domestic energy schemes. It is the relative abundance or scarcity of female labor that determines how many hearth fuel acquisition and use decisions are made.

The total number of females able to collect fuel represents a household's capacity to collect biomass fuel. This total is composed of all female household members with the exception of infants and elders. In Ounanskra, the number of women per household is generally constant, while there is significant variation in the number of girls per household. Because the number of girls varies more from household to household than does the number of women, it is the number of girls within a household that most directly influences a household's capacity to acquire and thus utilize biomass fuel.

Women are more likely to perceive the distance to *ifskan* fuel collection areas as a problem when there are fewer girls available to help with fuel collection. This indicates that the labor of girls is utilized to overcome the scarcity of fuel resources. By increasing the fuel collection labor of women and girls, these individuals must sacrifice other time and energy consuming activities. Girls, in particular, must sacrifice time that might otherwise be spent at school.

Fuel use decisions are based on a combination of economic and cultural value systems. Economic value systems represent households' understanding of their available resources and the manner in which they make rational decisions to maximize the efficiency of those resources. There is an inverse relationship between the amount of

female labor available to collect biomass fuel and the amount of money spent on butane fuel. Households with less fuel collection labor spend more money on butane. However, all households purchase and use butane fuel to some degree. While households choose between butane and biomass for certain food types based on their available resources of cash and labor, other foods are typically prepared with a particular fuel type by all households. This indicates that butane functions both as a substitute and a complementary fuel.

Cultural value systems represent those values significant to households for reasons that are not specifically economic. Like economic values, cultural values are representations of what households view as important and are thus essentially equal in significance to economic values. Cultural values are important in the preparation and consumption of food and influence preferences regarding the way hearth fuels are used. For foods that are consumed more frequently, such as bread and tea, these values are more significant and fuel use more likely to correlate with fuel preference. Women prepare bread based on their fuel preferences, while men make fuel use decisions regarding tea based on which fuels they prefer to use.

There are both significant similarities and fundamental differences between hearth fuels and the hearth energy technologies that use them. Like hearth fuels, hearth energy technologies are essential components to a household's overall subsistence scheme. Unlike hearth fuels, there is no shortage associated with hearth energy technologies. Households that use more of a fuel type are more likely to own and use a specific hearth energy technology that utilizes that fuel type. While some hearth energy technologies are potentially more fuel-efficient than their standard counterpart, others may facilitate the

cooking process but offer no added fuel-efficiency, while still others may be less fuel-efficient.

There is no specific set of indicators that can be applied to all communities realistically in order to determine whether or not there is a biomass fuel shortage. One reason for this may be that all communities are different and will respond to resource scarcity in different ways. Another reason may be that communities experience fuel wood shortages indirectly, through people and families. It is the experiences and perceptions of individual households that better explain how biomass fuels are acquired, used and what problems may be associated with that acquisition and use. Through examining these experiences and perceptions in Ouanskra's individual households, we can understand the general trends regarding hearth energy acquisition and use for the community as a whole.

The community of Ouanskra is experiencing a biomass fuel shortage and each household experiences that shortage differently and in context of the resources that it has available to manage the shortage. Biomass fuel becomes increasingly scarce with increased collection. In order to account for this scarcity households must either invest more labor to gather fuel, substitute butane for biomass fuel, or economize fuel use. Most households implement some combination of all three coping strategies. Because households have no direct and immediate way of increasing the availability of biomass fuel, they must instead manage other resources that can be used to overcome the scarcity of biomass.

To the extent that labor is used to acquire fuel, this study supports the notion that fuel shortages are labor shortages. My research indicates that the amount of biomass fuel consumed has a direct relationship to the amount of biomass fuel collectors within a

household. Moreover, the of number girls within a household has the most significant impact on the total number of biomass fuel collectors, which in essence determines a household's ability to collect fuel.

This study also demonstrates that Ouanskra's households are implementing standard coping strategies to manage the shortage of biomass fuel and collection labor. The substitution of butane for biomass as a coping strategy is likely to increase with diminishing biomass fuel availability. Families switch between biomass and butane fuel in efforts to manage their resources of cash and labor. If the two fuels become equal in their significance to a household's hearth energy scheme, then the resources necessary to acquire them will also become equal in significance. If butane becomes as important as biomass, then coping strategies to manage cash shortages will become equal in significance to those used to manage the current biomass fuel collection labor shortage.

Recommendations

Recommendations for Further Community Projects

Farmers in Ouanskra are experienced in different agroforestry techniques. During my time there, men expressed a great deal of interest in incorporating additional trees into their farm systems. They understand the value of trees that yield biomass for fuel and fodder, as those that produce a cash crop. Ouanskra's households are limited in their ability to incorporate greater numbers of trees into their farm systems by a lack of both financial resources and social organization. Future community projects assisting the village in accessing and mobilizing the financial and social resources necessary to plant

more trees would increase the community's potential to generate both biomass fuel and money from cash crops.

Recommendations for Further Study

My foremost recommendation is for a follow-up study to assess the efficiency of the fuel-efficient communal butane oven. Although initial responses were positive, the oven had not been in place long enough to determine if it was truly efficient or would function communally. A further study evaluating its use in the community should be used to determine if it is technology that is appropriate to meet the current fuel shortage and if additional ovens like it would be beneficial.

Also, I recommend that a study be conducted comparing hearth fuel use and acquisition in Ouanskra to hearth fuel behavior in similar communities with different levels of biomass fuel resources available. Within the Central High Atlas region there is a great deal of variation in the amount of biomass fuel resources available to different communities. This variation may be most significant between different valleys, which function as distinct natural and social environments. By comparing fuel use behavior in Ouanskra to that in communities with different levels of biomass fuel availability, we may be able to understand better to what degree fuel use behaviors are associated with household's efforts to manage biomass fuel scarcity

Final Thoughts

The villagers of Ouanskra are industrious, hard-working, and motivated people. Given their situation, I believe they are doing an excellent job of managing their local

resources. Beyond this, individual households have capacities and resources that are not readily apparent, such as the social and family networks that extend beyond the community. It is my belief that they have not exhausted their potential to adapt to the increasing biomass fuel shortage. However, the present biomass fuel shortage does detract from the well-being of the community, its households, and their residents. Any solutions that can relieve the burden imposed by this fuel shortage have the potential to increase the overall quality of life of community members.

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APPENDIX

Results of Data Correlation Analysis

Variable	N	Mean	StdDev	Sum	Minimum	Maximum
section	31	1.67742	0.47519	52.00000	1.00000	2.00000
men	31	1.87097	0.67042	58.00000	1.00000	3.00000
boys	31	2.32258	1.53595	72.00000	0.0	6.00000
women	31	1.87097	0.49946	58.00000	1.00000	3.00000
girls	31	1.96774	1.16859	61.00000	0.0	4.00000
elders	31	0.54839	0.72290	17.00000	0.0	2.00000
infants	31	0.80645	0.79244	25.00000	0.0	2.00000
ttlpeopl	31	9.38710	2.36188	291.00000	3.00000	13.0000
womenbio	31	1.87097	0.49946	58.00000	1.00000	3.00000
girlsbio	31	1.96774	1.16859	61.00000	0.0	4.00000
totalbio	31	3.83871	1.36862	119.00000	1.00000	6.00000
breadp	31	1.25806	0.44480	39.00000	1.00000	2.00000
cousp	31	1.00000	0.0	31.00000	1.00000	1.00000
duezp	31	1.61290	0.49514	50.00000	1.00000	2.00000
lentilp	31	1.67742	0.47519	52.00000	1.00000	2.00000
ricep	31	1.67742	0.47519	52.00000	1.00000	2.00000
pastap	31	1.48387	0.50800	46.00000	1.00000	2.00000
soupp	31	1.48387	0.50800	46.00000	1.00000	2.00000
teap	31	1.64516	0.48637	51.00000	1.00000	2.00000
bathp	31	1.90323	0.30054	59.00000	1.00000	2.00000
breadu	31	1.29032	0.46141	40.00000	1.00000	2.00000
cousu	31	1.06452	0.24973	33.00000	1.00000	2.00000
duezu	31	2.00000	0.0	62.00000	2.00000	2.00000
lentilu	31	1.51613	0.50800	47.00000	1.00000	2.00000
riceu	31	1.64516	0.48637	51.00000	1.00000	2.00000
pastau	31	1.25806	0.44480	39.00000	1.00000	2.00000
soupu	31	1.16129	0.37388	36.00000	1.00000	2.00000
teau	31	1.64516	0.48637	51.00000	1.00000	2.00000
bathu	31	1.38710	0.49514	43.00000	1.00000	2.00000
tcstove	31	5.00000	0.0	155.00000	5.00000	5.00000
imc	31	0.93548	1.03071	29.00000	0.0	5.00000
butsing	31	5.00000	0.0	155.00000	5.00000	5.00000
butmult	31	1.29032	2.22401	40.00000	0.0	5.00000
butoven	31	0.32258	1.24866	10.00000	0.0	5.00000
commoven	31	1.96774	1.88828	61.00000	0.0	5.00000
electcty	31	0.38710	0.49514	12.00000	0.0	1.00000
nbuts	31	1.45161	0.50588	45.00000	1.00000	2.50000
nbutsper	31	0.19935	0.14841	6.18000	0.08000	0.91000
nbutl	31	0.20968	0.38241	6.50000	0.0	1.00000
nbutlper	31	0.02774	0.05445	0.86000	0.0	0.23000
btmnth	31	12.50000	10.91635	387.50000	5.00000	35.0000
butmntpr	31	0.60032	0.48305	18.61000	0.14000	1.97000
butcost	31	39.43548	28.35158	1223	18.50000	97.0000
btcstper	31	5.33774	5.49427	165.47000	1.52000	30.4500
bndlpmth	31	14.72581	7.82394	456.50000	1.50000	26.0000
bndlwght	31	12.56452	0.70406	389.50000	11.00000	14.0000
mssbiopr	31	21.07452	8.94769	653.31000	6.00000	33.7500
biocllct	31	1.83871	0.37388	57.00000	1.00000	2.00000
tripsmth	31	8.03226	4.12298	249.00000	1.25000	16.5000
guard	31	0.41935	0.50161	13.00000	0.0	1.00000
distance	31	0.48387	0.50800	15.00000	0.0	1.00000
fight	31	0.12903	0.34078	4.00000	0.0	1.00000
biomnth	31	183.75968	96.40217	5697	0.25000	324.000
collthrs	31	51.20323	27.57042	1587	5.25000	91.0000

	section	men	boys	Women	girls	elders	infants	ttlpeopl
section	1.00000	-0.44890	-0.26371	-0.32167	-0.07939	-0.05008	-0.17133	-0.47903
		0.0113	0.1517	0.0776	0.6712	0.7890	0.3568	0.0064
men	-0.44890	1.00000	0.13888	0.64545	0.12215	0.01331	0.13965	0.62202
	0.0113		0.4562	<.0001	0.5127	0.9433	0.4537	0.0002
boys	-0.26371	0.13888	1.00000	-0.07429	-0.23544	-0.07457	-0.00177	0.53412
	0.1517	0.4562		0.6912	0.2023	0.6901	0.9925	0.0020
women	-0.32167	0.64545	-0.07429	1.00000	0.22107	0.11019	0.18746	0.55237
	0.0776	<.0001	0.6912		0.2320	0.5551	0.3126	0.0013
girls	-0.07939	0.12215	-0.23544	0.22107	1.00000	-0.09674	-0.25894	0.30660
	0.6712	0.5127	0.2023	0.2320		0.6047	0.1596	0.0934
elders	-0.05008	0.01331	-0.07457	0.11019	-0.09674	1.00000	0.19146	0.30103
	0.7890	0.9433	0.6901	0.5551	0.6047		0.3022	0.0998
infants	-0.17133	0.13965	-0.00177	0.18746	-0.25894	0.19146	1.00000	0.34413
	0.3568	0.4537	0.9925	0.3126	0.1596	0.3022		0.0580
ttlpeopl	-0.47903	0.62202	0.53412	0.55237	0.30660	0.30103	0.34413	1.00000
	0.0064	0.0002	0.0020	0.0013	0.0934	0.0998	0.0580	
womenbio	-0.32167	0.64545	-0.07429	1.00000	0.22107	0.11019	0.18746	0.55237
	0.0776	<.0001	0.6912	<.0001	0.2320	0.5551	0.3126	0.0013
girlsbio	-0.07939	0.12215	-0.23544	0.22107	1.00000	-0.09674	-0.25894	0.30660
	0.6712	0.5127	0.2023	0.2320	<.0001	0.6047	0.1596	0.0934
totalbio	-0.18518	0.33985	-0.22814	0.55370	0.93452	-0.04239	-0.15268	0.46337
	0.3186	0.0614	0.2171	0.0012	<.0001	0.8209	0.4122	0.0087
breadp	0.40698	-0.21995	-0.07712	-0.29524	-0.23996	0.06354	-0.13728	-0.32036
	0.0231	0.2345	0.6801	0.1069	0.1935	0.7342	0.4615	0.0789
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	0.01828	0.24618	-0.04949	0.33045	0.66901	-0.22531	-0.11236	0.33192
	0.9222	0.1819	0.7915	0.0694	<.0001	0.2230	0.5473	0.0681
lentilp	-0.32857	0.38815	-0.12670	0.38056	0.40083	-0.14712	0.00571	0.26347
	0.0711	0.0309	0.4970	0.0347	0.0254	0.4297	0.9757	0.1521

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
section	-0.32167	-0.07939	-0.18518	0.40698	.	0.01828	-0.32857	-0.18095
	0.0776	0.6712	0.3186	0.0231	.	0.9222	0.0711	0.3300
men	0.64545	0.12215	0.33985	-0.21995	.	0.24618	0.38815	0.17889
	<.0001	0.5127	0.0614	0.2345	.	0.1819	0.0309	0.3356
boys	-0.07429	-0.23544	-0.22814	-0.07712	.	-0.04949	-0.12670	-0.12670
	0.6912	0.2023	0.2171	0.6801	.	0.7915	0.4970	0.4970
women	1.00000	0.22107	0.55370	-0.29524	.	0.33045	0.38056	0.24012
	<.0001	0.2320	0.0012	0.1069	.	0.0694	0.0347	0.1932
girls	0.22107	1.00000	0.93452	-0.23996	.	0.66901	0.40083	0.34080
	0.2320	<.0001	<.0001	0.1935	.	<.0001	0.0254	0.0606
elders	0.11019	-0.09674	-0.04239	0.06354	.	-0.22531	-0.14712	-0.43823
	0.5551	0.6047	0.8209	0.7342	.	0.2230	0.4297	0.0137
infants	0.18746	-0.25894	-0.15268	-0.13728	.	-0.11236	0.00571	-0.08281
	0.3126	0.1596	0.4122	0.4615	.	0.5473	0.9757	0.6579

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
ttlpeopl	0.55237	0.30660	0.46337	-0.32036	.	0.33192	0.26347	0.02587
	0.0013	0.0934	0.0087	0.0789	.	0.0681	0.1521	0.8901
womenbio	1.00000	0.22107	0.55370	-0.29524	.	0.33045	0.38056	0.24012
		0.2320	0.0012	0.1069	.	0.0694	0.0347	0.1932
girlsbio	0.22107	1.00000	0.93452	-0.23996	.	0.66901	0.40083	0.34080
	0.2320		<.0001	0.1935	.	<.0001	0.0254	0.0606
totalbio	0.55370	0.93452	1.00000	-0.31264	.	0.69182	0.48113	0.37862
	0.0012	<.0001		0.0868	.	<.0001	0.0061	0.0357
breadp	-0.29524	-0.23996	-0.31264	1.00000	.	-0.28806	-0.38154	-0.22384
	0.1069	0.1935	0.0868		.	0.1161	0.0342	0.2261
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	0.33045	0.66901	0.69182	-0.28806	.	1.00000	0.72664	0.58497
	0.0694	<.0001	<.0001	0.1161	.		<.0001	0.0005
lentilp	0.38056	0.40083	0.48113	-0.38154	.	0.72664	1.00000	0.70476
	0.0347	0.0254	0.0061	0.0342	.	<.0001		<.0001

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
section	-0.16036	-0.02227	0.20936	0.24094	0.44137	0.18122	.	0.02227
	0.3888	0.9053	0.2583	0.1917	0.0129	0.3292	.	0.9053
men	0.38518	0.28731	-0.14510	-0.06404	-0.52140	-0.14772	.	-0.18943
	0.0324	0.1171	0.4361	0.7322	0.0026	0.4278	.	0.3074
boys	0.09233	0.09233	0.38143	0.14209	-0.04248	0.11774	.	0.42032
	0.6213	0.6213	0.0342	0.4458	0.8205	0.5282	.	0.0186
women	0.38565	0.25427	-0.33198	-0.08596	-0.55523	0.06897	.	-0.25427
	0.0321	0.1675	0.0681	0.6457	0.0012	0.7124	.	0.1675
girls	0.64483	0.42022	-0.78323	-0.57866	-0.53843	0.12159	.	-0.75713
	<.0001	0.0186	<.0001	0.0006	0.0018	0.5147	.	<.0001
elders	-0.29280	-0.20203	0.09786	0.09899	0.00645	-0.01787	.	0.11127
	0.1099	0.2757	0.6005	0.5963	0.9725	0.9240	.	0.5512
infants	-0.09082	-0.17362	0.07533	0.19866	-0.02353	0.06520	.	0.17362
	0.6271	0.3503	0.6871	0.2840	0.9000	0.7275	.	0.3503
ttlpeopl	0.44988	0.28319	-0.19563	-0.13330	-0.56536	0.12579	.	-0.11650
	0.0111	0.1226	0.2916	0.4747	0.0009	0.5001	.	0.5325
womenbio	0.38565	0.25427	-0.33198	-0.08596	-0.55523	0.06897	.	-0.25427
	0.0321	0.1675	0.0681	0.6457	0.0012	0.7124	.	0.1675
girlsbio	0.64483	0.42022	-0.78323	-0.57866	-0.53843	0.12159	.	-0.75713
	<.0001	0.0186	<.0001	0.0006	0.0018	0.5147	.	<.0001
totalbio	0.69132	0.45160	-0.78990	-0.52545	-0.66236	0.12899	.	-0.73926
	<.0001	0.0108	<.0001	0.0024	<.0001	0.4892	.	<.0001
breadp	-0.42352	-0.27600	0.28331	0.19305	0.75967	-0.15488	.	0.27600
	0.0176	0.1329	0.1225	0.2981	<.0001	0.4054	.	0.1329
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	0.63696	0.50444	-0.45096	-0.26013	-0.51301	0.20870	.	-0.50444
	0.0001	0.0038	0.0109	0.1576	0.0032	0.2599	.	0.0038

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
lentilp	0.39198	0.25390	-0.36754	-0.22588	-0.62282	-0.09967	.	-0.39198
	0.0292	0.1681	0.0419	0.2218	0.0002	0.5937	.	0.0292

	riceu	pastau	soupu	teau	bathu	tcstove	imc	butsing
section	0.06513	-0.38154	-0.07263	0.20936	0.12339	.	-0.24808	.
	0.7278	0.0342	0.6978	0.2583	0.5084	.	0.1784	.
men	-0.14510	-0.10817	-0.31316	-0.14510	-0.34660	.	0.32522	.
	0.4361	0.5624	0.0863	0.4361	0.0561	.	0.0742	.
boys	0.38143	0.11804	0.13856	0.38143	0.13715	.	0.13992	.
	0.0342	0.5271	0.4573	0.0342	0.4619	.	0.4528	.
women	-0.33198	-0.29524	-0.59885	-0.33198	-0.46523	.	0.43654	.
	0.0681	0.1069	0.0004	0.0681	0.0084	.	0.0141	.
girls	-0.66593	-0.43235	-0.59804	-0.78323	-0.38096	.	0.27496	.
	<.0001	0.0151	0.0004	<.0001	0.0345	.	0.1344	.
elders	0.09786	-0.04013	0.03183	0.09786	0.03905	.	0.31749	.
	0.6005	0.8303	0.8650	0.6005	0.8348	.	0.0818	.
infants	-0.01116	0.33557	0.10888	0.07533	-0.05755	.	0.18826	.
	0.9525	0.0650	0.5599	0.6871	0.7585	.	0.3105	.
ttlpeopl	-0.16661	-0.12999	-0.37504	-0.19563	-0.30342	.	0.57199	.
	0.3703	0.4858	0.0376	0.2916	0.0970	.	0.0008	.
womenbio	-0.33198	-0.29524	-0.59885	-0.33198	-0.46523	.	0.43654	.
	0.0681	0.1069	0.0004	0.0681	0.0084	.	0.0141	.
girlsbio	-0.66593	-0.43235	-0.59804	-0.78323	-0.38096	.	0.27496	.
	<.0001	0.0151	0.0004	<.0001	0.0345	.	0.1344	.
totalbio	-0.68975	-0.47690	-0.72918	-0.78990	-0.49507	.	0.39408	.
	<.0001	0.0067	<.0001	<.0001	0.0046	.	0.0283	.
breadp	0.28331	-0.17935	-0.05819	0.28331	0.43941	.	-0.32601	.
	0.1225	0.3343	0.7558	0.1225	0.0134	.	0.0735	.
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	-0.45096	-0.43941	-0.55180	-0.45096	-0.45614	.	0.14538	.
	0.0109	0.0134	0.0013	0.0109	0.0099	.	0.4352	.
lentilp	-0.36754	-0.06613	-0.26025	-0.36754	-0.30162	.	-0.11196	.
	0.0419	0.7237	0.1574	0.0419	0.0991	.	0.5487	.

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
section	-0.53925	0.18122	0.73099	-0.86831	-0.55242	0.03004	-0.62427	-0.36405
	0.0017	0.3292	<.0001	<.0001	0.0013	0.8726	0.0002	0.0441
men	0.11539	-0.34681	-0.37203	0.35632	0.17755	-0.31243	0.23907	0.02828
	0.5365	0.0560	0.0393	0.0491	0.3393	0.0871	0.1952	0.8800
boys	-0.02833	0.03084	-0.19167	0.31247	0.12801	-0.30029	-0.06224	-0.19427
	0.8798	0.8692	0.3016	0.0870	0.4926	0.1007	0.7394	0.2950
women	0.15488	-0.46552	-0.35800	0.20870	-0.02553	-0.43286	0.32089	0.03796
	0.4054	0.0083	0.0480	0.2599	0.8915	0.0150	0.0784	0.8394
girls	-0.04758	-0.44951	-0.22708	0.02230	-0.08731	-0.38260	0.09023	-0.16882
	0.7994	0.0112	0.2193	0.9052	0.6405	0.0336	0.6293	0.3639

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
elders	-0.04013	-0.20251	0.06223	-0.05407	-0.10732	-0.16126	-0.06807	-0.15380
	0.8303	0.2746	0.7395	0.7727	0.5655	0.3861	0.7160	0.4088
infants	0.33557	0.06520	-0.16025	0.28227	0.18374	0.06976	0.35838	0.29082
	0.0650	0.7275	0.3892	0.1239	0.3225	0.7092	0.0477	0.1125
ttlpeopl	0.12384	-0.43934	-0.45302	0.43766	0.11384	-0.59074	0.23929	-0.14331
	0.5068	0.0134	0.0105	0.0138	0.5420	0.0005	0.1948	0.4418
womenbio	0.15488	-0.46552	-0.35800	0.20870	-0.02553	-0.43286	0.32089	0.03796
	0.4054	0.0083	0.0480	0.2599	0.8915	0.0150	0.0784	0.8394
girlsbio	-0.04758	-0.44951	-0.22708	0.02230	-0.08731	-0.38260	0.09023	-0.16882
	0.7994	0.0112	0.2193	0.9052	0.6405	0.0336	0.6293	0.3639
totalbio	0.01590	-0.55370	-0.32454	0.09520	-0.08387	-0.48464	0.19415	-0.13030
	0.9324	0.0012	0.0749	0.6104	0.6538	0.0057	0.2953	0.4848
breadp	-0.34783	-0.15488	0.88335	-0.46870	-0.31300	-0.05294	-0.32872	-0.30545
	0.0552	0.4054	<.0001	0.0078	0.0864	0.7773	0.0710	0.0947
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	-0.13670	-0.33045	-0.22771	-0.04825	-0.14381	-0.37547	0.00284	-0.16951
	0.4634	0.0694	0.2179	0.7966	0.4402	0.0374	0.9879	0.3620
lentilp	-0.06613	-0.38056	-0.45777	0.26506	0.00224	-0.32445	0.10947	-0.09351
	0.7237	0.0347	0.0096	0.1496	0.9905	0.0750	0.5577	0.6168

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
section	-0.67472	-0.56298	-0.68757	-0.20584	-0.44149	-0.03535	-0.31512	0.07263
	<.0001	0.0010	<.0001	0.2666	0.0129	0.8502	0.0842	0.6978
men	0.25051	0.07424	0.25208	-0.13501	0.49824	0.01822	0.31817	0.31316
	0.1741	0.6914	0.1713	0.4690	0.0043	0.9225	0.0811	0.0863
boys	-0.02485	0.12071	-0.00812	-0.26487	0.30579	0.07259	0.04462	-0.13856
	0.8944	0.5177	0.9654	0.1499	0.0943	0.6980	0.8116	0.4573
women	0.27511	0.02505	0.25127	-0.18960	0.44274	-0.21252	0.34719	0.59885
	0.1342	0.8936	0.1727	0.3070	0.0126	0.2511	0.0557	0.0004
girls	0.05879	-0.07734	0.04420	-0.28872	0.55863	-0.58484	0.45012	0.59804
	0.7534	0.6792	0.8133	0.1152	0.0011	0.0005	0.0111	0.0004
elders	-0.08448	-0.16853	-0.09051	-0.16795	0.07462	0.12465	0.20502	-0.03183
	0.6514	0.3648	0.6282	0.3665	0.6899	0.5041	0.2686	0.8650
infants	0.35643	0.03761	0.35068	0.21220	0.00997	0.02313	0.01127	-0.10888
	0.0490	0.8408	0.0531	0.2518	0.9575	0.9017	0.9520	0.5599
ttlpeopl	0.23594	0.02764	0.23123	-0.37372	0.73649	-0.23602	0.48198	0.37504
	0.2013	0.8826	0.2107	0.0384	<.0001	0.2012	0.0060	0.0376
womenbio	0.27511	0.02505	0.25127	-0.18960	0.44274	-0.21252	0.34719	0.59885
	0.1342	0.8936	0.1727	0.3070	0.0126	0.2511	0.0557	0.0004
girlsbio	0.05879	-0.07734	0.04420	-0.28872	0.55863	-0.58484	0.45012	0.59804
	0.7534	0.6792	0.8133	0.1152	0.0011	0.0005	0.0111	0.0004
totalbio	0.15060	-0.05689	0.12944	-0.31572	0.63855	-0.57692	0.51103	0.72918
	0.4187	0.7611	0.4877	0.0836	0.0001	0.0007	0.0033	<.0001
breadp	-0.36041	-0.36187	-0.36935	-0.21035	-0.60636	0.05150	-0.62619	0.05819
	0.0464	0.0455	0.0409	0.2560	0.0003	0.7832	0.0002	0.7558

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
cousp	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
duezp	-0.03084	-0.13325	-0.04517	-0.28583	0.58261	-0.21283	0.48464	0.55180
	0.8692	0.4748	0.8093	0.1191	0.0006	0.2503	0.0057	0.0013
lentilp	0.09639	0.00192	0.08933	-0.21567	0.45508	0.06428	0.47489	0.26025
	0.6060	0.9918	0.6327	0.2439	0.0101	0.7312	0.0069	0.1574

	tripsmth	guard	distance	fight	biomnth	collthrs
section	-0.49642	-0.11278	-0.02227	0.26561	-0.45129	-0.42049
	0.0045	0.5458	0.9053	0.1487	0.0108	0.0185
men	0.39047	-0.03197	-0.00631	0.07530	0.52635	0.49244
	0.0299	0.8644	0.9731	0.6872	0.0024	0.0049
boys	0.40492	-0.09490	0.13505	-0.33691	0.30723	0.29819
	0.0238	0.6116	0.4688	0.0638	0.0927	0.1032
women	0.17610	0.09013	-0.00848	-0.09476	0.44358	0.43635
	0.3433	0.6297	0.9639	0.6121	0.0124	0.0141
girls	0.34096	-0.26048	-0.47819	-0.07290	0.51262	0.57618
	0.0605	0.1570	0.0065	0.6967	0.0032	0.0007
elders	0.12807	-0.19571	0.07027	-0.29681	0.09549	0.06622
	0.4923	0.2914	0.7072	0.1049	0.6094	0.7234
infants	0.10400	0.04328	-0.00801	0.09556	0.01368	0.02292
	0.5777	0.8172	0.9659	0.6091	0.9418	0.9026
ttlpeopl	0.65418	-0.22599	-0.13353	-0.31261	0.73045	0.73900
	<.0001	0.2215	0.4739	0.0869	<.0001	<.0001
womenbio	0.17610	0.09013	-0.00848	-0.09476	0.44358	0.43635
	0.3433	0.6297	0.9639	0.6121	0.0124	0.0141
girlsbio	0.34096	-0.26048	-0.47819	-0.07290	0.51262	0.57618
	0.0605	0.1570	0.0065	0.6967	0.0032	0.0007
totalbio	0.35539	-0.18952	-0.41139	-0.09683	0.59957	0.65121
	0.0498	0.3072	0.0215	0.6043	0.0004	<.0001
breadp	-0.57724	-0.05301	-0.12848	0.21281	-0.60485	-0.59493
	0.0007	0.7770	0.4909	0.2504	0.0003	0.0004
cousp	.	.	.	.	.	.
	.	.	.	.	.	.
duezp	0.34513	-0.12988	-0.15817	0.10834	0.57426	0.59431
	0.0572	0.4862	0.3954	0.5618	0.0007	0.0004
lentilp	0.38404	0.02707	-0.02227	0.05976	0.47850	0.44343
	0.0329	0.8851	0.9053	0.7495	0.0065	0.0125

	section	men	boys	women	girls	elders	infants	ttlpeopl
ricep	-0.18095	0.17889	-0.12670	0.24012	0.34080	-0.43823	-0.08281	0.02587
	0.3300	0.3356	0.4970	0.1932	0.0606	0.0137	0.6579	0.8901
pastap	-0.16036	0.38518	0.09233	0.38565	0.64483	-0.29280	-0.09082	0.44988
	0.3888	0.0324	0.6213	0.0321	<.0001	0.1099	0.6271	0.0111
soupp	-0.02227	0.28731	0.09233	0.25427	0.42022	-0.20203	-0.17362	0.28319
	0.9053	0.1171	0.6213	0.1675	0.0186	0.2757	0.3503	0.1226
teap	0.20936	-0.14510	0.38143	-0.33198	-0.78323	0.09786	0.07533	-0.19563
	0.2583	0.4361	0.0342	0.0681	<.0001	0.6005	0.6871	0.2916
bathp	0.24094	-0.06404	0.14209	-0.08596	-0.57866	0.09899	0.19866	-0.13330
	0.1917	0.7322	0.4458	0.6457	0.0006	0.5963	0.2840	0.4747
breadu	0.44137	-0.52140	-0.04248	-0.55523	-0.53843	0.00645	-0.02353	-0.56536
	0.0129	0.0026	0.8205	0.0012	0.0018	0.9725	0.9000	0.0009
cousu	0.18122	-0.14772	0.11774	0.06897	0.12159	-0.01787	0.06520	0.12579
	0.3292	0.4278	0.5282	0.7124	0.5147	0.9240	0.7275	0.5001
duezu	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
lentilu	0.02227	-0.18943	0.42032	-0.25427	-0.75713	0.11127	0.17362	-0.11650
	0.9053	0.3074	0.0186	0.1675	<.0001	0.5512	0.3503	0.5325
riceu	0.06513	-0.14510	0.38143	-0.33198	-0.66593	0.09786	-0.01116	-0.16661
	0.7278	0.4361	0.0342	0.0681	<.0001	0.6005	0.9525	0.3703
pastau	-0.38154	-0.10817	0.11804	-0.29524	-0.43235	-0.04013	0.33557	-0.12999
	0.0342	0.5624	0.5271	0.1069	0.0151	0.8303	0.0650	0.4858
soupu	-0.07263	-0.31316	0.13856	-0.59885	-0.59804	0.03183	0.10888	-0.37504
	0.6978	0.0863	0.4573	0.0004	0.0004	0.8650	0.5599	0.0376
teau	0.20936	-0.14510	0.38143	-0.33198	-0.78323	0.09786	0.07533	-0.19563
	0.2583	0.4361	0.0342	0.0681	<.0001	0.6005	0.6871	0.2916
bathu	0.12339	-0.34660	0.13715	-0.46523	-0.38096	0.03905	-0.05755	-0.30342
	0.5084	0.0561	0.4619	0.0084	0.0345	0.8348	0.7585	0.0970
tcstove	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
ricep	0.24012	0.34080	0.37862	-0.22384	.	0.58497	0.70476	1.00000
	0.1932	0.0606	0.0357	0.2261	.	0.0005	<.0001	
pastap	0.38565	0.64483	0.69132	-0.42352	.	0.63696	0.39198	0.39198
	0.0321	<.0001	<.0001	0.0176	.	0.0001	0.0292	0.0292
soupp	0.25427	0.42022	0.45160	-0.27600	.	0.50444	0.25390	0.25390
	0.1675	0.0186	0.0108	0.1329	.	0.0038	0.1681	0.1681
teap	-0.33198	-0.78323	-0.78990	0.28331	.	-0.45096	-0.36754	-0.36754
	0.0681	<.0001	<.0001	0.1225	.	0.0109	0.0419	0.0419
bathp	-0.08596	-0.57866	-0.52545	0.19305	.	-0.26013	-0.22588	-0.22588
	0.6457	0.0006	0.0024	0.2981	.	0.1576	0.2218	0.2218
breadu	-0.55523	-0.53843	-0.66236	0.75967	.	-0.51301	-0.62282	-0.31877
	0.0012	0.0018	<.0001	<.0001	.	0.0032	0.0002	0.0805

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
cousu	0.06897 0.7124	0.12159 0.5147	0.12899 0.4892	-0.15488 0.4054	. .	0.20870 0.2599	-0.09967 0.5937	-0.09967 0.5937
duezu	. .	. .	. .	. .	. .	. .	. .	. .
lentilu	-0.25427 0.1675	-0.75713 <.0001	-0.73926 <.0001	0.27600 0.1329	. .	-0.50444 0.0038	-0.39198 0.0292	-0.39198 0.0292
riceu	-0.33198 0.0681	-0.66593 <.0001	-0.68975 <.0001	0.28331 0.1225	. .	-0.45096 0.0109	-0.36754 0.0419	-0.36754 0.0419
pastau	-0.29524 0.1069	-0.43235 0.0151	-0.47690 0.0067	-0.17935 0.3343	. .	-0.43941 0.0134	-0.06613 0.7237	-0.06613 0.7237
soupu	-0.59885 0.0004	-0.59804 0.0004	-0.72918 <.0001	-0.05819 0.7558	. .	-0.55180 0.0013	-0.26025 0.1574	-0.26025 0.1574
teau	-0.33198 0.0681	-0.78323 <.0001	-0.78990 <.0001	0.28331 0.1225	. .	-0.45096 0.0109	-0.36754 0.0419	-0.36754 0.0419
bathu	-0.46523 0.0084	-0.38096 0.0345	-0.49507 0.0046	0.43941 0.0134	. .	-0.45614 0.0099	-0.30162 0.0991	-0.15995 0.3900
tcstove	. .	. .	. .	. .	. .	. .	. .	. .

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
ricep	0.39198 0.0292	0.25390 0.1681	-0.36754 0.0419	-0.22588 0.2218	-0.31877 0.0805	-0.09967 0.5937	. .	-0.39198 0.0292
pastap	1.00000	0.74167 <.0001	-0.49612 0.0045	-0.33806 0.0629	-0.61929 0.0002	0.27123 0.1400	. .	-0.48333 0.0059
soupp	0.74167 <.0001	1.00000	-0.22630 0.2209	0.09860 0.5977	-0.47708 0.0067	0.27123 0.1400	. .	-0.48333 0.0059
teap	-0.49612 0.0045	-0.22630 0.2209	1.00000	0.44137 0.0129	0.47434 0.0070	-0.07967 0.6701	. .	0.76594 <.0001
bathp	-0.33806 0.0629	0.09860 0.5977	0.44137 0.0129	1.00000	0.20936 0.2583	0.08596 0.6457	. .	0.33806 0.0629
breadu	-0.61929 0.0002	-0.47708 0.0067	0.47434 0.0070	0.20936 0.2583	1.00000	-0.16797 0.3664	. .	0.47708 0.0067
cousu	0.27123 0.1400	0.27123 0.1400	-0.07967 0.6701	0.08596 0.6457	-0.16797 0.3664	1.00000 .	. .	-0.00848 0.9639
duezu	. .	. .	. .	. .	. .	. .	. .	. .
lentilu	-0.48333 0.0059	-0.48333 0.0059	0.76594 <.0001	0.33806 0.0629	0.47708 0.0067	-0.00848 0.9639	. .	1.00000 .
riceu	-0.49612 0.0045	-0.36121 0.0459	0.85909 <.0001	0.21333 0.2492	0.47434 0.0070	-0.07967 0.6701	. .	0.76594 <.0001
pastau	-0.27600 0.1329	-0.42352 0.0176	0.12923 0.4884	-0.05631 0.7635	0.11002 0.5557	-0.15488 0.4054	. .	0.27600 0.1329
soupu	-0.42460 0.0173	-0.42460 0.0173	0.32522 0.0742	0.14354 0.4411	0.29918 0.1020	-0.11516 0.5373	. .	0.42460 0.0173
teau	-0.49612 0.0045	-0.22630 0.2209	1.00000 <.0001	0.44137 0.0129	0.47434 0.0070	-0.07967 0.6701	. .	0.76594 <.0001

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
bathu	-0.37192 0.0394	-0.23939 0.1946	0.31255 0.0869	0.26013 0.1576	0.51301 0.0032	-0.20870 0.2599	. .	0.37192 0.0394
tcstove	. .	. .	. .	. .	. .	. .	. .	. .

	riceu	pastau	soupu	teau	bathu	tcstove	imc	butsing
ricep	-0.36754 0.0419	-0.06613 0.7237	-0.26025 0.1574	-0.36754 0.0419	-0.15995 0.3900	. .	-0.18002 0.3325	. .
pastap	-0.49612 0.0045	-0.27600 0.1329	-0.42460 0.0173	-0.49612 0.0045	-0.37192 0.0394	. .	0.25259 0.1704	. .
soupp	-0.36121 0.0459	-0.42352 0.0176	-0.42460 0.0173	-0.22630 0.2209	-0.23939 0.1946	. .	0.18893 0.3087	. .
teap	0.85909 <.0001	0.12923 0.4884	0.32522 0.0742	1.00000 <.0001	0.31255 0.0869	. .	-0.11368 0.5426	. .
bathp	0.21333 0.2492	-0.05631 0.7635	0.14354 0.4411	0.44137 0.0129	0.26013 0.1576	. .	-0.02083 0.9115	. .
breadu	0.47434 0.0070	0.11002 0.5557	0.29918 0.1020	0.47434 0.0070	0.51301 0.0032	. .	-0.44993 0.0111	. .
cousu	-0.07967 0.6701	-0.15488 0.4054	-0.11516 0.5373	-0.07967 0.6701	-0.20870 0.2599	. .	0.27571 0.1333	. .
duezu	. .	. .	. .	. .	. .	. .	. .	. .
lentilu	0.76594 <.0001	0.27600 0.1329	0.42460 0.0173	0.76594 <.0001	0.37192 0.0394	. .	-0.06161 0.7420	. .
riceu	1.00000	0.28331 0.1225	0.32522 0.0742	0.85909 <.0001	0.31255 0.0869	. .	-0.11368 0.5426	. .
pastau	0.28331 0.1225	1.00000	0.74356 <.0001	0.12923 0.4884	0.28806 0.1161	. .	-0.32601 0.0735	. .
soupu	0.32522 0.0742	0.74356 <.0001	1.00000	0.32522 0.0742	0.37174 0.0395	. .	-0.40459 0.0240	. .
teau	0.85909 <.0001	0.12923 0.4884	0.32522 0.0742	1.00000	0.31255 0.0869	. .	-0.11368 0.5426	. .
bathu	0.31255 0.0869	0.28806 0.1161	0.37174 0.0395	0.31255 0.0869	1.00000	. .	-0.53727 0.0018	. .
tcstove	. .	. .	. .	. .	. .	. .	. .	. .

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
ricep	0.09157 0.6242	-0.09967 0.5937	-0.30917 0.0906	0.26506 0.1496	0.21023 0.2563	-0.14012 0.4522	0.20119 0.2778	-0.00332 0.9858
pastap	0.01903 0.9190	-0.25427 0.1675	-0.43493 0.0145	0.02565 0.8911	0.09414 0.6144	-0.27426 0.1354	0.14668 0.4311	-0.03149 0.8665
soupp	-0.12848 0.4909	-0.25427 0.1675	-0.26118 0.1558	-0.10687 0.5672	-0.03557 0.8494	-0.23005 0.2131	-0.02491 0.8942	-0.15200 0.4143
teap	-0.17893	0.19476	0.35007	-0.24111	-0.00437	0.19529	-0.30351	-0.10679

	0.3355	0.2938	0.0535	0.1913	0.9814	0.2924	0.0969	0.5675
	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
bathp	-0.30566	0.08596	0.22927	-0.18787	-0.14145	0.05834	-0.39763	-0.23787
	0.0945	0.6457	0.2147	0.3115	0.4478	0.7552	0.0267	0.1976
breadu	-0.05239	0.41059	0.77627	-0.36240	-0.08062	0.38250	-0.16758	0.06677
	0.7795	0.0218	<.0001	0.0451	0.6664	0.0337	0.3675	0.7212
cousu	-0.15488	-0.06897	-0.06613	-0.20870	-0.23832	-0.14274	-0.14637	-0.13601
	0.4054	0.7124	0.7238	0.2599	0.1967	0.4437	0.4320	0.4657
duezu	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
lentilu	-0.01903	0.25427	0.22643	-0.02565	-0.02929	0.15931	-0.14668	0.03149
	0.9190	0.1675	0.2206	0.8911	0.8757	0.3920	0.4311	0.8665
riceu	-0.02485	0.19476	0.27748	-0.10269	-0.00437	0.17682	-0.12430	0.01908
	0.8944	0.2938	0.1307	0.5825	0.9814	0.3413	0.5053	0.9188
pastau	0.49457	0.44528	-0.30725	0.43941	0.42769	0.44695	0.45515	0.53410
	0.0047	0.0121	0.0927	0.0134	0.0164	0.0117	0.0101	0.0020
soupu	0.14225	0.59885	-0.08682	0.19168	0.21888	0.51256	-0.01128	0.26410
	0.4453	0.0004	0.6424	0.3016	0.2368	0.0032	0.9520	0.1511
teau	-0.17893	0.19476	0.35007	-0.24111	-0.00437	0.19529	-0.30351	-0.10679
	0.3355	0.2938	0.0535	0.1913	0.9814	0.2924	0.0969	0.5675
bathu	-0.16600	0.06087	0.40598	-0.08772	-0.12235	-0.01463	-0.17888	-0.21378
	0.3721	0.7450	0.0234	0.6389	0.5120	0.9377	0.3356	0.2482
tcstove	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
ricep	0.22491	0.21829	0.23221	-0.07166	0.21301	-0.03535	0.17918	0.26025
	0.2238	0.2381	0.2087	0.7017	0.2499	0.8502	0.3348	0.1574
pastap	0.15027	0.01564	0.14978	-0.15258	0.78091	-0.41638	0.63692	0.42460
	0.4197	0.9334	0.4213	0.4125	<.0001	0.0198	0.0001	0.0173
soupp	-0.03005	-0.02103	-0.03190	-0.19952	0.61737	-0.32319	0.52677	0.42460
	0.8725	0.9106	0.8647	0.2819	0.0002	0.0762	0.0023	0.0173
teap	-0.26682	-0.15273	-0.24707	0.03050	-0.39432	0.36111	-0.37478	-0.32522
	0.1468	0.4121	0.1802	0.8706	0.0282	0.0459	0.0378	0.0742
bathp	-0.38101	-0.38782	-0.36849	-0.10834	-0.25265	0.26679	-0.15800	-0.14354
	0.0345	0.0311	0.0414	0.5618	0.1703	0.1468	0.3959	0.4411
breadu	-0.16544	-0.02436	-0.16223	0.22550	-0.82669	0.24824	-0.79535	-0.29918
	0.3738	0.8965	0.3832	0.2226	<.0001	0.1781	<.0001	0.1020
cousu	-0.18341	-0.19084	-0.19713	-0.15221	0.21408	-0.11925	0.21885	0.11516
	0.3233	0.3038	0.2878	0.4137	0.2475	0.5228	0.2369	0.5373
duezu	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
lentilu	-0.13524	-0.06319	-0.12837	0.09490	-0.40770	0.27659	-0.42645	-0.42460
	0.4682	0.7356	0.4913	0.6116	0.0228	0.1320	0.0167	0.0173
riceu	-0.10987	-0.06618	-0.10203	0.09424	-0.37680	0.36111	-0.39538	-0.32522
	0.5563	0.7235	0.5849	0.6141	0.0367	0.0459	0.0277	0.0742
pastau	0.49770	0.46812	0.50952	0.53860	-0.11787	0.42404	-0.00692	-0.74356

	0.0044	0.0079	0.0034	0.0018	0.5277	0.0174	0.9705	<.0001
	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
soupu	0.04084	0.29686	0.06312	0.41040	-0.29775	0.59231	-0.08362	-1.00000
	0.8273	0.1049	0.7359	0.0218	0.1038	0.0004	0.6547	<.0001
teau	-0.26682	-0.15273	-0.24707	0.03050	-0.39432	0.36111	-0.37478	-0.32522
	0.1468	0.4121	0.1802	0.8706	0.0282	0.0459	0.0378	0.0742
bathu	-0.18501	-0.08973	-0.18515	-0.13286	-0.43203	0.11721	-0.38729	-0.37174
	0.3191	0.6312	0.3187	0.4762	0.0152	0.5300	0.0314	0.0395
tcstove	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.

	tripsmth	guard	distance	fight	biomnth	collthrs
ricep	0.07354	0.16691	-0.16036	0.05976	0.21778	0.20286
	0.6942	0.3695	0.3888	0.7495	0.2392	0.2737
pastap	0.58115	-0.16879	-0.29167	-0.18013	0.75049	0.78765
	0.0006	0.3640	0.1114	0.3322	<.0001	<.0001
soupp	0.42598	-0.03798	-0.16250	-0.18013	0.60483	0.62522
	0.0169	0.8393	0.3824	0.3322	0.0003	0.0002
teap	-0.25175	0.22037	0.31334	-0.11677	-0.36729	-0.40087
0.1719	0.2336	0.0861	0.5316	0.0421	0.0254	
bathp	-0.18570	0.27817	0.31693	0.12599	-0.22173	-0.25501
	0.3172	0.1297	0.0824	0.4995	0.2306	0.1662
breadu	-0.72348	0.03252	0.09175	0.17780	-0.82213	-0.81314
	<.0001	0.8621	0.6235	0.3386	<.0001	<.0001
cousu	0.15978	0.04292	0.27123	-0.10108	0.20005	0.21589
	0.3906	0.8187	0.1400	0.5885	0.2806	0.2434
duezu	.	.	.	.	.	.
	.	.	.	.	.	.
lentilu	-0.22704	0.16879	0.29167	-0.01242	-0.40268	-0.41697
	0.2193	0.3640	0.1114	0.9471	0.0247	0.0196
riceu	-0.23513	0.22037	0.31334	-0.11677	-0.35023	-0.38347
	0.2029	0.2336	0.0861	0.5316	0.0534	0.0332
pastau	0.16798	0.09639	0.16655	-0.00709	-0.09544	-0.13815
	0.3664	0.6060	0.3705	0.9698	0.6095	0.4586
soupu	0.09382	-0.01720	0.27741	0.09283	-0.25664	-0.32407
	0.6157	0.9268	0.1308	0.6194	0.1634	0.0753
teau	-0.25175	0.22037	0.31334	-0.11677	-0.36729	-0.40087
	0.1719	0.2336	0.0861	0.5316	0.0421	0.0254
bathu	-0.21451	-0.00433	-0.10687	-0.10834	-0.43284	-0.44475
	0.2465	0.9816	0.5672	0.5618	0.0150	0.0122
tcstove	.	.	.	.	.	.
	.	.	.	.	.	.

	section	men	boys	women	girls	elders	infants	ttlpeopl
imc	-0.24808	0.32522	0.13992	0.43654	0.27496	0.31749	0.18826	0.57199
	0.1784	0.0742	0.4528	0.0141	0.1344	0.0818	0.3105	0.0008
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	-0.53925	0.11539	-0.02833	0.15488	-0.04758	-0.04013	0.33557	0.12384
	0.0017	0.5365	0.8798	0.4054	0.7994	0.8303	0.0650	0.5068
butoven	0.18122	-0.34681	0.03084	-0.46552	-0.44951	-0.20251	0.06520	-0.43934
	0.3292	0.0560	0.8692	0.0083	0.0112	0.2746	0.7275	0.0134
commoven	0.73099	-0.37203	-0.19167	-0.35800	-0.22708	0.06223	-0.16025	-0.45302
	<.0001	0.0393	0.3016	0.0480	0.2193	0.7395	0.3892	0.0105
electcty	-0.86831	0.35632	0.31247	0.20870	0.02230	-0.05407	0.28227	0.43766
	<.0001	0.0491	0.0870	0.2599	0.9052	0.7727	0.1239	0.0138
nbuts	-0.55242	0.17755	0.12801	-0.02553	-0.08731	-0.10732	0.18374	0.11384
	0.0013	0.3393	0.4926	0.8915	0.6405	0.5655	0.3225	0.5420
nbutsper	0.03004	-0.31243	-0.30029	-0.43286	-0.38260	-0.16126	0.06976	-0.59074
	0.8726	0.0871	0.1007	0.0150	0.0336	0.3861	0.7092	0.0005
nbutl	-0.62427	0.23907	-0.06224	0.32089	0.09023	-0.06807	0.35838	0.23929
	0.0002	0.1952	0.7394	0.0784	0.6293	0.7160	0.0477	0.1948
nbutlper	-0.36405	0.02828	-0.19427	0.03796	-0.16882	-0.15380	0.29082	-0.14331
	0.0441	0.8800	0.2950	0.8394	0.3639	0.4088	0.1125	0.4418
btmnth	-0.67472	0.25051	-0.02485	0.27511	0.05879	-0.08448	0.35643	0.23594
	<.0001	0.1741	0.8944	0.1342	0.7534	0.6514	0.0490	0.2013
butmntpr	-0.56298	0.07424	0.12071	0.02505	-0.07734	-0.16853	0.03761	0.02764
	0.0010	0.6914	0.5177	0.8936	0.6792	0.3648	0.8408	0.8826
butcost	-0.68757	0.25208	-0.00812	0.25127	0.04420	-0.09051	0.35068	0.23123
	<.0001	0.1713	0.9654	0.1727	0.8133	0.6282	0.0531	0.2107
btcstper	-0.20584	-0.13501	-0.26487	-0.18960	-0.28872	-0.16795	0.21220	-0.37372
	0.2666	0.4690	0.1499	0.3070	0.1152	0.3665	0.2518	0.0384
bndlpmth	-0.44149	0.49824	0.30579	0.44274	0.55863	0.07462	0.00997	0.73649
	0.0129	0.0043	0.0943	0.0126	0.0011	0.6899	0.9575	<.0001

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
imc	0.43654	0.27496	0.39408	-0.32601	.	0.14538	-0.11196	-0.18002
	0.0141	0.1344	0.0283	0.0735	.	0.4352	0.5487	0.3325
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	0.15488	-0.04758	0.01590	-0.34783	.	-0.13670	-0.06613	0.09157
	0.4054	0.7994	0.9324	0.0552	.	0.4634	0.7237	0.6242
butoven	-0.46552	-0.44951	-0.55370	-0.15488	.	-0.33045	-0.38056	-0.09967
	0.0083	0.0112	0.0012	0.4054	.	0.0694	0.0347	0.5937
commoven	-0.35800	-0.22708	-0.32454	0.88335	.	-0.22771	-0.45777	-0.30917
	0.0480	0.2193	0.0749	<.0001	.	0.2179	0.0096	0.0906
electcty	0.20870	0.02230	0.09520	-0.46870	.	-0.04825	0.26506	0.26506
	0.2599	0.9052	0.6104	0.0078	.	0.7966	0.1496	0.1496
nbuts	-0.02553	-0.08731	-0.08387	-0.31300	.	-0.14381	0.00224	0.21023
	0.8915	0.6405	0.6538	0.0864	.	0.4402	0.9905	0.2563

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
nbutsper	-0.43286	-0.38260	-0.48464	-0.05294	.	-0.37547	-0.32445	-0.14012
	0.0150	0.0336	0.0057	0.7773	.	0.0374	0.0750	0.4522
nbutl	0.32089	0.09023	0.19415	-0.32872	.	0.00284	0.10947	0.20119
	0.0784	0.6293	0.2953	0.0710	.	0.9879	0.5577	0.2778
nbutlper	0.03796	-0.16882	-0.13030	-0.30545	.	-0.16951	-0.09351	-0.00332
	0.8394	0.3639	0.4848	0.0947	.	0.3620	0.6168	0.9858
btmnth	0.27511	0.05879	0.15060	-0.36041	.	-0.03084	0.09639	0.22491
	0.1342	0.7534	0.4187	0.0464	.	0.8692	0.6060	0.2238
butmntpr	0.02505	-0.07734	-0.05689	-0.36187	.	-0.13325	0.00192	0.21829
	0.8936	0.6792	0.7611	0.0455	.	0.4748	0.9918	0.2381
butcost	0.25127	0.04420	0.12944	-0.36935	.	-0.04517	0.08933	0.23221
	0.1727	0.8133	0.4877	0.0409	.	0.8093	0.6327	0.2087
btcstper	-0.18960	-0.28872	-0.31572	-0.21035	.	-0.28583	-0.21567	-0.07166
	0.3070	0.1152	0.0836	0.2560	.	0.1191	0.2439	0.7017
bndlpmth	0.44274	0.55863	0.63855	-0.60636	.	0.58261	0.45508	0.21301
	0.0126	0.0011	0.0001	0.0003	.	0.0006	0.0101	0.2499

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
imc	0.25259	0.18893	-0.11368	-0.02083	-0.44993	0.27571	.	-0.06161
	0.1704	0.3087	0.5426	0.9115	0.0111	0.1333	.	0.7420
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	0.01903	-0.12848	-0.17893	-0.30566	-0.05239	-0.15488	.	-0.01903
	0.9190	0.4909	0.3355	0.0945	0.7795	0.4054	.	0.9190
butoven	-0.25427	-0.25427	0.19476	0.08596	0.41059	-0.06897	.	0.25427
	0.1675	0.1675	0.2938	0.6457	0.0218	0.7124	.	0.1675
commoven	-0.43493	-0.26118	0.35007	0.22927	0.77627	-0.06613	.	0.22643
	0.0145	0.1558	0.0535	0.2147	<.0001	0.7238	.	0.2206
electcty	0.02565	-0.10687	-0.24111	-0.18787	-0.36240	-0.20870	.	-0.02565
	0.8911	0.5672	0.1913	0.3115	0.0451	0.2599	.	0.8911
nbuts	0.09414	-0.03557	-0.00437	-0.14145	-0.08062	-0.23832	.	-0.02929
	0.6144	0.8494	0.9814	0.4478	0.6664	0.1967	.	0.8757
nbutsper	-0.27426	-0.23005	0.19529	0.05834	0.38250	-0.14274	.	0.15931
	0.1354	0.2131	0.2924	0.7552	0.0337	0.4437	.	0.3920
nbutl	0.14668	-0.02491	-0.30351	-0.39763	-0.16758	-0.14637	.	-0.14668
	0.4311	0.8942	0.0969	0.0267	0.3675	0.4320	.	0.4311
nbutlper	-0.03149	-0.15200	-0.10679	-0.23787	0.06677	-0.13601	.	0.03149
	0.8665	0.4143	0.5675	0.1976	0.7212	0.4657	.	0.8665
btmnth	0.15027	-0.03005	-0.26682	-0.38101	-0.16544	-0.18341	.	-0.13524
	0.4197	0.8725	0.1468	0.0345	0.3738	0.3233	.	0.4682
butmntpr	0.01564	-0.02103	-0.15273	-0.38782	-0.02436	-0.19084	.	-0.06319
	0.9334	0.9106	0.4121	0.0311	0.8965	0.3038	.	0.7356
butcost	0.14978	-0.03190	-0.24707	-0.36849	-0.16223	-0.19713	.	-0.12837
	0.4213	0.8647	0.1802	0.0414	0.3832	0.2878	.	0.4913
btcstper	-0.15258	-0.19952	0.03050	-0.10834	0.22550	-0.15221	.	0.09490

	0.4125	0.2819	0.8706	0.5618	0.2226	0.4137	.	0.6116
	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
bndlpmth	0.78091	0.61737	-0.39432	-0.25265	-0.82669	0.21408	.	-0.40770
	<.0001	0.0002	0.0282	0.1703	<.0001	0.2475	.	0.0228

	riceu	pastau	soupu	teau	bathu	tcstove	imc	butsing
imc	-0.11368	-0.32601	-0.40459	-0.11368	-0.53727	.	1.00000	.
	0.5426	0.0735	0.0240	0.5426	0.0018	.		.
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	-0.02485	0.49457	0.14225	-0.17893	-0.16600	.	0.25565	.
	0.8944	0.0047	0.4453	0.3355	0.3721	.	0.1651	.
butoven	0.19476	0.44528	0.59885	0.19476	0.06087	.	-0.24229	.
	0.2938	0.0121	0.0004	0.2938	0.7450	.	0.1891	.
commoven	0.27748	-0.30725	-0.08682	0.35007	0.40598	.	-0.34364	.
	0.1307	0.0927	0.6424	0.0535	0.0234	.	0.0584	.
electcty	-0.10269	0.43941	0.19168	-0.24111	-0.08772	.	0.18120	.
	0.5825	0.0134	0.3016	0.1913	0.6389	.	0.3293	.
nbuts	-0.00437	0.42769	0.21888	-0.00437	-0.12235	.	0.08971	.
	0.9814	0.0164	0.2368	0.9814	0.5120	.	0.6313	.
nbutsper	0.17682	0.44695	0.51256	0.19529	-0.01463	.	-0.23780	.
	0.3413	0.0117	0.0032	0.2924	0.9377	.	0.1977	.
nbutl	-0.12430	0.45515	-0.01128	-0.30351	-0.17888	.	0.20460	.
	0.5053	0.0101	0.9520	0.0969	0.3356	.	0.2695	.
nbutlper	0.01908	0.53410	0.26410	-0.10679	-0.21378	.	0.03295	.
	0.9188	0.0020	0.1511	0.5675	0.2482	.	0.8603	.
btmnth	-0.10987	0.49770	0.04084	-0.26682	-0.18501	.	0.19997	.
	0.5563	0.0044	0.8273	0.1468	0.3191	.	0.2808	.
butmntpr	-0.06618	0.46812	0.29686	-0.15273	-0.08973	.	-0.04414	.
	0.7235	0.0079	0.1049	0.4121	0.6312	.	0.8136	.
butcost	-0.10203	0.50952	0.06312	-0.24707	-0.18515	.	0.19519	.
	0.5849	0.0034	0.7359	0.1802	0.3187	.	0.2927	.
btcstper	0.09424	0.53860	0.41040	0.03050	-0.13286	.	-0.09297	.
	0.6141	0.0018	0.0218	0.8706	0.4762	.	0.6189	.
bndlpmth	-0.37680	-0.11787	-0.29775	-0.39432	-0.43203	.	0.51649	.
	0.0367	0.5277	0.1038	0.0282	0.0152	.	0.0029	.

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
imc	0.25565	-0.24229	-0.34364	0.18120	0.08971	-0.23780	0.20460	0.03295
	0.1651	0.1891	0.0584	0.3293	0.6313	0.1977	0.2695	0.8603
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	1.00000	0.44528	-0.50569	0.59076	0.50176	0.37626	0.94507	0.87818
	0.0121	0.0037	0.0005	0.0040	0.0370	<.0001	<.0001	
butoven	0.44528	1.00000	-0.06613	0.06087	0.28939	0.71166	0.20267	0.59941
	0.0121	0.7238	0.7450	0.1143	<.0001	0.2742	0.0004	
commoven	-0.50569	-0.06613	1.00000	-0.73490	-0.45533	0.00587	-0.52118	-0.37681
	0.0037	0.7238	<.0001	0.0101	0.9750	0.0026	0.0367	

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
electcty	0.59076	0.06087	-0.73490	1.00000	0.54304	-0.02824	0.61332	0.36733
	0.0005	0.7450	<.0001	0.0016	0.8801	0.0002	0.0421	
nbuts	0.50176	0.28939	-0.45533	0.54304	1.00000	0.51237	0.44188	0.44971
	0.0040	0.1143	0.0101	0.0016	0.0032	0.0128	0.0111	
nbutsper	0.37626	0.71166	0.00587	-0.02824	0.51237	1.00000	0.20215	0.68001
	0.0370	<.0001	0.9750	0.8801	0.0032	0.2754	<.0001	
nbutl	0.94507	0.20267	-0.52118	0.61332	0.44188	0.20215	1.00000	0.80793
	<.0001	0.2742	0.0026	0.0002	0.0128	0.2754	<.0001	
nbutlper	0.87818	0.59941	-0.37681	0.36733	0.44971	0.68001	0.80793	1.00000
	<.0001	0.0004	0.0367	0.0421	0.0111	<.0001	<.0001	
btmnth	0.94392	0.24455	-0.56194	0.66295	0.61870	0.29576	0.97816	0.81176
	<.0001	0.1849	0.0010	<.0001	0.0002	0.1062	<.0001	<.0001
butmntpr	0.79856	0.49996	-0.52294	0.66285	0.54502	0.38550	0.75932	0.72926
	<.0001	0.0042	0.0025	<.0001	0.0015	0.0322	<.0001	<.0001
butcost	0.93046	0.25954	-0.57209	0.67561	0.68771	0.33273	0.95515	0.80229
	<.0001	0.1585	0.0008	<.0001	<.0001	0.0674	<.0001	<.0001
btcstper	0.71196	0.70657	-0.22485	0.20778	0.52327	0.89865	0.58438	0.93253
	<.0001	<.0001	0.2239	0.2620	0.0025	<.0001	0.0006	<.0001
bndlpmth	0.12158	-0.35744	-0.66734	0.29075	0.19655	-0.38669	0.22875	-0.05393
	0.5147	0.0484	<.0001	0.1126	0.2892	0.0316	0.2158	0.7733

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
imc	0.19997	-0.04414	0.19519	-0.09297	0.51649	-0.36154	0.37734	0.40459
	0.2808	0.8136	0.2927	0.6189	0.0029	0.0457	0.0364	0.0240
butsing	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.
butmult	0.94392	0.79856	0.93046	0.71196	0.12158	0.10472	0.06092	-0.14225
	<.0001	<.0001	<.0001	<.0001	0.5147	0.5750	0.7448	0.4453
butoven	0.24455	0.49996	0.25954	0.70657	-0.35744	0.35470	-0.29565	-0.59885
	0.1849	0.0042	0.1585	<.0001	0.0484	0.0502	0.1064	0.0004
commoven	-0.56194	-0.52294	-0.57209	-0.22485	-0.66734	0.01415	-0.63139	0.08682
	0.0010	0.0025	0.0008	0.2239	<.0001	0.9398	0.0001	0.6424
electcty	0.66295	0.66285	0.67561	0.20778	0.29075	0.06940	0.15932	-0.19168
	<.0001	<.0001	<.0001	0.2620	0.1126	0.7107	0.3919	0.3016
nbuts	0.61870	0.54502	0.68771	0.52327	0.19655	0.05585	0.12012	-0.21888
	0.0002	0.0015	<.0001	0.0025	0.2892	0.7654	0.5198	0.2368
nbutsper	0.29576	0.38550	0.33273	0.89865	-0.38669	0.27476	-0.28206	-0.51256
	0.1062	0.0322	0.0674	<.0001	0.0316	0.1347	0.1242	0.0032
nbutl	0.97816	0.75932	0.95515	0.58438	0.22875	0.04094	0.14828	0.01128
	<.0001	<.0001	<.0001	0.0006	0.2158	0.8269	0.4260	0.9520
nbutlper	0.81176	0.72926	0.80229	0.93253	-0.05393	0.20392	-0.06634	-0.26410
	<.0001	<.0001	<.0001	<.0001	0.7733	0.2712	0.7229	0.1511
btmnth	1.00000	0.79128	0.99584	0.63303	0.24588	0.04879	0.15769	-0.04084
		<.0001	<.0001	0.0001	0.1824	0.7944	0.3969	0.8273
butmntpr	0.79128	1.00000	0.79442	0.62551	0.07689	0.14989	-0.00265	-0.29686
	<.0001		<.0001	0.0002	0.6810	0.4209	0.9887	0.1049

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
butcost	0.99584	0.79442	1.00000	0.64566	0.25001	0.05157	0.15965	-0.06312
	<.0001	<.0001		<.0001	0.1750	0.7829	0.3910	0.7359
btcstper	0.63303	0.62551	0.64566	1.00000	-0.21859	0.25717	-0.17398	-0.41040
	0.0001	0.0002	<.0001		0.2374	0.1625	0.3493	0.0218
bndlpmth	0.24588	0.07689	0.25001	-0.21859	1.00000	-0.23722	0.88467	0.29775
	0.1824	0.6810	0.1750	0.2374		0.1988	<.0001	0.1038

	tripsmth	guard	distance	fight	biomnth	collthrs
imc	0.33779	-0.01040	-0.06572	-0.16531	0.49179	0.52446
	0.0631	0.9557	0.7254	0.3741	0.0050	0.0025
butsing	.	.	.	.	.	.
	.	.	.	.	.	.
butmult	0.09528	0.09639	0.01903	-0.00709	0.12024	0.12809
	0.6102	0.6060	0.9190	0.9698	0.5194	0.4923
butoven	-0.24489	0.04292	0.27123	0.29060	-0.34998	-0.35175
	0.1842	0.8187	0.1400	0.1127	0.0536	0.0523
commoven	-0.67421	-0.09082	-0.08743	0.21389	-0.67137	-0.64966
	<.0001	0.6271	0.6400	0.2479	<.0001	<.0001
electcty	0.38556	0.12988	0.02565	-0.10834	0.30111	0.27314
	0.0322	0.4862	0.8911	0.5618	0.0997	0.1371
nbuts	0.23650	0.14831	-0.03557	-0.15593	0.19541	0.19402
	0.2002	0.4259	0.8494	0.4022	0.2921	0.2956
nbutsper	-0.31088	0.26345	0.13692	0.32465	-0.38363	-0.38500
	0.0887	0.1521	0.4627	0.0748	0.0331	0.0325
nbutl	0.16999	0.04765	-0.02491	-0.08664	0.22871	0.23413
	0.3606	0.7991	0.8942	0.6431	0.2159	0.2049
nbutlper	-0.07465	0.15787	0.12517	0.21384	-0.05259	-0.04712
	0.6898	0.3963	0.5023	0.2481	0.7787	0.8012
btmnth	0.20367	0.07609	-0.03005	-0.11201	0.24557	0.25000
	0.2718	0.6841	0.8725	0.5486	0.1830	0.1750
butmntpr	0.09912	0.07646	0.08628	-0.05494	0.07934	0.06557
	0.5958	0.6827	0.6444	0.7691	0.6714	0.7260
butcost	0.21564	0.08752	-0.03190	-0.12159	0.24959	0.25352
	0.2440	0.6397	0.8647	0.5147	0.1757	0.1688
btcstper	-0.19292	0.22592	0.14121	0.28715	-0.21600	-0.21370
	0.2984	0.2217	0.4486	0.1173	0.2432	0.2484
bndlpmth	0.89438	-0.24576	-0.16259	-0.33635	0.99320	0.99767
	<.0001	0.1826	0.3822	0.0643	<.0001	<.0001

	section	men	boys	women	girls	elders	infants	ttlpeopl
bndlwght	-0.03535	0.01822	0.07259	-0.21252	-0.58484	0.12465	0.02313	-0.23602
	0.8502	0.9225	0.6980	0.2511	0.0005	0.5041	0.9017	0.2012
mssbiopr	-0.31512	0.31817	0.04462	0.34719	0.45012	0.20502	0.01127	0.48198
	0.0842	0.0811	0.8116	0.0557	0.0111	0.2686	0.9520	0.0060
biocllct	0.07263	0.31316	-0.13856	0.59885	0.59804	-0.03183	-0.10888	0.37504

	0.6978	0.0863	0.4573	0.0004	0.0004	0.8650	0.5599	0.0376
	section	men	boys	women	girls	elders	infants	ttlpeopl
tripsmth	-0.49642	0.39047	0.40492	0.17610	0.34096	0.12807	0.10400	0.65418
	0.0045	0.0299	0.0238	0.3433	0.0605	0.4923	0.5777	<.0001
guard	-0.11278	-0.03197	-0.09490	0.09013	-0.26048	-0.19571	0.04328	-0.22599
	0.5458	0.8644	0.6116	0.6297	0.1570	0.2914	0.8172	0.2215
distance	-0.02227	-0.00631	0.13505	-0.00848	-0.47819	0.07027	-0.00801	-0.13353
	0.9053	0.9731	0.4688	0.9639	0.0065	0.7072	0.9659	0.4739
fight	0.26561	0.07530	-0.33691	-0.09476	-0.07290	-0.29681	0.09556	-0.31261
	0.1487	0.6872	0.0638	0.6121	0.6967	0.1049	0.6091	0.0869
biomnth	-0.45129	0.52635	0.30723	0.44358	0.51262	0.09549	0.01368	0.73045
	0.0108	0.0024	0.0927	0.0124	0.0032	0.6094	0.9418	<.0001
collthrs	-0.42049	0.49244	0.29819	0.43635	0.57618	0.06622	0.02292	0.73900
	0.0185	0.0049	0.1032	0.0141	0.0007	0.7234	0.9026	<.0001

	womenbio	girlsbio	totalbio	breadp	cousp	duezp	lentilp	ricep
bndlwght	-0.21252	-0.58484	-0.57692	0.05150	.	-0.21283	0.06428	-0.03535
	0.2511	0.0005	0.0007	0.7832	.	0.2503	0.7312	0.8502
mssbiopr	0.34719	0.45012	0.51103	-0.62619	.	0.48464	0.47489	0.17918
	0.0557	0.0111	0.0033	0.0002	.	0.0057	0.0069	0.3348
biocllct	0.59885	0.59804	0.72918	0.05819	.	0.55180	0.26025	0.26025
	0.0004	0.0004	<.0001	0.7558	.	0.0013	0.1574	0.1574
tripsmth	0.17610	0.34096	0.35539	-0.57724	.	0.34513	0.38404	0.07354
	0.3433	0.0605	0.0498	0.0007	.	0.0572	0.0329	0.6942
guard	0.09013	-0.26048	-0.18952	-0.05301	.	-0.12988	0.02707	0.16691
	0.6297	0.1570	0.3072	0.7770	.	0.4862	0.8851	0.3695
distance	-0.00848	-0.47819	-0.41139	-0.12848	.	-0.15817	-0.02227	-0.16036
	0.9639	0.0065	0.0215	0.4909	.	0.3954	0.9053	0.3888
fight	-0.09476	-0.07290	-0.09683	0.21281	.	0.10834	0.05976	0.05976
	0.6121	0.6967	0.6043	0.2504	.	0.5618	0.7495	0.7495
biomnth	0.44358	0.51262	0.59957	-0.60485	.	0.57426	0.47850	0.21778
	0.0124	0.0032	0.0004	0.0003	.	0.0007	0.0065	0.2392
collthrs	0.43635	0.57618	0.65121	-0.59493	.	0.59431	0.44343	0.20286
	0.0141	0.0007	<.0001	0.0004	.	0.0004	0.0125	0.2737

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
bndlwght	-0.41638	-0.32319	0.36111	0.26679	0.24824	-0.11925	.	0.27659
	0.0198	0.0762	0.0459	0.1468	0.1781	0.5228	.	0.1320
mssbiopr	0.63692	0.52677	-0.37478	-0.15800	-0.79535	0.21885	.	-0.42645
	0.0001	0.0023	0.0378	0.3959	<.0001	0.2369	.	0.0167
biocllct	0.42460	0.42460	-0.32522	-0.14354	-0.29918	0.11516	.	-0.42460
	0.0173	0.0173	0.0742	0.4411	0.1020	0.5373	.	0.0173
tripsmth	0.58115	0.42598	-0.25175	-0.18570	-0.72348	0.15978	.	-0.22704
	0.0006	0.0169	0.1719	0.3172	<.0001	0.3906	.	0.2193
guard	-0.16879	-0.03798	0.22037	0.27817	0.03252	0.04292	.	0.16879
	0.3640	0.8393	0.2336	0.1297	0.8621	0.8187	.	0.3640
distance	-0.29167	-0.16250	0.31334	0.31693	0.09175	0.27123	.	0.29167
	0.1114	0.3824	0.0861	0.0824	0.6235	0.1400	.	0.1114

	pastap	soupp	teap	bathp	breadu	cousu	duezu	lentilu
fight	-0.18013	-0.18013	-0.11677	0.12599	0.17780	-0.10108	.	-0.01242
	0.3322	0.3322	0.5316	0.4995	0.3386	0.5885	.	0.9471
biomnth	0.75049	0.60483	-0.36729	-0.22173	-0.82213	0.20005	.	-0.40268
	<.0001	0.0003	0.0421	0.2306	<.0001	0.2806	.	0.0247
collthrs	0.78765	0.62522	-0.40087	-0.25501	-0.81314	0.21589	.	-0.41697
	<.0001	0.0002	0.0254	0.1662	<.0001	0.2434	.	0.0196

	riceu	pastau	soupu	teau	bathu	tcstove	imc	butsing
bndlwght	0.36111	0.42404	0.59231	0.36111	0.11721	.	-0.36154	.
	0.0459	0.0174	0.0004	0.0459	0.5300	.	0.0457	.
mssbiopr	-0.39538	-0.00692	-0.08362	-0.37478	-0.38729	.	0.37734	.
	0.0277	0.9705	0.6547	0.0378	0.0314	.	0.0364	.
biocllct	-0.32522	-0.74356	-1.00000	-0.32522	-0.37174	.	0.40459	.
	0.0742	<.0001	<.0001	0.0742	0.0395	.	0.0240	.
tripsmth	-0.23513	0.16798	0.09382	-0.25175	-0.21451	.	0.33779	.
	0.2029	0.3664	0.6157	0.1719	0.2465	.	0.0631	.
guard	0.22037	0.09639	-0.01720	0.22037	-0.00433	.	-0.01040	.
	0.2336	0.6060	0.9268	0.2336	0.9816	.	0.9557	.
distance	0.31334	0.16655	0.27741	0.31334	-0.10687	.	-0.06572	.
	0.0861	0.3705	0.1308	0.0861	0.5672	.	0.7254	.
fight	-0.11677	-0.00709	0.09283	-0.11677	-0.10834	.	-0.16531	.
	0.5316	0.9698	0.6194	0.5316	0.5618	.	0.3741	.
biomnth	-0.35023	-0.09544	-0.25664	-0.36729	-0.43284	.	0.49179	.
	0.0534	0.6095	0.1634	0.0421	0.0150	.	0.0050	.
collthrs	-0.38347	-0.13815	-0.32407	-0.40087	-0.44475	.	0.52446	.
	0.0332	0.4586	0.0753	0.0254	0.0122	.	0.0025	.

	butmult	butoven	commoven	electcty	nbuts	nbutsper	nbutl	nbutlper
bndlwght	0.10472	0.35470	0.01415	0.06940	0.05585	0.27476	0.04094	0.20392
	0.5750	0.0502	0.9398	0.7107	0.7654	0.1347	0.8269	0.2712
mssbiopr	0.06092	-0.29565	-0.63139	0.15932	0.12012	-0.28206	0.14828	-0.06634
	0.7448	0.1064	0.0001	0.3919	0.5198	0.1242	0.4260	0.7229
biocllct	-0.14225	-0.59885	0.08682	-0.19168	-0.21888	-0.51256	0.01128	-0.26410
	0.4453	0.0004	0.6424	0.3016	0.2368	0.0032	0.9520	0.1511
tripsmth	0.09528	-0.24489	-0.67421	0.38556	0.23650	-0.31088	0.16999	-0.07465
	0.6102	0.1842	<.0001	0.0322	0.2002	0.0887	0.3606	0.6898
guard	0.09639	0.04292	-0.09082	0.12988	0.14831	0.26345	0.04765	0.15787
	0.6060	0.8187	0.6271	0.4862	0.4259	0.1521	0.7991	0.3963
distance	0.01903	0.27123	-0.08743	0.02565	-0.03557	0.13692	-0.02491	0.12517
	0.9190	0.1400	0.6400	0.8911	0.8494	0.4627	0.8942	0.5023
fight	-0.00709	0.29060	0.21389	-0.10834	-0.15593	0.32465	-0.08664	0.21384
	0.9698	0.1127	0.2479	0.5618	0.4022	0.0748	0.6431	0.2481
biomnth	0.12024	-0.34998	-0.67137	0.30111	0.19541	-0.38363	0.22871	-0.05259
	0.5194	0.0536	<.0001	0.0997	0.2921	0.0331	0.2159	0.7787
collthrs	0.12809	-0.35175	-0.64966	0.27314	0.19402	-0.38500	0.23413	-0.04712
	0.4923	0.0523	<.0001	0.1371	0.2956	0.0325	0.2049	0.8012

	btmnth	butmntpr	butcost	btcstper	bndlpmth	bndlwght	mssbiopr	biocllct
bndlwght	0.04879	0.14989	0.05157	0.25717	-0.23722	1.00000	-0.00444	-0.59231
	0.7944	0.4209	0.7829	0.1625	0.1988		0.9811	0.0004
mssbiopr	0.15769	-0.00265	0.15965	-0.17398	0.88467	-0.00444	1.00000	0.08362
	0.3969	0.9887	0.3910	0.3493	<.0001	0.9811		0.6547
biocllct	-0.04084	-0.29686	-0.06312	-0.41040	0.29775	-0.59231	0.08362	1.00000
	0.8273	0.1049	0.7359	0.0218	0.1038	0.0004	0.6547	
tripsmth	0.20367	0.09912	0.21564	-0.19292	0.89438	-0.00218	0.87061	-0.09382
	0.2718	0.5958	0.2440	0.2984	<.0001	0.9907	<.0001	0.6157
guard	0.07609	0.07646	0.08752	0.22592	-0.24576	0.06242	-0.24106	0.01720
	0.6841	0.6827	0.6397	0.2217	0.1826	0.7387	0.1914	0.9268
distance	-0.03005	0.08628	-0.03190	0.14121	-0.16259	0.60879	-0.03540	-0.27741
	0.8725	0.6444	0.8647	0.4486	0.3822	0.0003	0.8500	0.1308
fight	-0.11201	-0.05494	-0.12159	0.28715	-0.33635	0.03361	-0.36117	-0.09283
	0.5486	0.7691	0.5147	0.1173	0.0643	0.8575	0.0459	0.6194
biomnth	0.24557	0.07934	0.24959	-0.21600	0.99320	-0.13259	0.90372	0.25664
	0.1830	0.6714	0.1757	0.2432	<.0001	0.4771	<.0001	0.1634
collthrs	0.25000	0.06557	0.25352	-0.21370	0.99767	-0.25240	0.87669	0.32407
	0.1750	0.7260	0.1688	0.2484	<.0001	0.1707	<.0001	0.0753

	tripsmth	guard	distance	fight	biomnth	collthrs
bndlwght	-0.00218	0.06242	0.60879	0.03361	-0.13259	-0.25240
	0.9907	0.7387	0.0003	0.8575	0.4771	0.1707
mssbiopr	0.87061	-0.24106	-0.03540	-0.36117	0.90372	0.87669
	<.0001	0.1914	0.8500	0.0459	<.0001	<.0001
biocllct	-0.09382	0.01720	-0.27741	-0.09283	0.25664	0.32407
	0.6157	0.9268	0.1308	0.6194	0.1634	0.0753
tripsmth	1.00000	-0.31299	-0.06738	-0.36486	0.90893	0.88547
		0.0864	0.7187	0.0436	<.0001	<.0001
guard	-0.31299	1.00000	0.09283	0.25791	-0.23842	-0.25885
	0.0864		0.6194	0.1613	0.1965	0.1597
distance	-0.06738	0.09283	1.00000	-0.18013	-0.09451	-0.17433
	0.7187	0.6194		0.3322	0.6131	0.3483
fight	-0.36486	0.25791	-0.18013	1.00000	-0.34198	-0.32929
	0.0436	0.1613	0.3322		0.0597	0.0705
biomnth	0.90893	-0.23842	-0.09451	-0.34198	1.00000	0.98937
	<.0001	0.1965	0.6131	0.0597		<.0001
collthrs	0.88547	-0.25885	-0.17433	-0.32929	0.98937	1.00000
	<.0001	0.1597	0.3483	0.0705	<.0001	