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The fuel economy of mountain villages in Ishkamish and Burka (Northeast Afghanistan)

Rural subsistence and urban marketing patterns

Nasratullah Yarash, Paul Smith, Katja Mielke

Summary

Afghanistan is a resource-scarce country. Its remaining forests and open woodlands are currently threatened by extinction. While it is believed that closed forests once covered about 5% of the country, less than 0,5% of its territory is verified to have been covered by forests before the outbreak of violent conflict in 1978. Of this area more than half has been lost during the subsequent decades of war until today. Similarly, open woodlands decreased from originally assumed 38% to 13% in the late 1970s to 5% in 2009 (GoA 2009, 4-5). Forests and woodlands are not only significant given the Afghan population's extraordinary high resource dependence (UNEP 2003, 15), but possess strategic importance for agriculture and food security at large as they contribute to river basin's upper catchment protection through soil and water conservation.

This paper is an attempt at understanding the long-term patterns, extents and underlying motives of deforestation of woodlands and biomass removal for fuel purposes in two rural districts – Ishkamish and Burka – of Northeast Afghanistan, which form part of the upper catchment of the Kunduz river basin. The research departs from the popular hunch that deforestation is causally linked with the fuel needs of the urban populations in the provincial centers of Kunduz, Baghlan and Takhar province. However, the analysis of the change of fuel use over time as well as late marketing patterns of fuel show that the initial hypothesis has to be rejected. On the contrary, the results show that the fuel economy is largely localized and linked to rural subsistence needs for fuel and income generation in the first place. Given these findings that rural livelihood security in both districts is currently a more significant driver for local deforestation than fuel trade or demands for timber, intervention strategies are advised to focus on livelihood support, alternative rural energy schemes and successive reforestation in the rural areas (5.3).

Based on extensive field research and recurrent visits to the districts as well as a market study in the main urban centers of three provinces between autumn 2007 and 2010, this paper achieved to quantify the amount of fuel collected and used for different purposes by households distinguished into three income groups. Moreover, an overview of fuel composition, an inventory of the species used and respective changes for fuel wood usage over a period of more than 30 years from the 1970s until 2007 is provided. Additional qualitative enquiries shed light on aspects of marketing, legal frameworks and local people's attitudes towards fuel usage.

It can be concluded that there has been a dramatic change in biomass composition of fuel wood between 1977 and 2007. This is evidenced by the changes in time taken to reach important fuel species. The use of Bashal (Judas tree/Red Bud), Matraq, Badam-e kohi (Wild almond), Archah (Juniper), Irghai and Zarang as fuel species declined significantly (in that order from greatest to lowest decline). In some sites at local scale the stocks of these species have been entirely depleted already. Of the remaining wood fuels Archah is the most commonly used tree for fuel overall and the amount used is almost eight times as the next most commonly used trees – Irghai and Matraq. As a result there has been a shift towards the use of animal manure and Poosh (Artemisia), a shrub which is similarly threatened by near-future extinction as Archah because it is lately being torn out with its entire rootstocks.

The amounts being withdrawn annually are alarming: The average amount of trees used per household per year is 7,8 tonnes. Hence a typical village of 200 households would remove around 1.570 tonnes per year. This is equivalent to around 2.500m³ and over 1.000 trees with an average volume of 2,5m³. Over 80% of households use some form of bush for fuel in addition to trees. The average annual use is 7,8 tonnes. Two thirds of the bushes used is Poosh (Artemisia). The average use of Artemisia is 4,87t per household, equivalent to around 5.000 plants per household per year. As these plants are uprooted the damage to the environment is permanent.

The use of all trees and bushes combined ranges from around 9 to 20t per year per household with an average of 15,6t per year. Almost all households use some form of manure, the average use of which amounts to 7,1t per household annually. With animal manure included, the average amount of biomass used by each household for fuel is 22,8t (about seven donkey loads a week or a donkey load per day). On average, use of manure, trees and bushes was almost equally divided.

Because of over-exploitation, the distances that people have to go to collect fuel have quadrupled over the last 30 years. The average time used per year collecting wood fuel is 867 hours or almost 87 working

days (of 10 hours). For all types of fuel collected, the total time is almost double this – 1.698 hours. This means that collecting fuel is a full time job for one household member working 10 hours a day three days a week or seven hours a day for almost five days a week. Over a year, 67% of households collected more tree wood than they used, 65% collected more Artemisia than they used, 50% collected more of other types of bushes then they used and 67% collected more manure than they used. The surplus was sold/bartered to households in neighboring villages or in the district town. The research team was not able to track fuel wood from Burka and/or Ishkamish in the large urban municipalities. The bulk of the wood traded in the urban centers for fuel purposes is garden wood (fruit trees or other fast-growing species in farm contexts) from semi-urban areas and villages in close proximity as opposed to wild-growing Archah and Poosh (plus other kind of beta) in the districts. Accordingly, the urban fuel economy of Kunduz City and Taloqan (less so of Baghlan) is much more sustainable than the rural, where fuel wood grown in orchards is not common in the first place; it is not grown commercially (with the exception of Poplar types for timber wood) and does not cover the households' subsistence demands.

Keywords: natural resources, Afghanistan, fuel wood, livelihoods, flora, vegetation, markets (bazaar)

About the authors

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Notes on spelling and recording of local terms

Dari proper names for species and other indigenous terms are transcribed based on heard accounts in order to provide the reader with the possibility to come as close to the original pronunciation as possible.

Furthermore, we decided to use the Dari species' names as they are used locally throughout the working paper to give more justice to indigenous categories and sensitize the reader accordingly. A glossary (A2) and overview of the species with local, English and botanical names (A3) are included in the appendix.

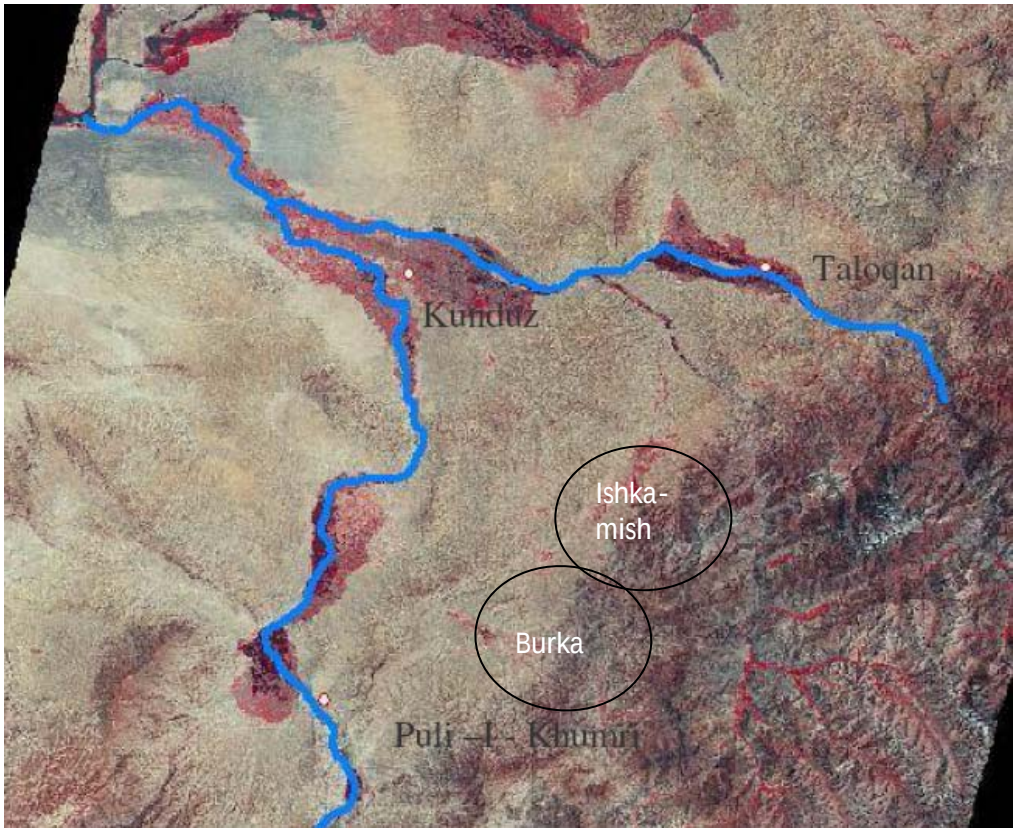
Copyright of pictures

1 Introduction

The Center for Development Research (ZEF) is engaged in several large-scale research projects which focus on water management issues, basins and dam controversies from various perspectives.[1] However, most studies are directly water-related. This study focuses on rangeland conditions and the fuel economy in the upper catchments of one of the Amu Darya sub-basins, namely the Kunduz river basin which stretches into the three provinces Baghlan, Kunduz and Takhar in Northeast Afghanistan (see Figure 1 below and the map M1 in A4).

Deforestation and overuse of rangelands pose a significant threat not only to water supply and food security of the lowland population inhabiting the river basin area, but also to local human livelihoods (FAO 2006). This paper explores the extent of natural resource degradation, in particular fuel wood, in selected communities of Ishkamish (Takhar Province) and Burka (Baghlan Province) district in the upper catchment area of the Kunduz River Basin. The research was initiated by Mercy Corps' Catchment Development Programme (CDP), one of the projects of the Kunduz River Basin Programme (KRPB) active in the upper watershed areas.[2] CDP's major objectives include finding ways to contribute to reforestation, the development of sustainable rangeland strategies, the identification of income generation strategies, as well as the formulation of rural energy components for future action within the framework of KRBP.

Figure 1: Satellite picture of the main part of the Kunduz River Basin[3]



[1] For an overview of past and current projects visit www.zef.de/researchprojects.html: The second stage of the Khorezm-Projekt in Uzbekistan (Economic and Ecologic Restructuring of Land- and Water Use in the Region Khorezm/Uzbekistan), the WISDOM-Project in Vietnam and recently finished Glowa-Volta in West-Africa are exemplary in this regard.

[2] CDP initially ran its first phase from 2006-2009, a follow-up phase was granted and started working, yet insecurity in the districts and in and around Kunduz where the project office is located, have hampered project activities lately.

[3] Source: Implementing the Kunduz River Basin Authority; Presented by KRBP and DWHH/GAA at the Kabul Water Conference 02.08. – 03.08.2005, p. 3. The picture was adapted to indicate the approximate research sites. Pul-i Khumri is the provincial center of Baghlan Province, Taloqan the provincial capital of Takhar Province.

Despite political turmoil and violent conflicts over the last three decades, Afghanistan has experienced enormous population growth, both in the rural and urban areas. Fuel wood always has been and still is the main source of heating in many homes. Experiences from other countries and decades all over the world show that ever higher demand of life necessities in a widely rural context, like Afghanistan's today, are met with increased fuel wood usage.[4] The visible overuse of rangelands and deforestation in the upper catchment area of the Kunduz River Basin prompted CDP to closer investigate the dynamics of the local fuel economy in selected sites.[5]

When this research was launched it was unknown, to what extent fuel from the upper catchments serves subsistence needs in the local rural communities or whether it is cut (and maybe even grown) commercially, traded further and marketed in the provincial urban centers. The underlying rationale of the study was that if the research results support the latter assumption, a major contributing factor for the ongoing environmental degradation in the upper catchment areas would be identified and could offer an entry point for the planning and implementation of canny interventions to put degradation processes to a hold and provide alternatives.

1.1 Objectives

Thus, one objective of the research was to find out whether the assumption that fuel wood for both heating and cooking in the entire river basin area is harvested mainly in its upper catchment districts and then marketed in the provincial capitals, was correct.

Consequently, the objective of this research was to quantify

- the amount of fuel being collected by selected households in Burka and Ishkamish districts
- the species distribution of fuel wood
- changes in types of fuel being used over the last 30 years
- changes in the distances that people have to go to collect fuel
- the prices paid at different points from source to final market

Further questions included:

- Is there any trend to grow wood for fuel commercially?
- Is there a market for all kinds of fuel besides wood?
- How much fuel (wood) is being exported from the target districts to major cities and how much is consumed locally?

1.2 Research design, implementation and analysis

The research for this study consisted of two field components to cover supply and demand sides in the regional fuel economy system:

(1) in the local communities in the target districts of Burka and Ishkamish, and
(2) the fuel market research in both, the district bazaars and in the urban provincial centers.

Both field components were designed to include quantitative data gathering techniques (questionnaires) as well as qualitative methods (semi-structured and narrative interviews, fuel transect walks in settlements, participant observation during interviews and during accompanying fuel collectors to their destinations).

[4] See FAO 2010/ 2007, Swinton 2003, Agrawal 2001, for European history Küster 2008. Moreover, ensuing relative welfare (mainly due to peace and stability, though a real peace dividend is under doubt for Afghanistan) usually increases the need for fuel wood even more as people want to construct bigger houses, heat more rooms, jump-start small businesses (restaurants, bakeries, shops, trade) in the rural towns and urban provincial centers.

[5] Deforestation and environmental degradation is a severe problem in all parts of Afghanistan. While woodland ecosystems (>40 trees per ha) comprised approximately 32.000 km² in the late 1970s, they are now considered to be almost extinct (Government of the Islamic Republic of Afghanistan 2009, 5; UNEP 2003). Deforestation and natural resource depletion continues despite the war had officially ended in 2001, because livelihoods (including food security) are still highly insecure, not least because peace and stability have been lost anew.

1.2.1 Fuel use in local communities

In detail, of the two districts eight NSP-communities[6] were selected according to their relevance in the local fuel economy based on MC's CDP-baseline study (2007), i.e. communities in the main valleys with an assumed stock of fuel wood, and within the valleys at remote, middle and entry position of the respective valley were selected (see the maps M2-3 in A4). The household sampling was undertaken in three categories according to the main income sources:

a) labouring (without livestock or land property/farming income)
b) livestock (without irrigated land)
c) diversified (from mixed sources). [7]

The second category (b) was mainly aimed at the Gujirs.[8] The purpose behind this income-structure sampling was to gain insights into how use and collection patterns of different strata of rural society maybe differ. For the selection of the target households in Burka the researchers initially relied on household-specific socio-economic background information provided by MC-staff in the field. Yet, during the data gathering it turned out that given preliminary data was not always reliable, so that some household who was thought to derive its income from labouring turned out to rather fit into the category of diversified income. Thus, the research team ensured proper sampling by selecting the target households based on local responses upon direct request to local knowledgeables (mullah emam and NSP-head in the communities proper, CDP-staff from the area).

Of each wealth group (labouring, livestock, diversified) four households per community were chosen. As Burka consists mainly of one long-stretched valley, three NSP-communities located at the far remote end of the valley, in the middle and at the valley entry nearer to Burka town were selected. Thus, the quantitative questionnaire was conducted in 36 households (3x4x3in Burka. In Ishkamish, which entails five main valleys, one NSP-community in each valley was selected, thus adding up to 60 households surveyed. The total number of household surveys was thus 96. The quantitative data collected with the questionnaire was entered into an MS Access data base and analyzed/visualized with MS Excel and SPSS.[9]

In addition the researchers conducted fuel transect walks in the villages and in each community one day was spent with the fuel collectors walking up into the mountains to the places where they harvest wood in order to get an idea about the distances people cover for fuel collection and how these – according to their narrated accounts – have changed over the last decades. On these walks and during the conduction of the questionnaire as well as during fuel transects in the villages qualitative data was collected with a semi-structured interview guideline. Furthermore, in order to ensure the validity of the data collected and to detect actual behaviour from reported behaviour in fuel usage and trading patterns, participant observation and action as well as cross-checking for triangulation purposes were used as additional methods.

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[6] NSP-communities are communities of 20-300 households registered for block grant disbursement with the National Solidarity Programme (NSP), a rural development program initiated by the Government of Afghanistan in 2003. The units conform to, extend, or break up local villages, depending on their size. Each NSP-community has an elected representation body, the Community Development Council (CDC) – shura-ye inkeshafi dehat – which is the implementing NGO's counterpart for community development projects financed in the NSP framework and possibly other projects coming thereafter. For an overview of NSP's aims and claims on participation etc. see Boesen 2004.

[7] The initial idea of sampling into four categories including a group of households which own are large landowners or people who can solely rely on agriculture for their living turned out to be not realistic. After talking to people in the field during the piloting of the questionnaire respondents reported that there were no such persons whose income is generated from agriculture only.

[8] Gujirs are once ethnically distinct livestock herders living in rather remote locations. Their ancestors migrated as nomads westwards from Gujarat (Northwest India) in the past. Due to their dark appearance and similar livelihood to naqel and other Pashtuns who came to Northeast Afghanistan in different waves during the last century (Dupree 1973) they are often labeled as Pashtuns and Taliban or Taliban-sympathizers by their ethnically distinct neighbors. Their relative wealth of which livestock is a strong indicator makes them vulnerable to material envy by other groups. In the research area Gujirs exemplify one income-group because their livelihood is solely based on livestock-keeping; they do not own land and only very rarely cultivate crops. At the same time they live closest to the remote areas where forests still exist to some extent and rangeland is rather intact, i.e. in Saei Hazara at the end of Folol valley (Burka) and in Bustan at the end of Darah Qalan (Ishkamish).

[9] A detailed discussion on the Household-questionnaire (Appendix A6) and its methodology as well as data analysis is provided in Appendix A5.

In addition, fuel and timber marketing activities at the local fuel markets in the district centers, i.e. Burka town (Friday and Monday) and Ishkamish town (Thursday) were surveyed during bazaar days.

The focus of this working paper is on the presentation of the quantitative data derived from field research. It can be read as a first part (of more forthcoming analysis) to better understand the actual 'problem' of the local fuel economy. In a follow up the qualitative aspects included in the interviews in the districts should be included more systematically, i.e.

- aspects of local governance: the management of forest access and use, property rights, marketing patterns, the role of the police and appointed forest guards as representatives of the government, the role of religious authorities;
- livelihood strategies, and
- historic development of the current fuel economy (usage, cutting, marketing).

Partly and where they complete quantitative data, some of the insights are already included in this paper (sections 2.4 and 5.3).

1.2.2 Fuel and timber market research

A separate research component was the investigation of fuel demand and supply in provincial centers' bakeries, hotals (restaurants), fuel wood markets, timber markets, mixed fuel and timber markets, fuel wood shops and with mobile wood sellers (for details see Chapters III and IV). These inquiries were conducted by semi-structured interviews in Kunduz City, Taloqan and four major municipalities of Baghlan province (Baghlan Kohna, Baghlan Jadid, Pul-e Khumri, Fobrika). Hotals and bakeries were surveyed because field research in Burka and Ishkamish hinted that fuel wood is being transported to Kunduz, Taloqan and Baghlan during the night and mainly being sold to bakeries and hotal owners. To get an idea about the amount of fuel used by bakeries and hotals in Kunduz City, Taloqan and Baghlan municipalities a representative number of bakeries in each location was sampled (8 in Kunduz City, 8 in Baghlan, 6 in Taloqan) for fuel use and related to the overall number of bakeries in each city. The data about the number and location of the fuel wood and timber wood markets, bakeries, hotals and fuel wood shops were provided by the Municipality Department of the three provinces.[10]

2 Fuel use patterns in Burka and Ishkamish

2.1 Fuels in use

In the area where primary field data was collected (Burka and Ishkamish district) fuel wood, chub-e sukht[11], refers to any material that produces heat or power when it is burnt, including animal fossils and different plant fuels besides wood fuel.[12] Both upper catchment districts show varying degrees of degradation and fuel uses (see the established degradation typology in Table 13). The further degraded an area is, the less wood is actually used but compensated for by brushes, shrubs and other elements of natural vegetation. If the latter also become scarce increasing reliance on animal fossils can be observed. In irrigation areas residues of crops are traditionally used for heating in winter. In addition, local people make use of coal, diesel, petrol and oil to a limited degree (for specific purposes and depending on availability).

2.1.1 Wood (chub)

The first and most valuable category (because efficient, especially for heating) of fuel is wood fuel (chub) which is understood to be always from trees. Reportedly dead wood (chub-e khushk) cannot be found anymore, thus fresh wood is cut at large, mainly Archah, Irghai, Matraq, Safedar, and Beed from the mountains, only partly from private gardens, orchards or fields ('planted', see Table 1). An overlap exists with

[10] For further information on aims and methodology of this research component see A5.
[11] Chub-e sukht literally means fire wood (wood for burning).
[12] In contrast, in the urban centers of Northeast Afghanistan chub-e sukht is largely associated with wood fuel only. See also section 3.2.

timber wood, so are the garden trees Beed and Safedar used for both in Zarmukh village/valley of Ishkamish. Archah is also being cut for fuel and timber. The main uses of wood extend to cooking, heating and water boiling for tea. For baking and water heating for washing-purposes the wood is mixed with different bushes because these purposes don't require the highest possible fuel value.[13]

Table 1: Overview of local tree species and their English synonyms[14]

Local name	English name	Wild or planted tree
Archah	Juniper	wild
Matraq	Ephedra	wild
Bashal/ Arghawan	Judas Tree/ Red Bud	wild
Irghai	Hawthorn or Cotoneaster	wild
Badam-e kohi	Mountain Almond	wild
Badam	Almond	planted
Akasi	False acacia	wild
(Jaw) Beed	(White) Willow	planted
Beed-e roosee	Russian willow	wild/ planted
Toot	Mulberry, white mulberry	planted
Zarang	Maple	wild
Safedar	White Poplar	planted
Pasha khana	Elm	wild/ also planted
Senjid	Russian Olive; oleaster	planted/ also wild
Ar Ar	Black Poplar	planted
Shulmak	Poplar	planted
Chinar	Oriental Plane	planted
Zardaloo	Apricot	planted
Charmaghz	Walnut	planted
Pistah	Pistachio	wild/ planted

Pictures 1: Zarang (photograph taken from above), Sabzgul, Archah, Irghai

[13] Finally, sawdust (buri ara) which accrues in carpenter workshops and saw mills/workshops is used in the urban provincial centers like Kunduz and Taloqan as well. In Burka people do not use it for fuel purposes because it requires a special kind of stove and locals are not familiar with sawdust usage. Even in the urban areas it is not popular because of its low heating value.

[14] For a comprehensive overview of all fuel types and their local Dari vs. English names see Appendix A3.

Picture 2: Sabzgul

Picture 3: Archah

Picture 4: Irghai

2.1.2 Shrubs and other elements of natural vegetation (beta)

There are eight different species of shrubs and thorn bushes e.g. Poosh, Sabzgul, Diktak, Shapash, Khar-e jantaq, Mosh khar, Talkhak and Kamal, all of them are called beta. They grow in the mountains, hills and dryland (lalmi) areas in close proximity with the settlements. The preferred uses extend to baking, making hot water for washing and partly for making tea and lighting wood. At least two of the above mentioned beta-species, i.e. Sabzgul and Khar-e jantaq are also used (and quite popular) as animal fodder, so the fodder value of these shrubs is always in competition with its fuel value.

Picture 5: Poosh

Picture 6: Diktak

2.1.3 Animal fossil and products thereof: sargin, tapi, peshqul, lar

Four types of animal fossil can be distinguished: sargin, tapi, peshqul and lar. Tapi is a type of dungcake made from collected cattle manure, most of the time mixed with chaff if the person owns agricultural/irrigable land and cultivates grain. Yet there are NSP communities among the studied the people of which cannot mix chaff with manure because they have no chaff. Sargin is dried loose cattle manure, peshqul are dried pellets of sheep or goat dung. Lar is sheep and goat manure taken out of stalls or animal shelters, dried and broken into pieces. The above mentioned animal products/ fossils are the main fuel used for baking, heating, making hot water for washing and making tea mixed with wood in the NSP communities which are far from the mountains e.g. Kariz, Folol Bala, Chap Darah, Zarmokh and some communities belonging to the Darah Kalan NSP shura. Lar is preferred for heating as it burns long, but peshqul, tapi and sargin are mainly used for baking and heating water for laundry cleaning.

2.1.4 Use of agricultural plants for heating

In addition to the above mentioned locals of the studied NSP communities use also crop residues for fuel purposes. Pakhal (flax straw) is used as animal fodder and fuel for baking. After reaping the flax plant turns yellow and farmers leave it in the fields so that it dries up before having the plants treshed/flailed by cattle for seed extraction. The dried-up residue is then brought to the farmers' houses and stored for the winter. Kunjid payeah (sesame straw) is used for baking and tea-making in Zarmukh and Darah Kalan NSP communities where people have some plots of irrigated lands. Sesame is not reaped, but usually gets pulled out as a green plant. Farmers leave it on top of their roofs or in the field for one and a half or two weeks to have it dry up. In this period the seeds fall off. The residue is transported to the homesteads after it has totally dried up.

2.1.5 Fossil fuels: diesel, petrol, coal

Besides above described natural fuel types, rural dwellers of the study area use diesel, petrol and coal to a limited extent. Diesel and petrol is used for lighting in the absence of electricity, some households in each of the studied NSP communities also use diesel for starting the fire of the bukhari (wood stove) in winter. Diesel and Petrol are bought from the local bazaars in Burka or Ishkamish town. Coal is not very common and hard to access in the studied communities, but where available the richer strata of society – households of big land owners, rural elites like former arbab and/or commanders – tend to use it for heating during the winter season, because they have are likely to use bukhari ovens.

Table 2: Percentage of households using fossil fuels in 2007

	Spring	Summer	Autumn	Winter	Year
Diesel	100.0	100.0	100.0	100.0	100.0
Gas	72.9	72.9	72.9	70.8	72.9
Coal	0.0	0.0	0.0	12.5	12.5

2.2 Use and change over time

The questionnaire (see A6) intended two things:

- to provide an overview over the different kinds of fuel used in the rural areas of Burka and Ishkamish,
- to map trends and changes in fuel (and timber) harvesting and trading over time (40 years), taking the time period of peace under Zaher Shah and Daoud, i.e. the years before the outbreak of the so-called 'revolution' as starting point (Question 1). Speaking in years, the research team tried to collect information regarding fuel use according to purposes at four different points in time over the last 40 years in order to generate some insight into changes that have occurred meanwhile:
  - before 1979/1358,
  - before the Karzai government (Taliban rule),
  - two years back (2005/1384), and
  - current use patterns (2007/1386).

Respondents were asked to name the fuels used in order of amounts. During the piloting phase for the questionnaire it turned out to be not feasible to ask respondents to try to estimate the amounts of each fuel used in the past. Interviewees could not tell how much and how much in proportion their use of each fuel type had been many years back. Thus the research team decided to try to leave this dimension for qualitative data gathering. [15]

Use amounts asked for at different times focused on six use purposes: (1) baking bread, (2) cooking, (3) heating and boiling water, (4) heating, (5) lighting and (6) storage for potential sale (section 2.3.2).[16]

[15] However, in order to make maximum use of the order in which the fuels were given, several methods were considered by which to allocate an index that would give some indication of the relative amounts used (see discussion in Appendix 3/A3) and it was decided to use a harmonic system. In this system, a weight of 1/1 is allocated to the most used fuel, 1/2 to the second most used fuel, 1/3 to the third most used fuel and so on. These weights are totalled and then a normalised index calculated by dividing each weighting by the total. Furthermore, in order to allow for higher use of fuel by households with larger numbers of members, a combined index was calculated for each fuel used in each household by multiplying by the number of household members. Presumably this tends to underestimate fuel index for previous times because of changes in household size. For each fuel, the index allocated to it by each household was added. The totals of all the indices for each fuel were again normalised by calculating a grand total and dividing each total by the grand total.

[16] In the following the main fuel use purposes (1-5) will be mapped stating fuel types used and long-time change processes (storage patterns will be discussed in section 2.3.2). For consistency of this report only the aggregated figures will be discussed in the text below, i.e. one chart is given to indicate the change over time for different fuels

(1) Baking bread

Figure 2: Indices for fuels used for baking currently

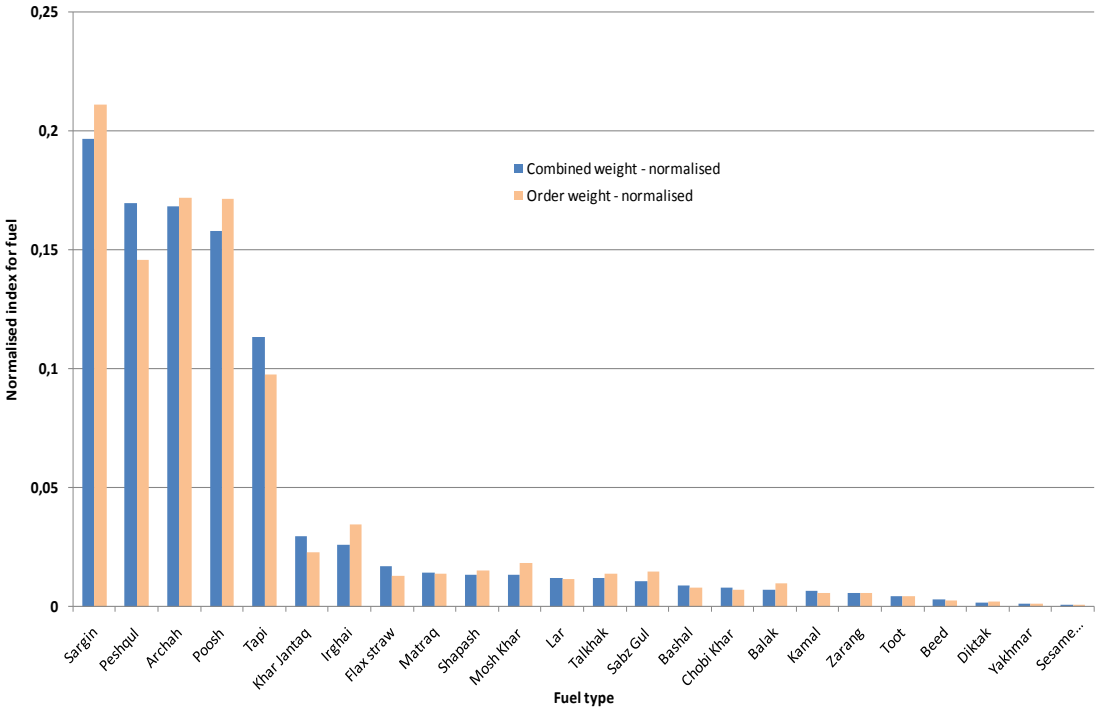
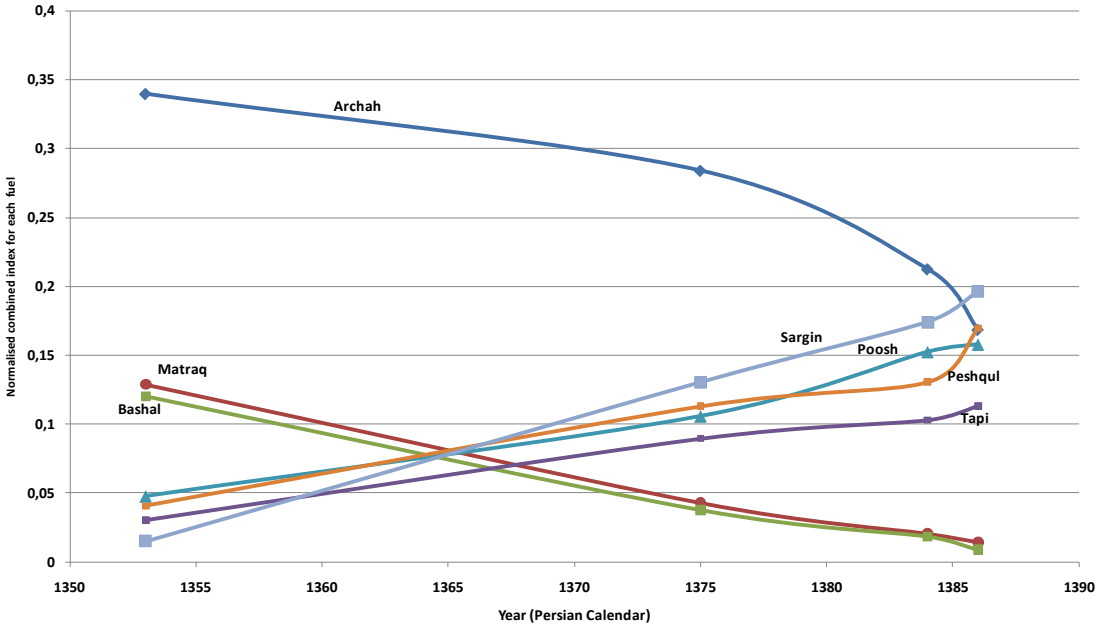


Figure 2 indicates the most popular fuels for baking currently are: sargin, peshqul, Archah, Poosh and Tapi, in other words three kinds of animal fossils as well as Juniper and Artemisia. By comparison, quantities' estimates for the past and qualitative interviews showed that before the revolution mainly Archah, Matraq, Bashal, and Irghai were used for baking, all wood fuel types.

Figure 3: Comparison chart fuel uses over time for baking

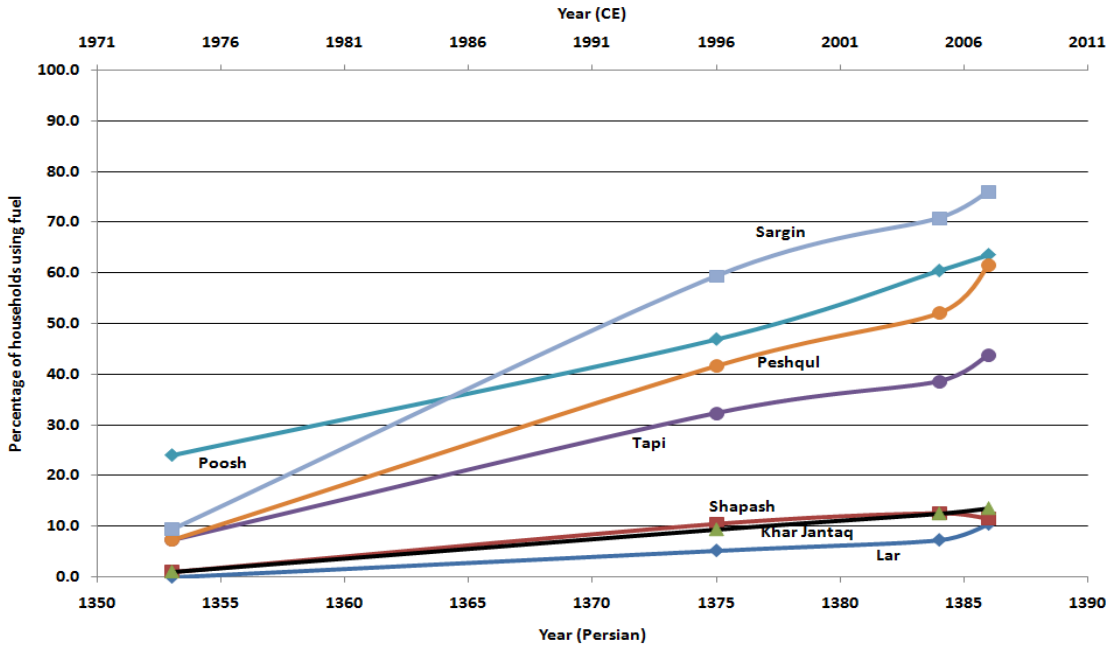


used, but not the individual charts at all 4 points in time which data was aggregated for. For the latter and a detailed discussion of the questionnaire and methodology refer to A7.

The variation of fuel used for baking with time manifests itself in seven main fuels: the wood fuel types Archah, Matraq and Bashal plus the animal fossil types tapi, Poosh, peshqul and sargin. Figure 3 visualizes how the former's use has decreased and was obviously compensated by a heightened use of animal fossils. According to above Figures (2-3), Archah was the most widely used fuel until fairly recently (1385/2006-07). It is now the second-most important fuel for baking after sargin – which had not been used at all almost in the past – and Archah is also used in about equal amounts as peshqul. The underlying reasons for this shift in fuel use are related to socio-economic changes that occurred on household level. For once, population growth triggered exponential higher demands in general, but due to the use of baking pans in former times Archah was the preferred fuel type because the pan outweighed the high fuel value of Archah, what is perceived as disadvantage of Archah use in baking today.

Reasons for the increased popularity of sargin (index + 9,4 to 76% of households, see Figure 4) is likely to be that it can be easily collected and is easily accessible around people's houses. At a time when wood fuel became scarcer, animal fossil usage – of sargin, peshqul and tapi – filled the gap. Sargin was reported to be very popular lately also because of its fire value for baking, i.e. it burns long without making smoke. Peshqul is even considered more valuable for baking regarding its fuel value, yet since it is pellets from sheep and goat the collection is rather difficult – not only because of the consistency of the manure, but also because of the distances the collectors would have to cover as sheep and goats usually graze high up in the mountains during the day. Thus accessible peshqul gathered from the animal shelters in the morning time is used but no extra effort is made as yet to collect it in rather remote places. The still existing relative diversity of fuels qualifies the need to chase peshqul in all locations.

Figure 4: Trend in percentage of households using fuel for baking – increases

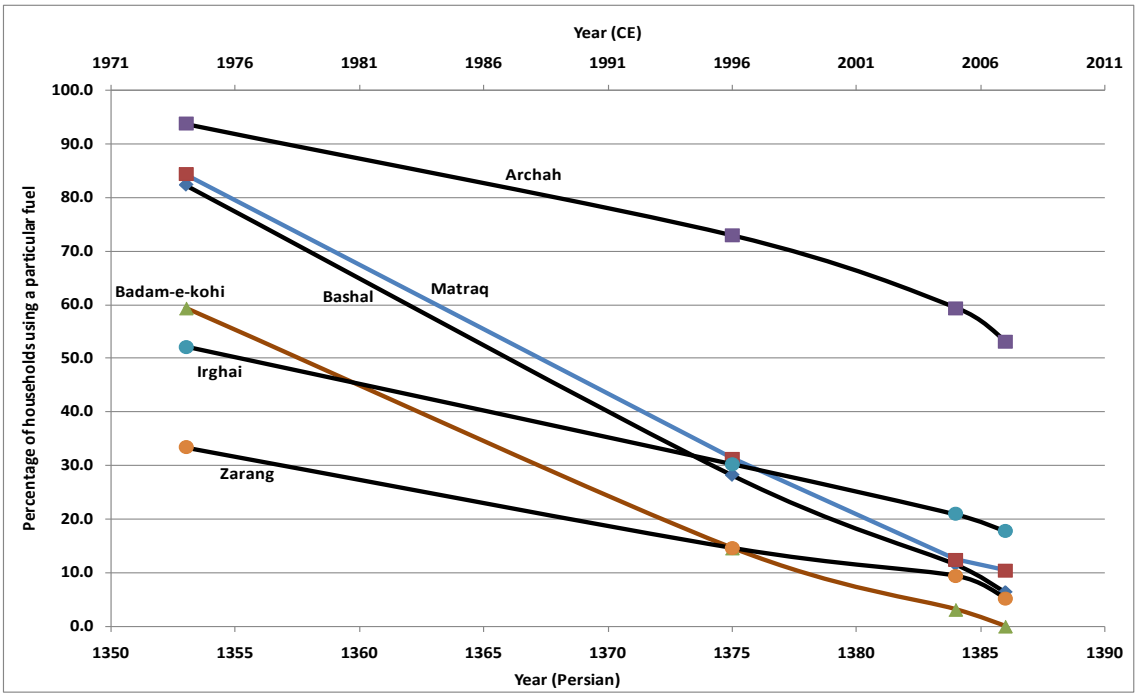


Juniper/Archah as the third most popular fuel for baking, it is used with caution because of its too high fuel value. This means Archah develops too much heat and subsequently the bread will burn.[17] Poosh/Artemisia is on forth position in the baking-ranking. As a common shrub it is used for many different purposes, but for baking it is mainly used to start a fire with the other fuel types or as second-place fuel mixed with tapi, Khar-e jantaq and Irghai when the tandoor is already over its peak heat.

[17] This applies for households' ovens (tandoors) in the local communities. Bakeries surveyed in the municipalities of Baghlan province (Pul-I Khumri, Baghlan-e jadid, Baghlan-e kohna, Fobrika) rank Archah as first priority wood for heating the baking ovens. The only reason for not using it is its comparatively high price (see Chapter III).

The relative loss of significance of wood fuel for baking has resulted from decreasing wood species populations (Figure 5): Matraq, Bashal and Irghai have almost vanished from the mountains in both districts; only single trees can still be seen in remote places. The reason is simple: Matraq and Bashal, but also Irghai grew in lower-lying valley and were easier accessible from human settlements. In addition, the relatively soft woody structure of these species and the fact that they have leaves instead of needles like Archah, these species also ranked prominent among the livestock herds and have been harmed by grazing. Given the fact that no management structures existed and degradation continued unabated, the leaves species (other examples being Badam-e kohi, Zarang and Akasi) suffered most. If such wood is still collected today, it is rather sold or mixed with other fuels than used for baking – in light of non-woody alternatives like shrubs and bushes (beta) and animal fossil – because of economic hardship and a lack of alternatives for cash-income generation.

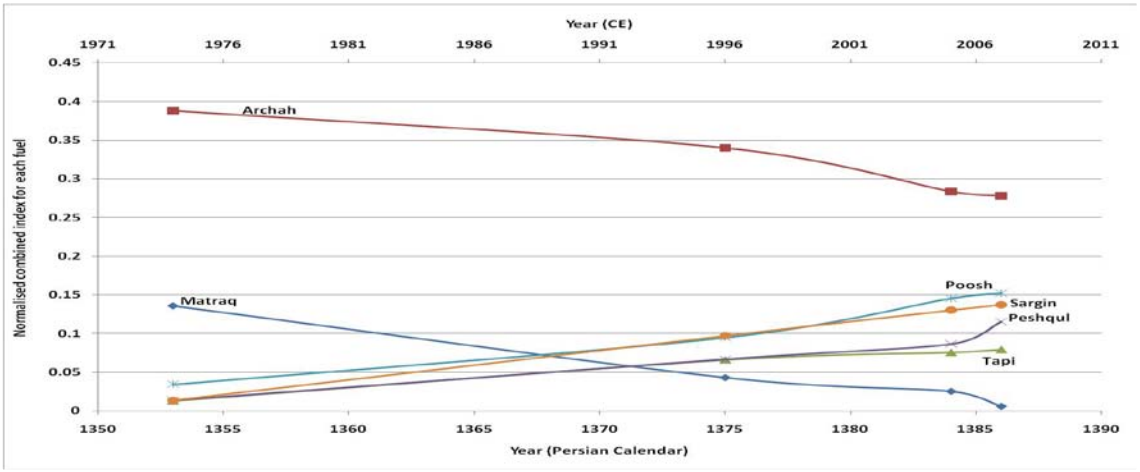
Figure 5: Trend in percentage of households using fuel for baking - decreases



(2) Cooking and (3) Boiling/heating water

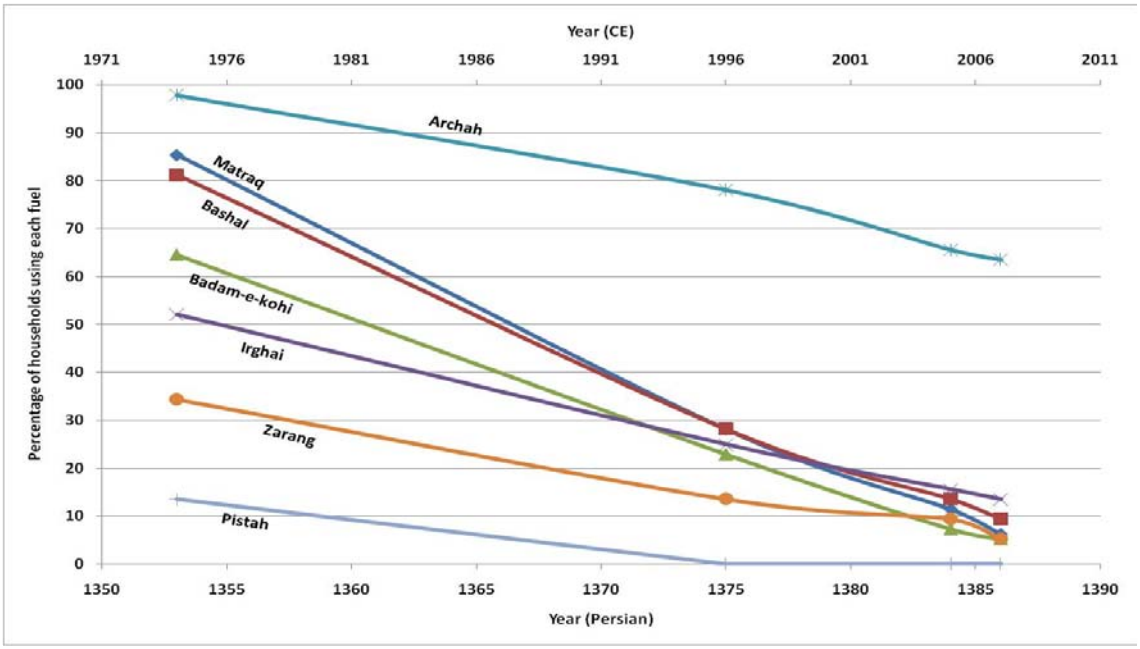
When shifting the focus on cooking and heating up water for cooking, or boiling water to make tea, similar patterns of decrease and increase of different fuel types as for baking (1) emerge, yet with the significant difference that Archah still prevails as the most important fuel due to its fuel value. The figures below display the changes over time in fuels used for cooking (Figure 6) and water-making (Figure 9).

Figure 6: Fuels used for cooking over time



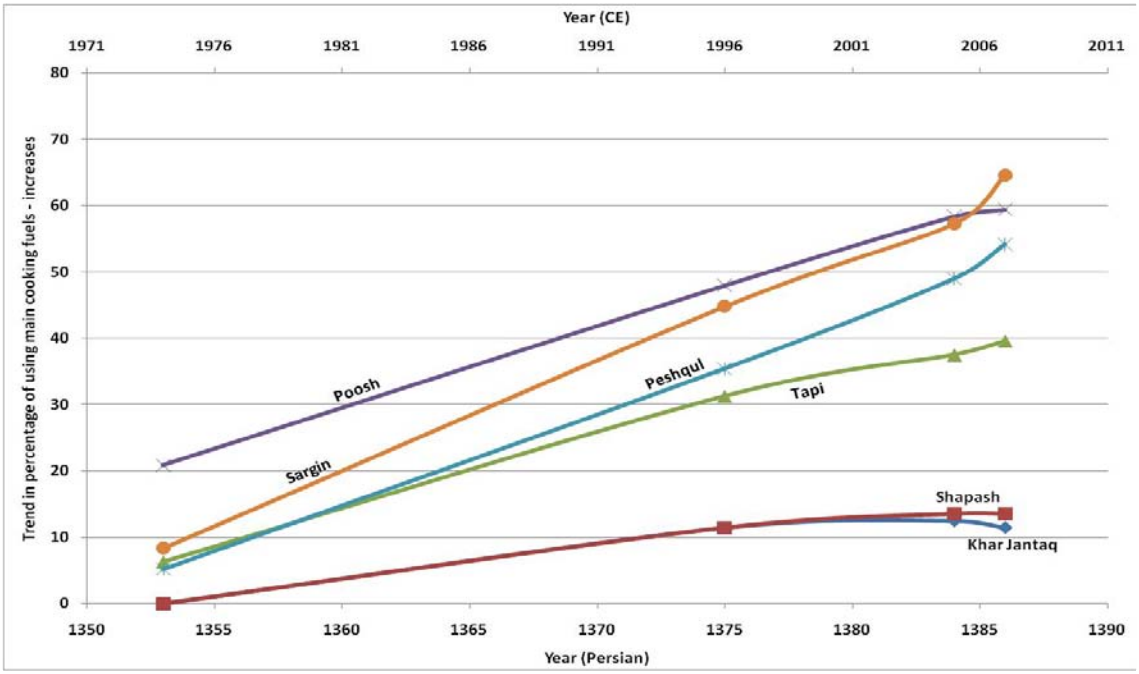
Despite sargin and, to a lesser extent, peshqul gain prominence also for cooking and water heating purposes, the significance of Poosh/Artemisia can be detected as most valuable fuel plant after Archah. It has seen a constant rise in usage since the pre-revolution period. The same holds true for water-making purposes (see Figures 9 and 11 below). Since the mid-1990s (after 1375) gas has gained in prominence for water-heating in households (Figure 11).

Figure 7: Trend in percentage of households using main cooking fuels - decreases



The decline of Matraq, Bashal, Badam-e kohi and Irghai can be interpreted along the same lines as was done for baking. Pistah was never commonly used for cooking. In short, usage of most tree and bush species have reduced to negligible amounts apart from Archah.

Figure 8: Trend in percentage of households using main cooking fuels - increases



Again we see an increase in the amount of Poosh and manure based fuels. There has been also an increase in the use of Shapash and Khar-e jantaq.

In contrast with the cooking chart (Figure 6) the below curves for Archah (Figure 9) as well as for Bashal and Zarang (Figure 10) see a sudden drop in the last year or so before inquiry (2005-2006). The reason is not clear, it might have to do with the respondents' 'awareness of wrongdoing' because, first, cutting of wood fuel is legally prohibited and, second, animal fossils are quite practical for kettles. So it is not surprising, that the usage of peshqul (Figure 11) had a suitable 'jump up' for the same time period.

Figure 9: Variations of indices with time for most important fuels used for boiling water

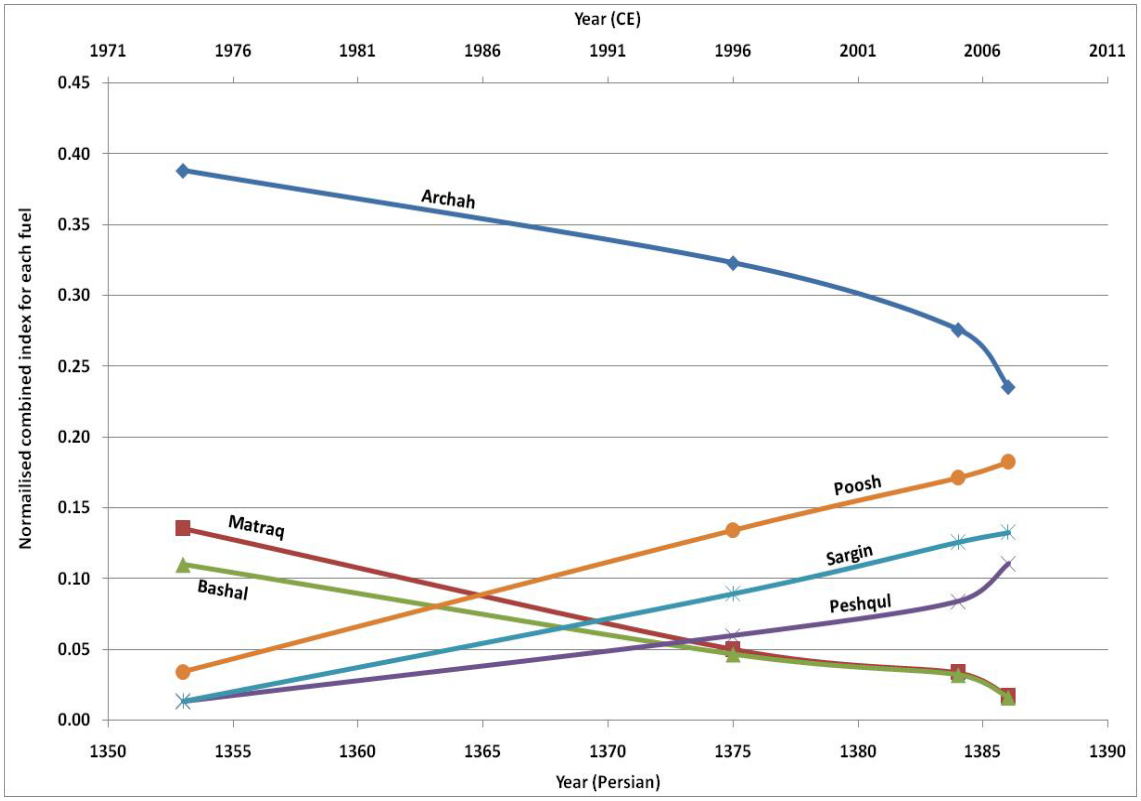


Figure 10: Trend in percentage of households using main fuels for boiling water - decreases

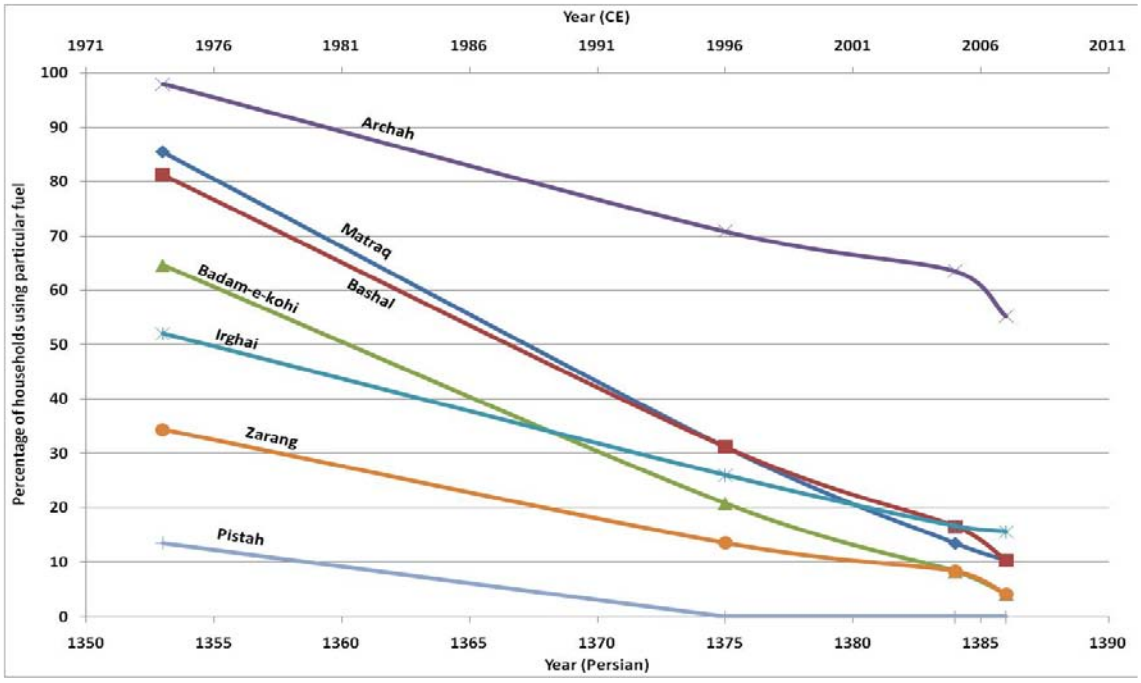
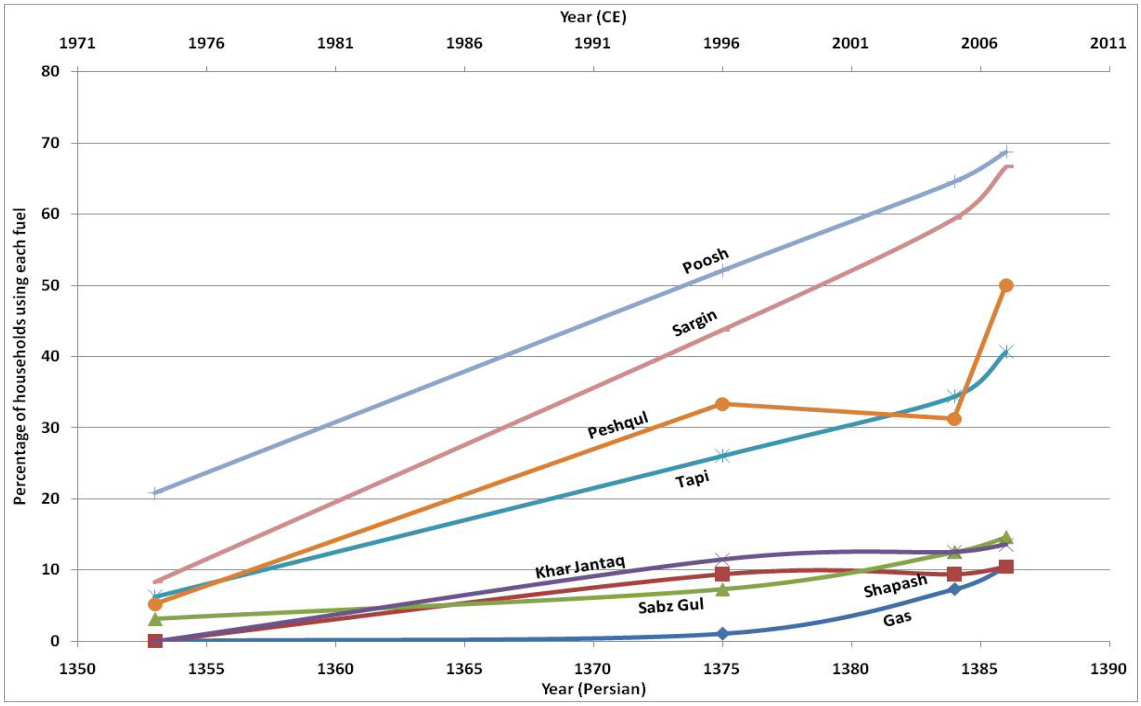


Figure 11: Trend in percentage of households using main fuels for boiling water - increases



(4) Heating

From comparing below graph 'Trend in percentage of households using most common fuels for heating' (Figure 12) with the same graphs for baking, cooking, and heating water it becomes apparent, that Archah still has tremendous significance for heating. While for other household purposes Archah use declined more significantly (baking near 50%, cooking near 60%, boiling water 55%), 75% of all households surveyed still mainly rely on Archah to heat their houses.

Figure 12: Trend in percentage of households using most common fuels for heating – declines

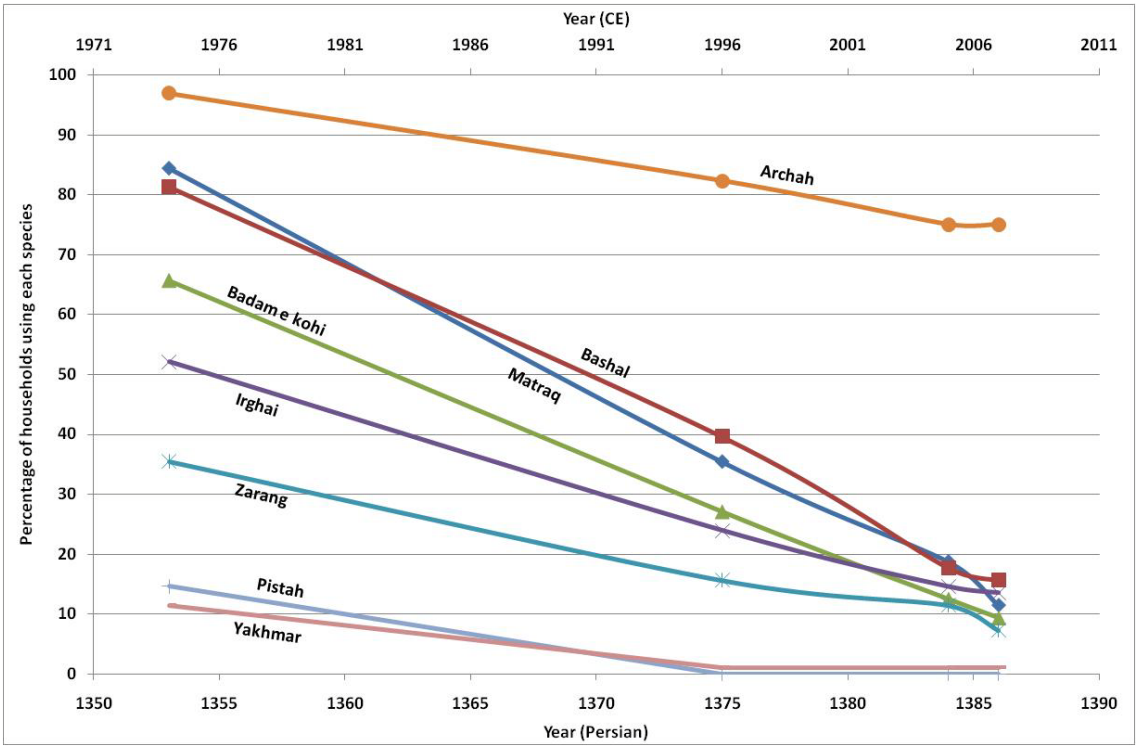


Figure 13: Trend in percentage of households using most common fuels for heating - increases

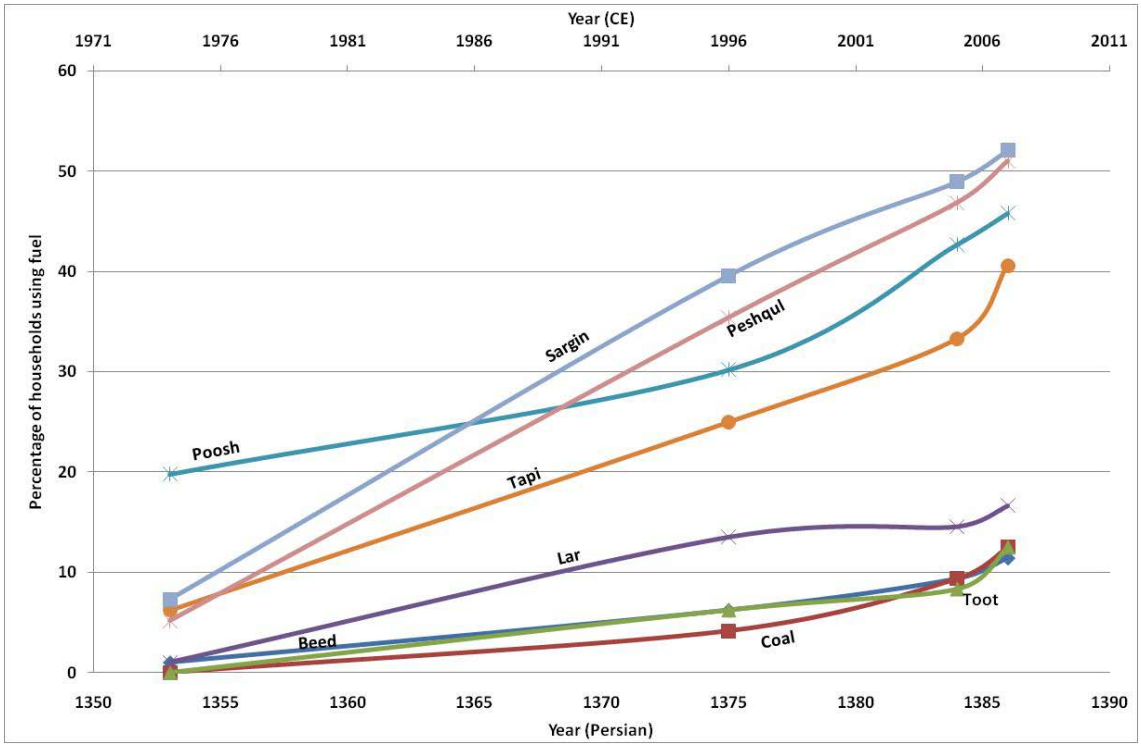


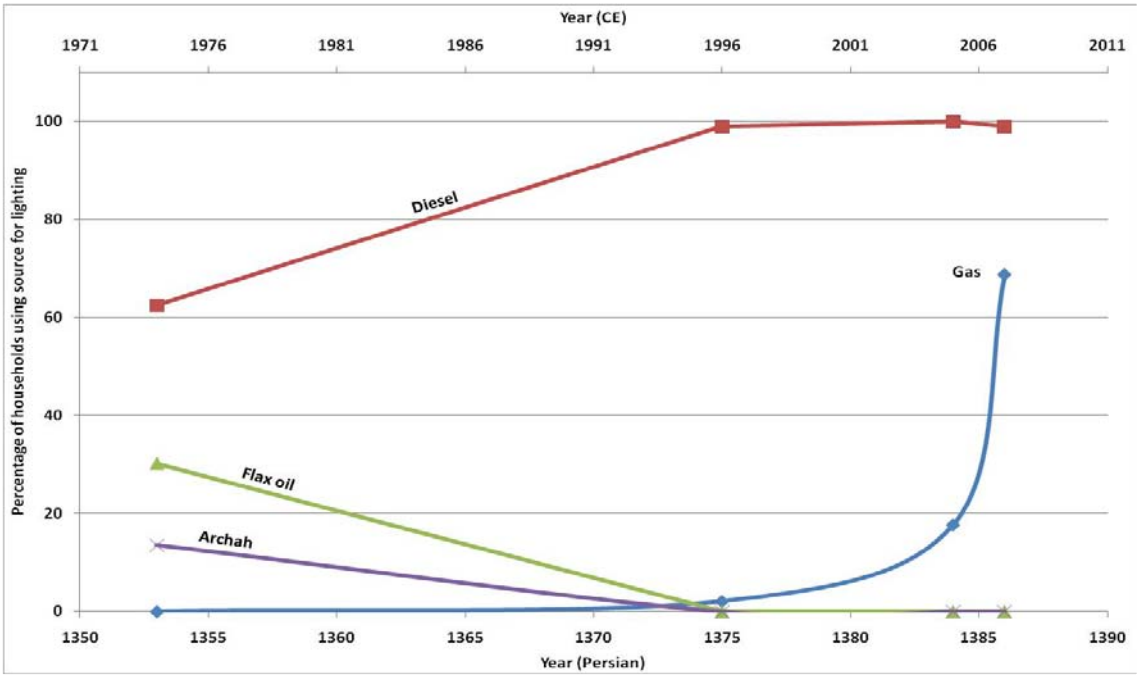
Figure 13 shows that the trend for coal usage has been on the increase in the last years. At the time of field research 12,5% of all households said to use coal in the winter (Table 2). As mentioned before (section 2.1.5) a broader popularity of coal is restrained by its limited accessibility in the districts and heating infrastructure, i.e. coal is used by most of these 12,5% as supplementary heating fuel besides wood because people largely use sandali-'ovens' which run on embers. Usually a household has one oven fired with wood (and possibly coal at a later point of time in the day) to warm up water. From this oven ember is taken to the separate rooms to heat a vessel or similar covered by a blanket where people put their feet and legs under.

The similar increasing trend of Toot usage has to be seen in connection with garden renewals. Usually old trees which do not bear fruits anymore are cut and sold. Toot is very popular for heating because it has a good fuel value: It is said to burn long, without smoke (see also sections 3.2 and 5.1).

(5) Lighting

Figure 14 depicts the most common fuels used for lighting in the investigated communities over the last decades: diesel, gas, flax oil and Archah (in form of wood shavings). On average only one to two households in one community used generator electricity at the time of field research, of the respondent households none reported to use electricity for anything. Generators run with petrol which has to be purchased in the bazaar. Diesel is used in lamps. Since it became accessible to villagers in the 1970s after Afghanistan had started to import it, diesel has increasingly replaced the use of flax oil (low lighting quality) and Archah for lighting. In addition gas has become more widely used since 2002. As it is more expensive than diesel, only better-off people make use of it.

Figure 14: Trends in most common fuels used for lighting showing - percentage of households



2.3 Amounts and collection patterns for different fuel types

2.3.1 Current fuel use amounts

To learn about the amounts of fuel collected and used in both districts the question: How much fuel does your household collect (in which measurement units) or buy, and how much is used in different times of the year (currently)?, was asked from the respondents.[18] The measurement unit for fuel collection, use and sale turned out to be solely the donkey load. Yet given that donkeys vary in physical appearance and capacity as fuel types vary in bulkiness, an average of all the minimum and maximum figures for estimated weight in ser[19] was established, with the average outcome of 10,31 ser per donkeyload, thus 72,2 kg. On this basis weight totals were determined for all uses only, not according to specific purposes. The results converted into tonnes (t) are given in Tables 3 and 4.

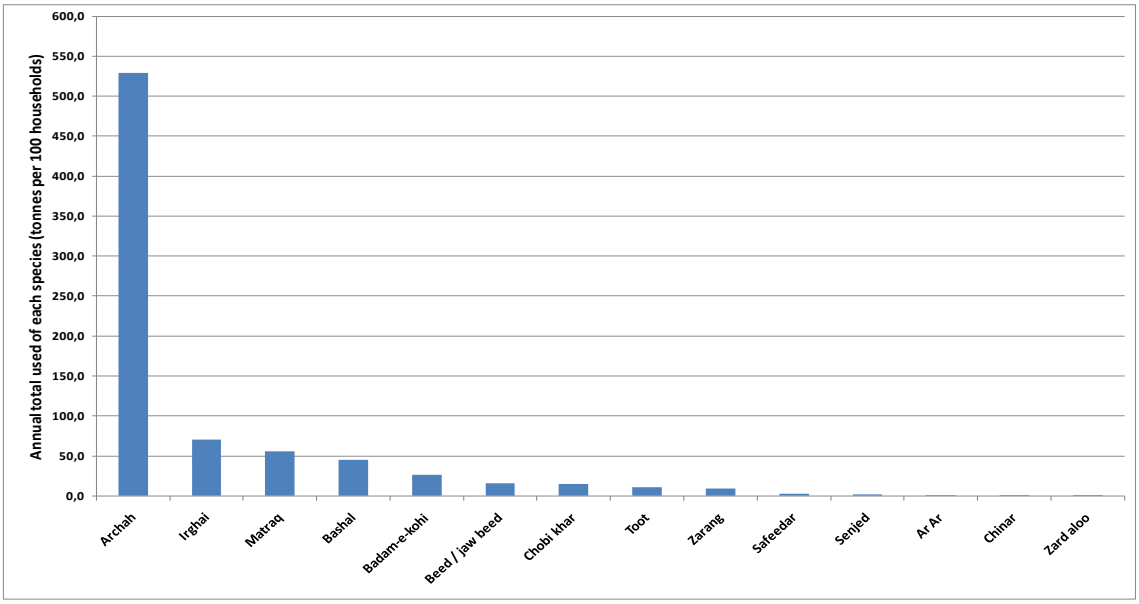
Table 4 shows the estimated amounts and annual totals of wood fuel used at the time of field research. Table 5 highlights the same data for non-woody plant fuel types, i.e. beta (bushes and brush species) and residues of agricultural plants (flax and sesame straw). What can be detected from Table 7 is that 87,5% of the households interviewed burn wood, Archah is used by 77,1%, whereas other species like Matraq (17,7%) and Irghai/Bashal (each 16,7%) are used considerably less. Of fruit trees Toot is used by 12,5%, Senjid (2,1%) and Zardaloo by 1% of the households surveyed. These trees are usually grown in gardens and in front of houses. Moreover respondents mentioned minor fuel use of actual timber trees like Safedar (3,1%) and Beed/ Jaw beed (14,6%).

The average amount of trees used per household per year is 7.853 kg (7,8 t), of which alone 5,28t is Archah wood. Hence, a typical village of 200 households would remove around 1.570 tonnes of wood (1.056 tonnes Archah) per year. This is equivalent to around 2.500 m³ and over 1.000 trees with an average volume of 2,5 m³.

[18] Already the first inquiry regarding the purpose of fuel use did not show any significant results for storage amounts. This question was meant to cross-check the information by introducing a seasonal distinction of collection and use patterns and to subsequently estimate the stored amounts.
[19] Ser is the popular local weight unit. One ser equals 7 kg.

Figure 15 shows the amount of each tree species used per year aggregated for 100 households arranged in order. Accordingly 100 households annually use 528,7t of Archah, 70,4t of Irghai, 55,9t Matraq, and 45,5t Bashal.

Figure 15: Average amount of tree species used per year per household



More than one third (36,46%) of all households uses only one tree species, just over a fifth (20,83%) use two species, slightly less households use three different species for wood fuel (17,71%). At the same time 12,5% of all households surveyed indicated that they would not use any wood fuel at all.[20]

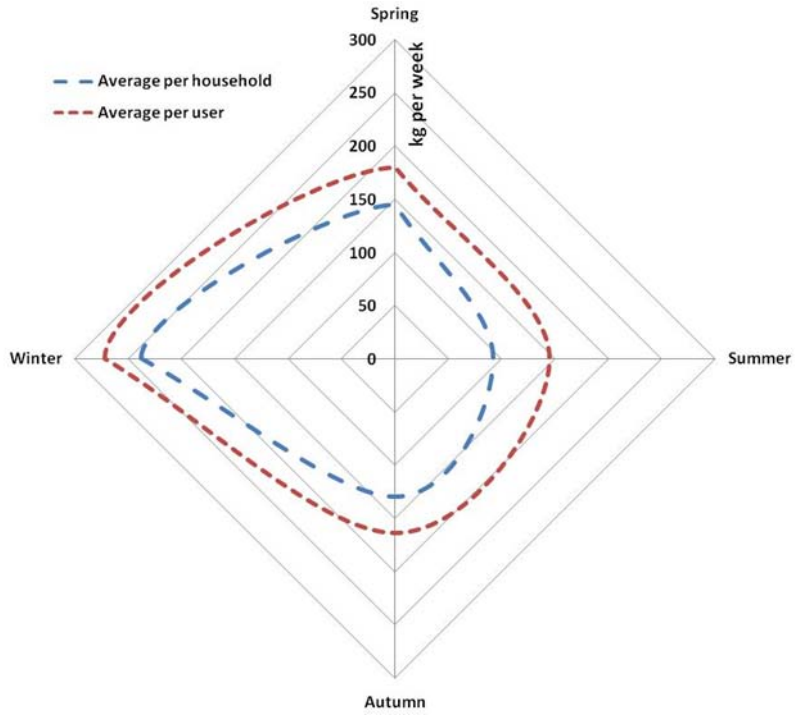
Not surprisingly, the seasonal analysis shows the highest use rate of wood fuel during winter season (3,1t per household), followed by spring time (1,9t) and autumn (1,7t). However, the volume of wood fuel used in the summer is with 1,2t per household still very large given that heating is not necessary. The qualitative inquiries indicated that this is mainly due to tea-making during the summer. The overall averages – aggregated to include households that reported not to use any wood fuel at all – are visualized in Figure 16 below.[21]

Table 4 shows the estimated amounts and annual totals of non-wood plant fuel, i.e. bushes and crop residues, used at the time of field research; moreover the percentage of households using each species is indicated. Thus, 85,4% of all households interviewed use brushes and crop residues for fuel purposes, these are slightly less households than for wood fuel (87,5%) as mentioned above. Yet the main non-wood fuel use is from Artemisia/Poosh, which 79,2% of all households said to use. However, 52,1% of the households indicated to use non-woody fuel plants without Poosh, which shows that although Poosh does play an outstanding role as fuel plant, shrubs and also crop residues – if available – are quite popular. Of the former Sabzgul (used by 17,7% of all households), Khar-e jantaq (15,6%), Mosh khar (14,6%) and Shapash (12,5%) are worth mentioning. Where people can cultivate crops every 10th household (10,4%) makes use of Pakhal (flax straw).

[20] Against this background the average per user-data was determined.

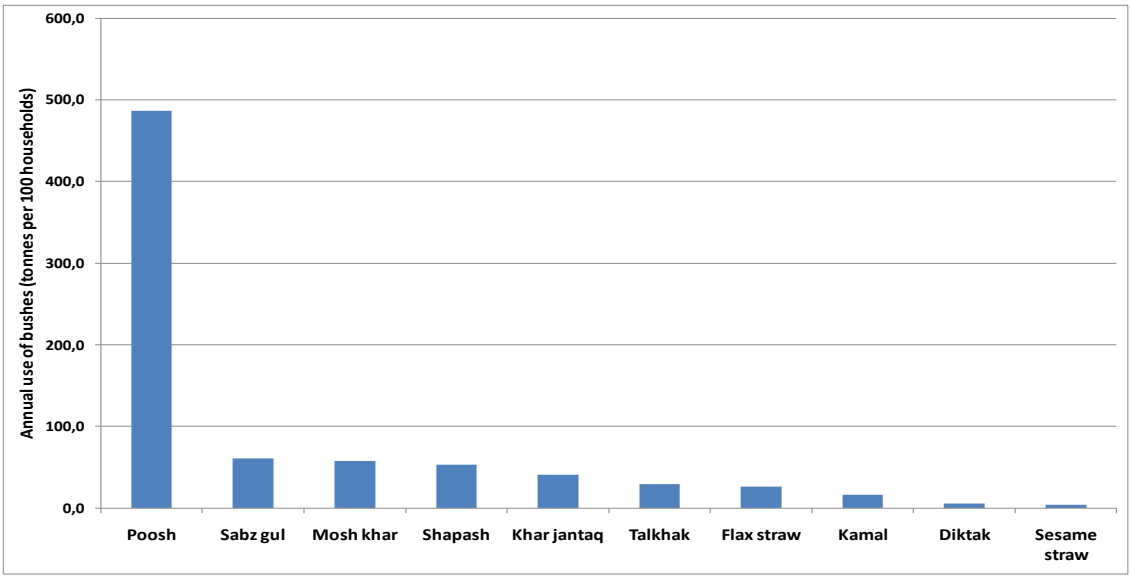
[21] The data shown are overall averages including households that say that they do not use trees. Only 87,5% of households said they used trees at all; thus, i.e. 12,5% reported using no trees. The average use per household for those actually using trees would be about 12,5% higher.

Figure 16: Average amount of trees (kg/week) used per household in each season



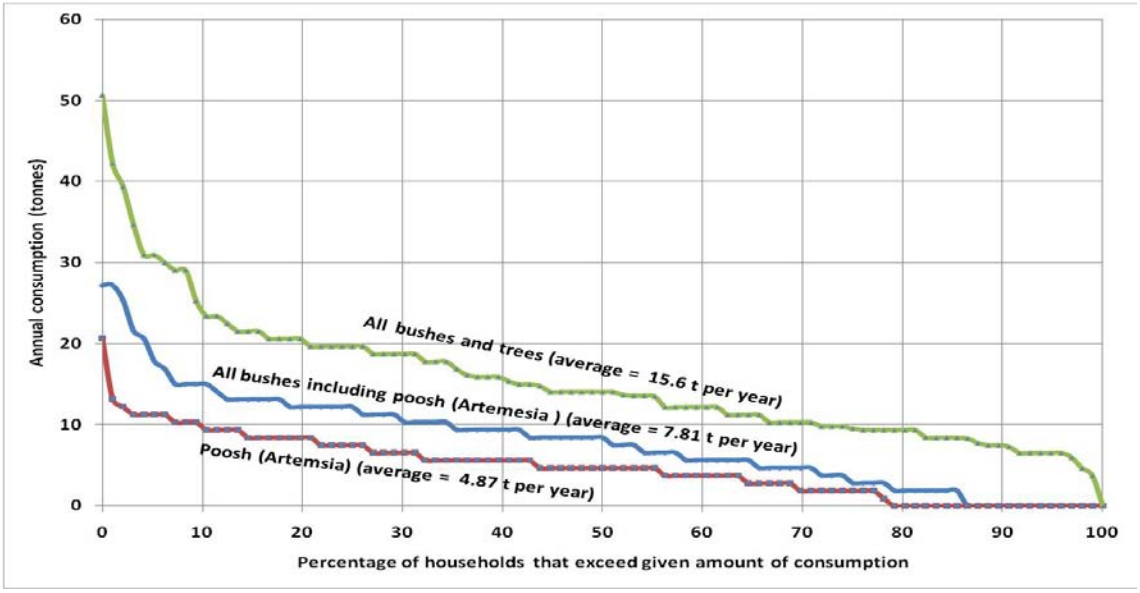
The annual user averages amount to a total volume of 780,9t for 100 households, thus 7,8t per single household. This is almost the same annual amount as for trees used (785,3t per 100 households), thus adding up to a fuel usage total of 1.566,2t for 100 households or 15,66t per individual household per year on average – of which 5,3t are made up of Archah wood and 4,9t of Artemisia. The remaining 5,5t of fuel used annually derive from wood and non-wood fuel equally, thus the third most used species is Irghai (0,7t per household annually), fourth is Sabzgul (0,6t), followed by Mosh khar (0,57t), Matraq (0,56t), Shapash (0,53t) and Bashal (0,46t). This is evidence for the fact that Artemisia/ Poosh is the second most important fuel plant for heating purposes. It is further surmised by the comparative low use numbers for Poosh in summer (98,7t) versus the other seasons (111,4t-123,2t-153,5t). Figure 19 visualizes the popularity of Poosh versus the other non-woody fuel plants.

Figure 17: Annual amount of bushes and crop residues used per household



It is clear from Table 4 that 14,6% of all households do not use any bushes or crop residues for fuel purposes. They either use wood fuel exclusively or a combination of wood and manure/ animal fossils. The weekly use patterns for non-wood fuel plants in different seasons are depicted in Figure 19. Annual totals amount to the same volume in spring and summer, i.e. 165,2t per 100 households, increasing to 201,4t in autumn and 249,3t in winter season.

Figure 18: Cumulative graph of annual usage of trees and bushes



Taking the central 60% of households we see that annual Poosh (Artemesia) use ranges from about 0 to 8 tonnes per year, use of all bushes including Poosh ranges from around 2 to 12 tonnes per year and use of all trees and bushes ranges from around 9 to 20 tonnes per year per household.

Figure 19: Seasonal usage of bushes (kg per week)

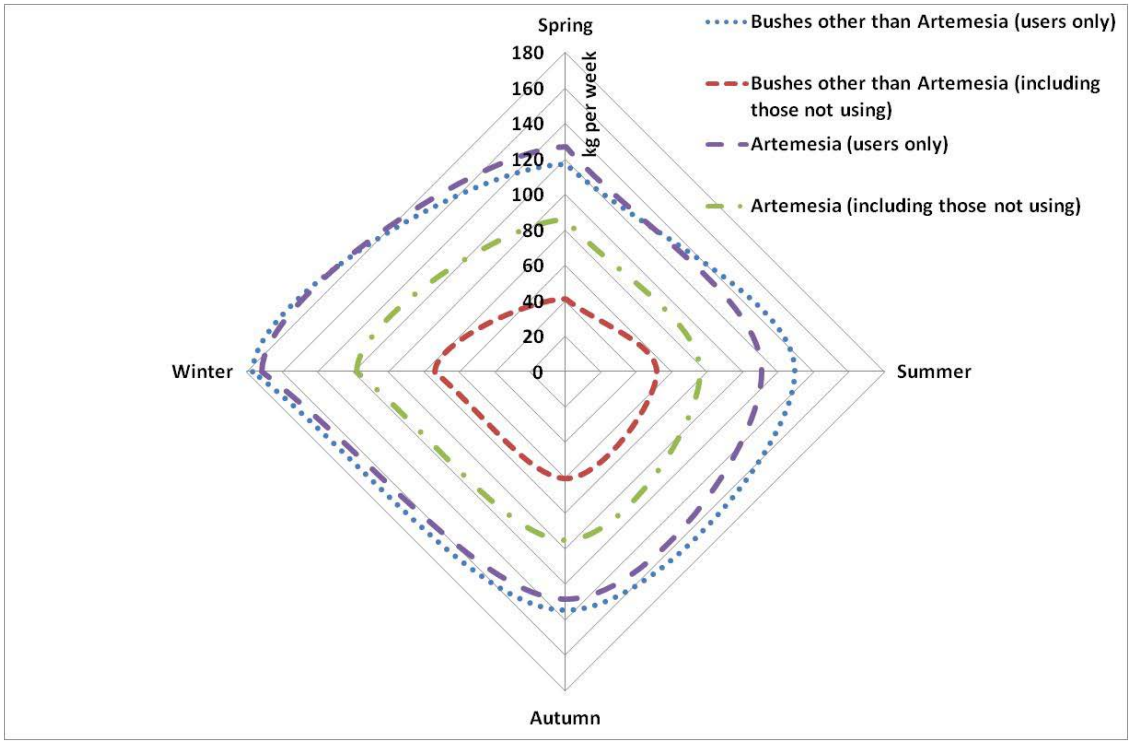


Table 3: Tree species used in 1386 (2007)

Tree species	Spring		Summer		Autumn		Winter		Whole year	
	average per household (1) (kg)	average per user (2) (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)
Archah	1.211	1.761	752	1.388	1.220	1.697	2.105	2.731	5.287	6.859
Irghai	177	1.061	157	944	143	979	227	1.451	704	4.222
Matraq	175	1.050	102	751	117	662	165	991	559	3.157
Bashal	131	898	103	758	94	601	128	819	455	2.733
Badam-e kohi	78	1.072	34	1.095	34	1.095	117	1.126	264	2.303
Beed / Jaw beed	22	719	8	751	2	150	127	871	159	1.090
Chub-e khar	39	1.251	20	938	59	1.877	29	938	147	4.691
Toot	5	469	0	0	2	188	102	813	108	868
Zarang	22	360	18	338	14	328	38	610	92	1.470
Safedar	0	0	0	0	7	328	23	751	30	970
Senjid	3	281	0	0	0	0	13	610	16	751
Ar Ar	4	188	0	0	0	0	3	281	7	328
Chinar	3	281	0	0	0	0	3	281	6	563
Zardaloo	0	0	0	0	0	0	5	469	5	469
Any	1.875	2.338	1.192	1.877	1.691	2.135	3.095	3.538	7.853	8.975

Notes: (1) Average per household is the amount used divided by the total number of households even those not using that type of fuel
(2) Average per user is the amount used divided by the number of households using that type of fuel

Table 4: Other plant fuels (bushes and crop residues) used in 1386 (2007)

Species	Spring		Summer		Autumn		Winter		Whole year	
	average per household (kg)	average per user(kg)	average per household (kg)	average per user(kg)	average per household (kg)	average per user(kg)	average per household (kg)	average per user(kg)	average per household (kg)	average per user(kg)
Poosh	1.114	1.646	987	1.436	1.232	1.665	1.535	2.232	4.867	6.148
Sabzgul	137	1.314	127	1.109	186	1.371	156	1.501	606	3.422
Moshkhar	137	1.095	98	1.043	137	1.010	205	1.516	577	3.954
Shapash	39	1.877	205	1.642	127	1.525	156	1.501	528	4.222
Khar-e jantaq	68	938	68	1.095	117	1.024	156	1.251	411	2.627
Talkhak	59	1.407	68	938	88	1.206	78	1.251	293	3.128
Pakhal	49	1.173	39	1.251	68	1.095	108	1.147	264	2.533
Kamal	20	1.877	49	1.564	49	1.564	49	2.346	166	3.988
Diktak	29	938	0	0	10	938	20	938	59	1.126
Kunjid payeah	0	0	10	938	0	0	29	1.407	39	1.251
ANY bush	1.652	2.265	1.652	2.059	2.013	2.416	2.492	3.278	7.809	9.143

Note: Average per household includes those households not using fuel, average per user is based only on those households who do use the fuel

Table 5: Average amount of different types of animal manure used in each season

Type of manure	Spring		Summer		Autumn		Winter		Whole year	
	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)	average per household (kg)	average per user (kg)
sargin	445	712	574	697	633	759	787	995	***2.439***	***2.927***
peshqul	486	916	341	778	480	839	778	1.311	***2.086***	***3.337***
tapi	357	761	364	793	403	805	669	1.212	***1.792***	***3.246***
lar	213	1.463	66	908	132	1.156	412	2.082	***824***	***4.164***
ALL TYPES	***1.502***	***1.638***	***1.344***	***1.358***	***1.648***	***1.666***	***2.647***	***2.675***	***7.141***	***7.216***

As wood and other plant-fuels are measured in donkey loads which were then estimated in ser and converted to kg/t, manure is usually counted in sacks. Table 6 gives an overview of the mean estimates for sack weights in kg of the four different manure types identified in section 2.1.3. The initial estimates were given in ser and converted into kg by the research team.

Table 6: Average weight of a sack of different animal fossils and description

Type of manure	Mean estimated weight of sack (kg)	Standard deviation	Description
sargin	27.2	10.3	dried loose cattle manure
tapi	33.9	8.7	dung cakes made from cattle manure
peshqul	44.9	12.1	dried pellets of sheep or goat dung
lar	54.3	14.4	sheep & goat manure from stalls, hardened and broken into pieces

The amounts of manure used in each season are indicated in Table 5 Accordingly animal fossil is part of the fuel economy of 99% of all households surveyed. The most commonly used type is sargin with 83,3% of all households using it, followed by peshqul (62,5%), tapi (55,2%) and lar, which is merely used by a fifth of the households (19,8%). The numbers underline the importance livestock has in the rural dwellers' livelihoods. The annual volume of manure used amounts to 7,1t per household or 714t per 100 households. This figure is almost as high as for the conventional fuel categories wood fuel and other vegetation fuel types. Given that section 2.2 brought to light that animal fossil was not used at all 30 years back and only fairly recently became prominent out of necessity due to the vanishing availability of other fuel types, this indicates the severity of the current state of degradation as well as the poor state of the local fuel economy. Only one household reported to use no manure at all.

In Table 7 the proportional percentages of the three fuel categories are listed as shares of the total fuel used. Accordingly wood fuel has the highest share in the total with 34,4%, but only slightly higher than other plant fuels (34,2%) and not far from the extent that manure is used (31,3%).

Table 7: Proportions of total for different fuel categories used

Fuel type	% of hh using	whole year average of single hh in t	whole year average per 100 hh in t	% of total fuel types used (rounded)
wood	87,5	7,85	785,3	34,4
of which Archah	77,1	5,3	528,7	23,2
non-wood plant	85,4	7,81	780,9	34,2
of which Poosh	79,2	4,9	486,7	21,3
manure	99	7,14	714,1	31,3
total	Ø 90,6	22,8	2.280,3	100

The average household usage of biomass from both, trees or bushes is 15,67 t with a standard deviation of 8,28 t (53%). If we include animal manure the average amount of biomass used by each household for fuel is 22,80 tonnes with a standard deviation of 9,02 (40%). This represents around half a tonne per week (about 7 donkey loads or a donkey load per day). Exactly 50% of households use more trees than bushes and 50% use more bushes than trees, whereas 12,5% use a combination of bushes and manure and thus no trees. Only one household reported using no manure at all. On average, use of manure, trees and bushes was almost equally divided: 7.14 tonnes per year of manure (s.d. 63%); 7,81 tonnes per year of bushes (74% s.d.) and 7,85 tonnes per year of trees (85% s.d.).

Taking into consideration the long-term developments as described in section 2.2 and as gathered from the semi-structured interviews and other qualitative methods applied, there are clear signs for a still growing

trend to use more manure and less wood and even other fuel plants. But this general pattern – as will be shown in the next section – varies considerably according to location of the fuel-using household.

2.3.2 Collection patterns and storage

Asked for storage patterns of the different fuel types the following picture emerged: Apparently, according to Table 8, all households store Zarang, Safedar, Ar Ar and Zardaloo. While the latter is a fruit tree (Apricot), Safedar and Ar Ar are mainly grown for timber wood, Zarang is a wild tree not grown in orchards. As the others are all garden trees, cutting is not legally sanctioned and the wood can be stored around the house without fear of getting fined. These species are used as winter reserves for heating. Khar-e jantaq is cut freshly in the months of Jawza and Saratan (May 21st – July 22nd, see A7) and also needs to be dried in order to gain a certain fire value. All other shrubs from the mountains are stored depending on the distance a household lives from the growing area of the different species. While Shapash and Talkhak are collected seasonally, all other species, i.e. Poosh, Sabzgul, and Mosh khar can be collected all year around. Talkhak and Kamal are collected when they are green and have to be dried. Kamal is used as animal fodder as well.

Storage patterns vary in relation to the extent of degradation in the vicinity of settlements. Thus, households close to the mountains, possibly at the entrance of longer remote valleys where degradation has not progressed too far yet, do not need to store major amounts of fuel because it is easily accessible all year around. Sesame straw (Kunjid payeah) and flax straw (Pakhal) are stored after the harvest. Pakhal is used exclusively as fuel, 90% of the households indicated to store it for this purpose. Sesame straw is stored by 66,7% of the households, most likely only by those with irrigated land on which they cultivate sesame. Furthermore the sesame plant leaves are popularly used as animal fodder for sheep. Animal fossils all need to be stored, because they need to dry up. Tapi is made in Jawza and Saratan to get dry in the sun during peak summer season in July/August. Lar is classical dung, being stored after the winter months after it was collected from the livestock's winter shelters (here goat and sheep).

Table 8: Storage of biomass

Wood fuel		Other plant fuel		Animal fossil	
species	% of hh storing	species	% of hh storing	manure type	% of hh storing
Zarang	100.0	Poosh	47.9	sargin	93.8
Safedar	100.0	Sabzgul	47.1	tapi	94.3
Ar Ar	100.0	Mosh khar	50.0	peshqul	98.3
Zardaloo	100.0	Shapash	50.0	lar	84.2
Toot	83.3	Khar jantaq	100.0		
Archah	77.0	Talkhak	88.9		
Irghai	75.0	Pakhal	90.0		
Beed /Jaw beed	71.4	Kamal	75.0		
Matraq	64.7	Diktak	16.7		
Bashal	56.3	Sesame straw	66.7		
Badam-e kohi	45.5				
Chub-e khar	33.3				
Senjid	0.0				
Chinar	0.0				

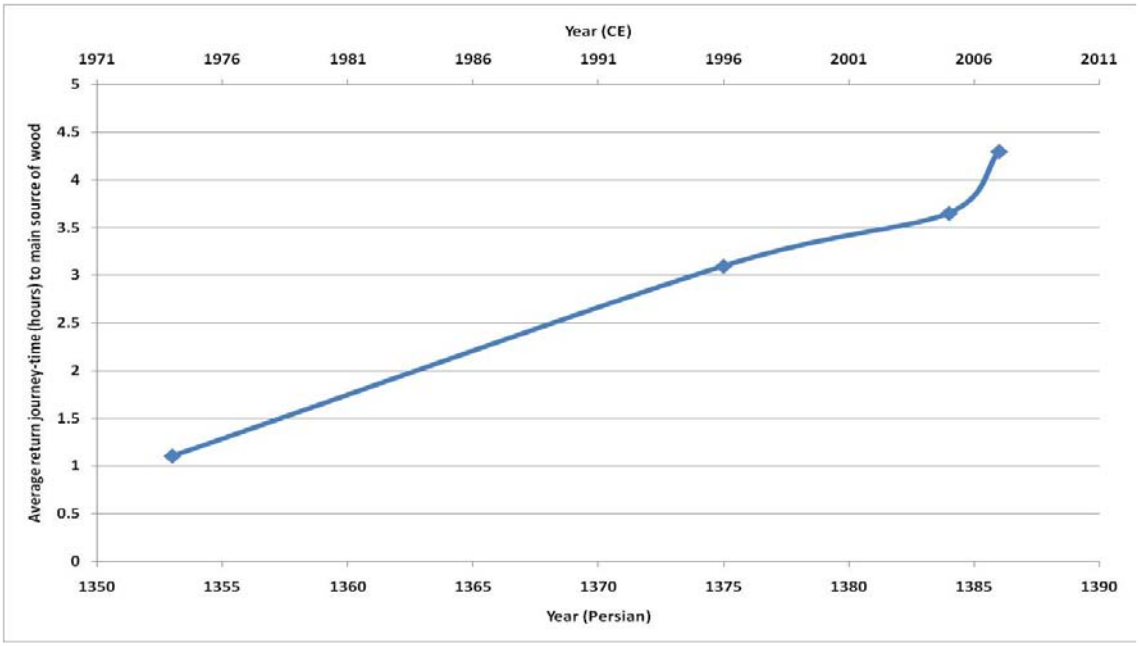
Storage and collection activities vary for all fuel types according to season – for once because of the climatic conditions, secondly because rural dwellers – at least some of the men in the household – are occupied with other income-generating activities during the summer. Many go for labouring during wheat and rice harvesting and for rice paddy planting to Kunduz and Takhar. Moreover, the destinations for fuel collection follow a seasonal logic as some parts of the still forest-covered valleys are hardly accessible in winter because they are located at the shady side of the mountain where the snow adds up. In line with

this, also the remotest places are visited in the summer in order to not decrease the amount of fuel in the broader vicinity of the settlements too soon.

During the qualitative data collection in the districts some detailed and insightful accounts of fuel collection patterns for shrubs and trees were obtained from people in each of the investigated eight NSP-communities. The pattern that emerges from these accounts can be summarized as follows: The peak season for wood collection is in autumn, because during the rest of the year, but especially in summer, most of the men in working age are busy with labouring, e.g. they head to Kunduz for reaping what, planting rice paddies and other labouring. During spring and summer these households often do not have any possibility to store wood at home, although – where the surrounding vegetations conditions allow it – women as well as boys also collect Mosh khar and Irghai in the mountains close to their settlements for own usage (Alochak Bala). Girls and boys are also often responsible for collecting sargin (Folol) during summer and autumn.

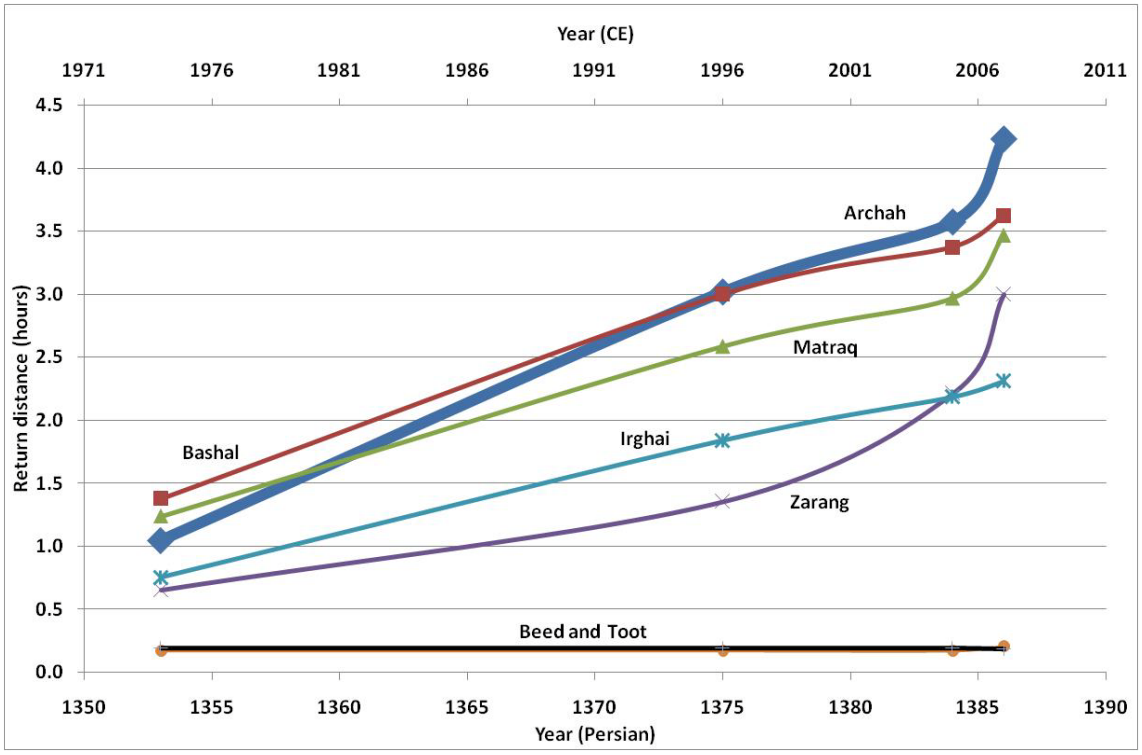
The distances people walk to collect (read: cut) fuel wood quadrupled in the last 35 years (Figure 20). If people found enough dry wood in close proximity to their villages three to four decades ago, they now have to walk between four and eight hours for fuel wood collection.

Figure 20: Changes in average return journey time (hours) to main source of fuel wood



This applies for the traditional fuel wood species (Archah, Matraq, Irghai, Zarang, Bashal). Figure 21 shows the distinct collection times for these species in comparison to garden trees (Toot and Beed) which are also used for fuel purposes.

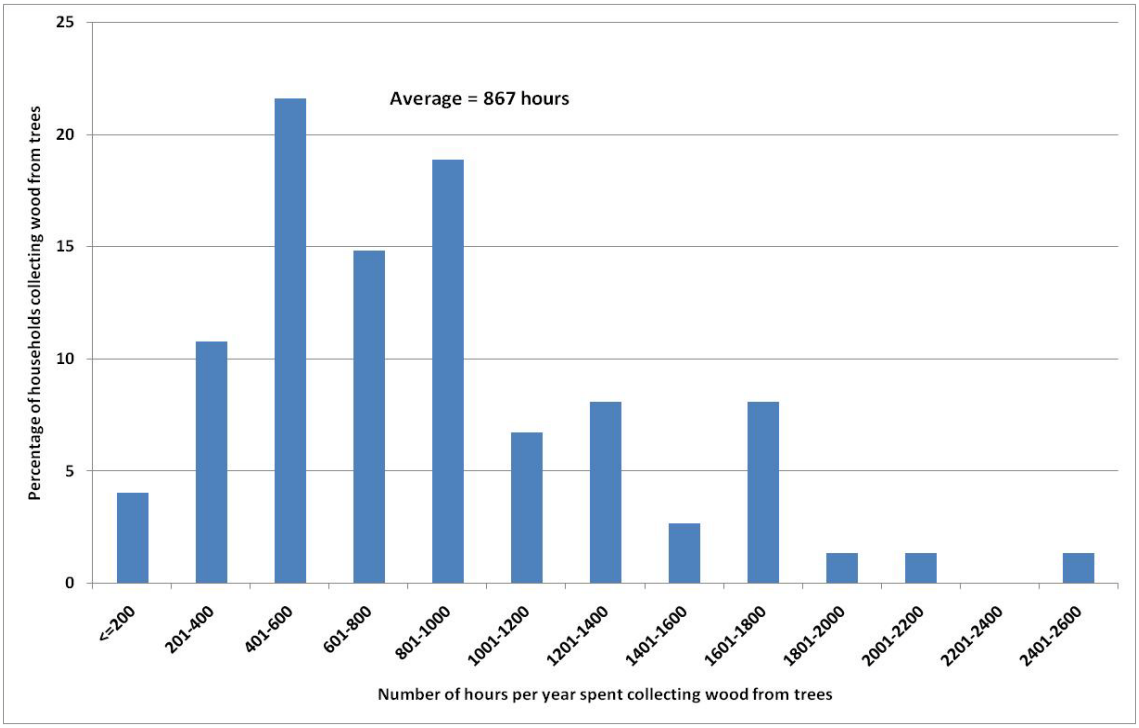
Figure 21: Changes in distance (hours) to reach main types of trees used



One consequence of increasing walking distances for wood collection is the increased amount of time each household has to allocate for it. In a year, this adds up to 867 hours as the average amount of time households need to cover their fuel wood demand (from trees, see Figure 22). Calculated on an average working day of 10 hours, 87 man-days of the year are solely spent with wood collection.[22]

[22] In 'western' man-days of seven hours the calculation would add up to nearly 124 man-days. In practice, however, seven hours are not enough to walk to the place of fuel collection, cut and collect and walk back. Above given 10 hours are more realistic in this regard. The average wood collected per hour amounts to 17,5 kg.

Figure 22: Total number of hours spent collecting wood in 2007



Respondents reported to usually go four to five times a week to collect wood, common exceptions are bazaar days (when they take wood or Poosh to the district bazaar for selling) and Fridays (e.g. in Ishkamish).[23]

If looked at all fuels, the average total amount of biomass collected in one year is 31,1 tonnes of which nearly 50% is wood from trees.

[23] In Ishkamish bazaar days are Monday and Thursday, in Burka Monday and Friday.

Table 9: Time spent collecting different types of fuel at different times of year

		Trees	Bushes – Artemesia	Bushes – other	Manure	All types
Spring	Average number of hours per week per collector	19	16	9	8	27
	Average number of hours per week household	12	8	3	1	23
	Percentage of households collecting	61	49	27	10	84
	Average amount collected (kg) – per household	2,152	1,643	665	107	4,566
	Average amount collected (kg) – per collector	3,501	3,355	2,553	1,024	5,412
Summer	Average number of hours per week per collector	19	14	15	18	42
	Average number of hours per week household	11	8	6	16	42
	Percentage of households collecting	58	54	42	90	100
	Average amount collected (kg) – per household	1,920	1,555	3,647	3,166	10,288
	Average amount collected (kg) – per collector	3,292	2,870	8,752	3,534	10,288
Autumn	Average number of hours per week per collector	25	16	12	18	49
	Average number of hours per week household	18	10	5	16	49
	Percentage of households collecting	74	63	42	89	100
	Average amount collected (kg) – per household	6,137	2,024	1,916	3,357	13,435
	Average amount collected (kg) – per collector	8,298	3,238	4,599	3,792	13,435
Winter	Average number of hours per week per collector	19	12	9	5	24
	Average number of hours per week household	10	5	1	0	17
	Percentage of households collecting	55	41	16	2	70
	Average amount collected (kg) – per household	1,645	880	284	20	2,828
	Average amount collected (kg) – per collector	2,979	2,060	1,815	971	4,052
Whole year	Average number of hours per collector	867	600	366	472	1,698
	Average number of hours per household	668	400	202	428	1,698
	Percentage of households collecting	78	67	55	91	100
	Average amount collected (kg) – per household	11,854	6,101	6,512	6,650	31,116
	Average amount collected (kg) – per collector	15,173	9,011	11,794	7,338	31,116

The amount collected by species is shown in Table 10: Archah is the most widely collected and thus has the highest amount collected per household (76% of households reported collecting Archah). However, Safedar, Beed and Toot have higher amounts collected by those collecting these species – probably because all these three species are often found close to the homestead. Yet these garden trees are still collected by less households (Beed 14%, Toot 13%) than Matraq (18%), Bashal and Irghai (17% of households each). Water availability does play a crucial role for whether people can grow trees in gardens or not. Those who cannot are 100% dependent on mountain trees.

Table 10: Amount of tree species collected

Species	Total collected per collector (kg)	Total collected per household (kg)	Percentage of households collecting
Archah	8,621	6,556	76
Beed	8,736	1,183	14
Toot	9,308	1,163	13
Irghai	4,224	704	17
Matraq	2,744	486	18
Bashal	2,476	413	17
Safedar	10,637	332	3
Chub-e khar	5,632	176	3
Zarang	1,877	137	7
ArAr	9,386	98	1
Badam/Badam-e kohi[24]	3,754	78	2

2.4 Summary

To sum up the previous section the following points deserve special emphasis:

- the change of use patterns for different fuel types over time,
- which relates to a change of collection patterns,
- the amounts of biomass distracted in the upper catchment area, and
- the current extent and prospects of degradation.

Section 2.1 showed a clear shift of fuel use patterns over the last 30 years in the two study districts. Whereas in the past – under the governments of Zahir Shah and Daoud – the main fuel source were trees. The period commonly perceived as 'revolution', i.e. the years between 1979 until the mid-1990s and even until the interim-government of Hamid Karzai in 2002 saw major changes as cutting was not sanctioned and thus the populations of species like Badam-e kohi, Akasi, Matraq, Irgahai and Bashal were severely diminished. Similar extents of harvesting took place with Archah, yet Juniper was and is the most common tree species in the area growing in lower as well as higher elevations, so that comparable harvesting activities in the lower lying stretches of the valleys did not lead to its almost-demise yet in all places, though it must be stressed that locally – usually in the middle sections of valley, e.g. in Folol or Darah Kalan – the demise of Archah has also considerably progressed. The lack of wood fuel was compensated by increased use of beta – brushes and thorn bushes – as well as by use of animal fossil for which there was no tradition in the area. The practice of tapi-making or lar-storing developed out of necessity in local contexts, i.e. not all households surveyed use manure, but then there are also households which, by now, almost solely have to rely on it because all other fuel types have vanished or are not accessible anymore.

Now, as in the past, Archah and Poosh play the biggest role in the local fuel economy. This varies for different purposes, as for example a lower fuel value is necessary for baking and thus sargin and peshqul are used by the majority of households interviewed – and where both manure types are available people would rather store Poosh for heating instead of using ('wasting') it for baking. Accordingly, for other purposes like boiling water and heating, which require a high fuel value, Archah is the most common and popular fuel, alone owning a share of 23% in the fuel economy. Poosh ranks second with 21%, thus more than two fifths, or 44% of all fuels used is derived from these two species. Against the background of mounting degradation (increasing lack of other fuel species), population growth, and due to a continued absence of alternative income possibilities, increasing fuel demand is likely to build up ever more pressure on Juniper and Artemisia

[24] Badam-e kohi (Wild Almond) reportedly used to be the second most common tree species in the local mountains besides Archah. Locals sold almond oil in the past to Kunduzi customers.

so that harvesting will go forth unchecked and ruthless, intensifying a spiral of degradation. The almost-similar shares of the three fuel categories – wood 34,4%, plants 34,2%, manure 31,3% – in the local fuel economy can be read as indicator for advanced degradation and almost reaching the point where subsistence livelihoods are no longer secured by fuel harvesting. Only in one place – Chap Darah – has this led to an open conflict so far as the locals deny villagers from Zarmukh access to 'their' mountains.

Popular local claims that the Gujir – who live at the far end of Folol valley in Saie Hazarah NSP community, in Bostan of Darah Kalan and also in Shar Shar – are to be blamed for the bulk of wood fuel usage, can be revoked on the grounds of above data analysis. The comparison of fuel use for the three different strata of income groups does not show any significant differences in use patterns among them (Table 11). Thus the figures for the group mainly deriving income from livestock – the Gujirs – show that they use 6,7t of wood annually compared to households with diversified income (8,95t) and labouring (7,6t). Instead livestock-owning households use 9,5t of manure compared to 6,4t used by households with diversified income structure and 5,7t animal fossil that labouring households use in one year. Yet, it cannot be concluded simply that Gujirs are also the major manure-users since they stated in qualitative interviews that they do not have to and, indeed, do not rely in any way on manure for fuel, because they are living in the farthest places where access to wood and bushes is always granted. Thus, the numbers of livestock-relying households using manure do rather belong to non-Gujirs in the lower parts of the valleys making a living mainly from animal husbandry.

Relationship of total fuel use to source of income

The difference in fuel use was examined between the three different strata used, households with diversified livelihoods (crop production with some laboring and livestock), households whose main source of income is from laboring and households whose main source of income is from herding livestock. The results are presented in Table 11.

Table 11: Comparison of fuel use by different livelihood groups

		Main source of income		
		Diversified	Labouring	Livestock
Number in sample:-		33	33	30
Number of families in household	Average	1.58	1.39	1.70
	Standard deviation	0.87	1.12	1.12
Number of people in household	Average	9.82	8.70	10.20
	Standard deviation	4.19	6.72	4.99
Annual amount of trees used per household for fuel (t)	Average	8.95	7.63	6.89
	Standard deviation	5.70	8.21	5.83
Annual amount of bushes used per household for fuel (t)	Average	6.85	8.76	7.82
	Standard deviation	5.90	5.63	5.96
Annual amount of manure used per household for fuel (t)	Average	6.42	5.68	9.54
	Standard deviation	3.16	3.31	5.89
Annual total amount of biomass (trees, bushes and manure) used per household for fuel (t)	Average	22.23	22.16	24.56
	Standard deviation	9.32	8.50	9.81

As the diversity of fuel plants (and thus biodiversity in general) over time decreased (from at least 13 tree species to mainly 3-4 now) and the share of fuel categories changed towards bushes and manure to an almost equilibrium of the three, the collection patterns saw a significant shift as well. After the immediate environment of settled areas had been deforested at large, distances to more remote valleys and forest sections increased and households changed their behaviour towards increased reliance on bushes in the immediate vicinity of their houses. Bushes are usually attributed perennial growth characteristics, though the most important one of the local beta, Poosh, does need longer time to acquire its state of maturity. In Folol valley, for example, people from the middle section stated that their Poosh is of less quality than the

Poosh which could still be found in Saie Hazarah where it is big in comparison, and has strong branches and long roots. The recovery of the Poosh stocks in environments under stress, i.e. where degradation is already under way, is therefore rather unlikely. Even if non-wood fuel plants are still being harvested in closer proximity to people's settlements, this does not mean that these fuel plants provide the same fuel value as the same species in places with less advanced degradation or in the past. Walking distances of 5-10 hours one way to collect fuel are quite common nowadays and show the extent of degradation. In Figures 20 and 21 the comparison of former and current collection distances was visualized.

Total amount of biomass withdrawn annually

To give some vague, yet not unrealistic account of the significance of the amounts of biomass lost per year in both districts the following calculation for Folol might serve as an example (Table 12): Folol is the main valley of Burka district, at the entry point close to the district center Burka town is located, then the middle section is called Folol (proper) and the tail end is known as Saie Hazarah (see in A4 map M3). According to NSP and CDC surveys the valley, including the settlement Naw Abad-e Folol, has a population of about 3.000 families.[25] 69% of all households surveyed in the fuel economy research said to consist of one family, 17% of two, the remaining 14% of more than two families, thus from the 96 households included in the survey the number of 149 families emerges. To get a fair minimum of fuel use (i.e. not to run risk to overestimate the use) and to keep it simple though, this calculation is based on the assumption that one household is equal to one family. Accordingly and based on the worked out annual fuel use amount of 22,8t per household (section 2.3), a total of 68.400t of biomass is used in Folol valley in one year. This total amount can be split up further:

Table 12: Annual fuel use amounts calculated for Folol valley[26]

fuel category	amount used in one year in Folol (based on 3.000 households) in t
wood	23.550
non-woody plant fuel	23.430
manure	21.420
total	68.400

As a result of this calculation the magnificence of deforestation and degradation of vegetation in general becomes apparent. 23.550 tonnes of wood (equalling 15.000 trees[27]) and 23.430 tonnes of bushes and other fuel plant material is withdrawn by the Folol valley inhabitants annually. If it is considered that people only use a share of what they actually harvest in the mountains because Poosh-selling in the bazaar or Archah-selling at nights is about the only possibility for them to generate some cash income, the amounts of loss are even more massive.[28] In peak times in autumn – as was the time of field research, though even it was Ramazan – in places like Saie Hazarah at the remote end of Folol 70-100 donkey loads of Archah are said to be coming down from the mountains daily. Taking the previous worked-out average of one donkey load equalling 10,31 ser or 70 kg, the daily wood harvest amounts to 722-1.031 ser or 5.052-7.217 kg or 5-7t in the 'hotspot of cutting' for Folol (in peak-season autumn).

Subsistence – degradation - poverty linkages?

Burka, with its main valley Folol, and Ishkamish, with the five main valleys, all of which have been included in this study, show some commonalities regarding the use and degradation patterns of forests/woodlands. Moreover livelihoods seem to be directly linked to the abundance/availability of fuel in the study area. From the settlements close to town further into the valley and up into side valleys or the remotest ends of a

[25] The exact number is 3.028 families for NSP zon-e Folol, including the valley and few villages at the entrance of Folol valley.
[26] Harvested amounts are likely to be higher, all estimates here are for fuel usage.
[27] Calculated with one tree on average equaling 2,5 m³ = 1,57t wood (conversion rate: 1m³ = 0,628t).
[28] Though, if all the households/families naturally use fuel for heating, cooking, baking, boiling water etc., by far not all harvest fuel because the town population has other income possibilities and lacks the means (labour and time) to collect fuel themselves.

valley the extent of degradation seems to decrease as can be observed in Folol, Kariz (Burka) or Darah Kalan (Ishkamish). At the same time the dependence on diversification of fuel types decreases as the people living at the remotest ends of a valley are the closest to the forested areas and thus always able to harvest wood or Poosh in case of need. Burka and Ishkamish town populations or people inhabiting the middle section of a valley are not in such a favourable position and need to rely on stocking up for emergency needs and the cold season. In the fuel economy-chain of supply and demand the latter take on the role of intermediates as they buy up wood from the people at the far ends and re-sell to clients in town or even transport wood on to Kunduz and Takhar. Poosh is also often already being sold by the person who harvested it in the villages which are located along the way to the bazaar. The livelihoods of tail, middle and head-enders of valley inhabitants are thus directly interlinked and mutually complementing. Respectively rising use of animal fossils can be traced from the remote end of a valley to the lower entry sections. In line with this logic the inhabitants of the forest-close areas stated not to be using manure much for fuel purposes as they have enough Poosh and Archah available, even if they have lots of animals.[29]

From what can be gathered from the data so far, there are a variety of indicators that hint to increasing extents of degradation. Thus, a simple typology of at least three degradation stages – with the boundaries in between being fluid – could look like displayed in Table 13. The categories of 'environment under stress' as can be imagined to precede the 'beginning degradation' category or on the other pole the 'total degradation' describing a situation where soil cover, vegetation and biodiversity has been completely eroded, have been deliberately missed out in the overview. Nevertheless, what becomes very clear from this plain compilation of conditions is the nexus between people's livelihoods and deforestation and advancing degradation. This is not to say that there is necessarily a causal linkage between poverty and degradation (discussed in section 5.3).

The more advanced the degradation, the more money is involved in the fuel economy because not every household can afford time and labour to harvest fuel by itself. Thus, they rather buy from the people who go to the mountains from their neighbouring villages and buy at lower prices than at the local bazaar. At medium degradation level relatively well-off people, i.e. the ones who can afford it, tend to buy timber wood rather from other villages or neighbours' gardens than cut and transport it from the mountains. In this sense the data hints also to a degradation/scarcity-market nexus linked to increasing monetarization of the local fuel economy, despite the fact that demand and supply cannot be negotiated openly in most cases as the cutting and sale of wood fuel and timber from the mountains is illegal. Only Poosh and other beta-varieties are not sanctioned for harvest.

The underlying causes for degradation are not fully captured by just focusing on the fuel economy and deforestation phenomena. Moreover, a whole set of interrelated dynamics and motives must be taken into account, i.e. the role of livestock, the renting out of pasture/grazing land and jangal, lalmi cultivation practices up in the mountains, mudslides that destroy houses, agricultural land in the villages, pastures, gardens etc. Interestingly, mudslides have become to be looked at by the locals as causes and consequences of degradation at the same time. This can be seen as clear indicator of the complexity of local environmental issues.

[29] The relationship between fuel, degradation and the livestock economy has not been investigated in this study and thus has not been fully understood in terms of if and how overgrazing and increasing livestock numbers impact on deforestation and loss of vegetation cover in the two districts.

Pictures 7: Boys cutting Mosh khar in Chap Darah


Picture 8: donkeys loaded with Archah wood coming down from the mountains

Picture 9: donkey load Poosh in Qainar bazaar/ Ishkamish

Table 13: Typology of degradation stages based on data analysis

	Beginning degradation	Advanced degradation	Next to total degradation
Fuel use	▪ Archah, Irghai and some third tree species (Bashal, Matraq or Zarang) as well as Poosh with long roots and strong branches can be found and are used in relative abundance ▪ fuel users do not have to diversify their fuel resources (no or next to no manure use)	▪ the Archah to be found is all small green trees ▪ Poosh is small and 'green', with less fire value ▪ other beta are used all year around ▪ livestock owners do collect manure to dry up and store it for fuel use purposes in the winter	▪ wood fuel is very rare ▪ Poosh cannot be found in any close proximity anymore, thus beta-use is highly diversified and on decline ▪ accordingly the demand for and use of alternatives in animal fossils is high, to the detriment of non-livestock owning households, even peshqul is being collected purposeful at all seasons
Fuel collection	▪ wood fuel collected in relatively far distances from the settlements ▪ all households collect wood fuel and Poosh/other beta as well as timber from the mountains	▪ walks of 5-10 hours one way are common ▪ cutting and loading a donkey takes a long time ▪ most households, but especially the needy, those closer to mountains and without any other income possibilities go for harvesting	▪ Archah is only to be found in neighboring valleys or at very remote locations, thus the effort in labour and time it takes to collect Archah, has become enormous ▪ different beta species are collected where people can get hold of them
Vegetation cover	▪ near the settlements deforested area ▪ only beta is left in close proximity, incl. Poosh ▪ occasional mudslides damage houses and agricultural lands/gardens	▪ other tree species besides Archah have vanished due to extensive cutting in the past ▪ beta varieties also have to be collected from locations far off ▪ mudslides occur on more regular base	▪ beta collection patterns prevent their recovery as perennials and supports the long-term vanishing of these beta-types which goes along with their decreasing fuel value and thus precipitates the degradation spiral, soil erosion
Harvesting practice	▪ axes to cut fresh wood	▪ Poosh and other beta types are pulled out with roots to use as many plant parts with fuel value as possible	▪ stems and roots from trees cut long ago are pulled out by force for fuel purposes
Other	▪ people make a living in subsistence terms from selling wood and Poosh in the local bazaar or to households of neighbouring villages during the night, for many it is their only way of generating cash to achieve food security	▪ fuel harvesting is still part of people's livelihood strategy, though seasonal, as they sell about one third of what they cut in autumn and/or winter ▪ localized diversified livelihoods, labouring in Kunduz/Takhar during summer months	▪ conflicts over access arise ▪ loss of lalmi and pasture land due to mudslides, loss of houses and settlement sections, displacements ▪ labour migration to Iran and Kabul as alternative livelihood strategy pursued by the majority of local males due to lack of alternative income possibilities

3 Marketing of fuel

From above analysis of fuel use and collection data it can be concluded that over a year,

- 67% of households collected more tree wood than they used,
- 65% collected more Artemisia (Poosh),
- 50% collected more of other types of bushes and
- 67% collected more manure than they used.

The surplus was sold to households in neighboring villages or in the district town. Only 25% of households admitted to selling fuel-wood, namely Archah (7,3%, see Table 14 below) and Poosh (Artemesia). But the fact that 50% of households collect more wood fuel than they use is sufficient to indicate some reluctance to admit sales – as people are well aware that cutting of fresh tree wood is prohibited by government decree and formally subject to fining if discovered. Thus, it cannot be assumed that those not answering did not engage in selling. Rather there is a reluctance to divulge this information for fear of getting into trouble with the authorities. Though the households were asked how many units were sold this is considered unreliable and is not reported.

Table 14: Percentage of households selling fuel

	Archah (Juniper)	*Poosh* (Artemesia)
Percentage of households selling IN village	0	3.1
Percentage of households selling NEAR village	10.4	21.9
Percentage of households bartering NEAR village	6.25	12.5
Percentage of households selling or bartering NEAR village	10.4	21.9
Percentage of households selling in bazaar	7.3	21.9

For selling in and near the village prospective buyers (households without male helpers, i.e. sons) would usually ask a person from the village or some neighboring settlement to bring wood or Poosh to their house. In Burka and Ishkamish town Poosh is being sold openly in the bazaar while the selling of Archah is comparatively less because it is prohibited by law and due to the bribes a prospective seller risks to pay to all kinds of security and government guards while transporting Archah to the bazaar, it is not as lucrative as selling it secretly. 'Secret' here means the direct sale to the buyers' doorsteps during nights. An example might highlight the scale of secret selling: From Darah Kalan it was reported that 200 households do sell wood at night, only 20 would not.

Bartering and selling of fuel is one of very few income generating possibilities in Burka and Ishkamish, especially for households who cannot yield income from agricultural land or livestock. The depletion of fuel resources around the district centers and valley entrance areas (e.g. Folol) allows the inhabitants of more remote communities to build their livelihoods on Poosh- and wood-selling. The calculation of collection time (see above, section 2.3.2) with market wage rate and sales prices is indicative in this regard: Assuming an opportunity cost equal to the market wage rate of AFs 200 per day, the cost of collection of wood from trees is around AFs 1,5 per kg. Market rates for sale of wood is around AFs 200 per donkey load or AFs 2,8 per kg – a profit of 84%. Yet, as will be shown in section 3.2, trade outside both districts is similarly lucrative.

3.1 District bazaars[30]

While Chapter II described the diversity of fuel plants used for baking, heating, cooking, and lighting, it is interesting to note that of all the non-wood and non-animal fossils only Poosh is sold and bartered in the local context, no other kind of beta (bushes). Dik tak, Sabzgul, Jantaq, Shapash etc. are used in every household, but collected individually in closer vicinity to the settlements compared to wood-fuel and Poosh. Moreover as has been mentioned before, some of the bush types are also used as animal fodder in the first place.

Table 15: Selling price of fuel at different locations in Burka (in AFs)[31]

	Archah (Juniper)	*Poosh* (Artemesia)
Selling price per donkey load – in village	not sold	62.7
Selling price per donkey load – near village	248	112
Selling price per donkey load – bazaar	283	131
Barter price near village – a) sacks chaff per donkey load	1.8	1.6
Barter price near village – b) ser barley per donkey load	4.0	1.4

To give an example the following table sketches the number of donkeys loaded with fuel and the selling prices on one random bazaar day in Burka town. Sellers move to the bazaar at night and all fuel trading is done in the early morning between 5 and 10:30am mainly, few sellers – mostly with low-quality Poosh – hold out until noon if they could not sell their loads earlier.

Table 16: Fuel marketing in Burka town

Time	Fuel type	Number of donkeys	Price per donkey load in AFs
5:15 am	Poosh	30	110-120
	Archah	8	250 [32]
5:45 am	Poosh	50	90-150 depending on size of Poosh plants: long roots and strong plants sell for 110-150 AFs per donkeyload, small plants for 90-100
6:00am	Poosh	76	
6:30am	Poosh	90	
7:30am	Poosh	180	

Interestingly, the majority of the Poosh-sellers originated from Saei Hazara, i.e. 140 of the 180 donkey loads, the rest from Kariz and Folol. As was hinted at above, the quality of the Poosh determines the price. So it was noted that the Saei Hazara people could sell their Poosh 20-40 AFs higher than sellers from Folol Bala and Kariz, because the Poosh from Saei Hazara is old and has long roots.

In comparison with Burka bazaar, the amounts of Poosh found in the two bazaars of Ishkamish is negligible (and of low quality) because there is sufficient Archah on offer from Darah Kalan – traded more or less secretly. Anyhow, Ishkamish (district of Takhar province) seems to be better connected with urban provincial centers throughout North and even stretching into Northwest Afghanistan (relations with Faryab, Mazar-i Sharif). Wood leaving Ishkamish is first and foremost timber wood (garden-grown). Burka's fuel trade is

[30] The market research component was based on the accounts of households about fuel selling inquired via the questionnaire, plus interviews and participant observation in the district bazaars and with intermediate traders and other knowledgeable people of the district towns. A survey of fuel selling in the district bazaar of Burka was carried out every bazaar day during the data collection period of two weeks: 15, 17, 22 and 24 September 2010 (each Monday and Friday).

[31] Variability of prices is about +/- 20%.

[32] This is the autumn/ winter price, in other seasons the average price for Archah at Burka market was reported to be 200 AFs. Interview 14 September 2007.

limited to the urban provincial capitals of the Northeast, i.e. of the provinces of Baghlan, Kunduz, and Badakhshan, less so its own provincial center Takhar.[33]

3.2 Provincial capitals/urban centers: Sale and trade patterns

The trade of fuel wood is either realized by local vehicle owners who leave the district at night or via timber traders who visit the districts' villages on a regular basis to buy up gardens (Charmaghz, Safedar, Beed, Ar Ar, Shulmak …). Locals whose livelihoods are mainly based on fuel collection; i.e. who go up the mountains to collect fuel on a daily basis; sell Archah to these traders. For transportation the fuel wood is usually hidden under the timber wood. For example, seasonally[34] traders come to Folol weekly to buy timber and firewood. Besides Archah (prices discussed below), Toot is sold for 12 AFs per ser and walnut for approximately 20 AFs to these traders. In addition, they buy up walnuts, dried mulberries and flax. Upon their return they bring chaff and 'sell'[35] it to the villagers. The locals who bring the wood themselves to Kunduz or Baghlan are said to supply the bakeries and restaurants (hotals) with fuel wood.

Based on these preliminary research insights from the districts, the second component of the fuel economy research focused on the wood markets (in a broader sense, i.e. including commercial wood users like hotals and bakeries) of the major urban centers in Kunduz (Kunduz City), Baghlan (Pul-e Khumri, Baghlan-e Jadid, Baghlan-e Kohna, Fobrika) and Takhar province (Taloqan). However, for all the spot tests and samples undertaken – in fuel wood shops, with mobile wood sellers, in bakeries, restaurants and wood markets (sarays)[36] – the authors were not able to trace the connection of wood from Burka and/ or Ishkamish to any of the places. The only exception throughout our (not representative samples) was one wood market in Kunduz with Archah wood from Burka. One of the wood sellers in this market had reportedly just bought the wood from an intermediate trader. The follow-up of the trader revealed that – according to his own accounts – he received the Archah wood as in-kind payment by people in Saei Hazara because they could not provide cash for straw he had sold them months ago.

The share of Archah wood on offer in wood shops and markets was highest in Baghlan's municipalities, i.e. Archah was available in all three Pul-i Khumri wood shops that were sampled and in two out of three sampled woodshops of Baghlan-e Jadid. However, this Archah is brought from Southeast Afghanistan's provinces Paktya and Khost.[37] The same holds true for one market in Taloqan where Archah made up 5% of all fuel wood on offer. Thus, the amount of local Archah wood from Baghlan or Takhar province sold openly in the urban centers seems to be negligible. The survey included also restaurants and bakeries (eight of each in Kunduz, six of each in Taloqan and Baghlan's municipalities). Of the eight bakeries surveyed in Kunduz, only one used Archah with a share of 10% of its overall daily firewood needs in winter season. The main species sampled bakers in the urban centers used at the time of data collection are indicated in the pie charts below:

[33] Interviews with fuel traders, September 22, 2007. Takhar is not a primary destination of fuel wood from Burka because it has lots of wood fuel coming from the surrounding villages and agricultural districts. For this reason Burka fuel traders orientate towards Kunduz and Baghlan's municipalities.

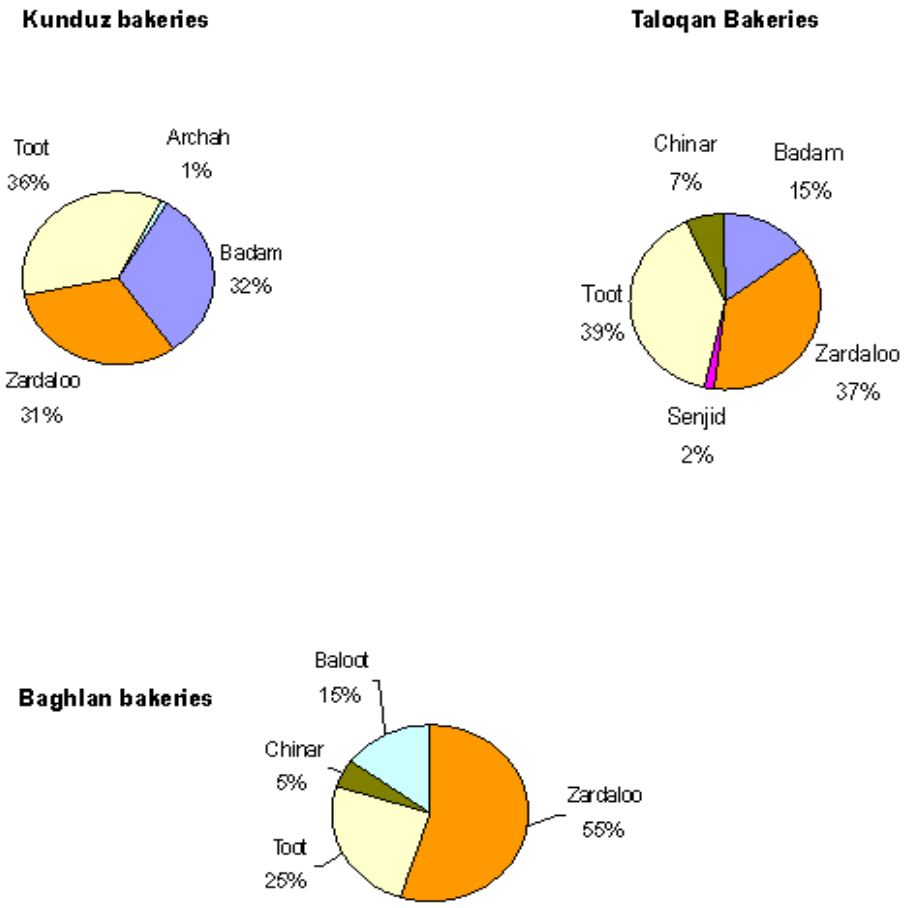
[34] The peak time for timber trade is in the months of Jawza and Saratan, i.e. between 21 May and 22 July each year.

[35] 'Exchange' or 'barter' is likely to be the more correct term here given the subsistence-economy-style livelihoods.

[36] For the methodology and data provided by the municipal authorities on the number of shops, markets, bakeries and restaurants see A7.

[37] A second dry wood-species from Khost/ Paktya is Baloot. It was found in three markets in Baghlan, in two places in Taloqan and only once in Kunduz. Pul-i Khumri and Baghlan in general are well-connected with Kabul and S/SE-Afghanistan, so wood is traded to Pul-I Khumri despite legal prohibition. Partly, the trade is on order of traders and practiced in trucks that take melons and chaff south, so the trucks don't have to come back empty. From Pul-i Khumri wood is then traded on to Kunduz wood traders/ sellers, though amounts are small since Kunduzis seem to rely to a large extent on garden woods (buying and own gardens).

Figure 23: wood fuel species used in urban bakeries



Toot and Zardaloo are the favored wood species in all locations, moreover in Kunduz and Taloqan considerable amounts of Badam (32% in Kunduz and 15% in Taloqan) are used. The reason that Badam is not used by bakeries in Baghlan's municipalities is probably that it is not grown in the surrounding villages and Baloot is widely available in the bazaar (yet expensive, see Table 18). A repetition of the survey in October 2010 showed that half of the bakeries use either 100% Badam or 100% Zardaloo, the other half combines Badam (or less so Zardaloo) with Toot.

Despite its relatively wide distribution and availability in the Baghlan wood markets, Archah was not found to be used in municipal bakeries of the province. In four of the six bakeries surveyed in Baghlan the respondents said that they would prefer to use Archah, but due to its high price used Zardaloo instead. Though regarded inferior in quality if compared to Zardaloo, Toot is also very popular because it is cheaper than Zardaloo.

In restaurants (hotal) fuel wood use is mixed, because smoke is not considered spoiling the food like the bakers' bread. It can be assumed that any wood available at local wood markets and with a reasonable price will be purchased by the hotal cooks. Seasonal variations include more use of Senjid in Kunduz in spring and summer – most likely because Badam is not freshly cut at that time of the year in order to bloom and bear fruits (almonds) and dry Badam is just too expensive for cooking purposes (Table 18). Similarly there is likely to be a decline of Toot (mulberry) – notable in Taloqan and Baghlan's municipalities – and Zardaloo (apricot) in all places, compensated with more Chinar and Beed burning in spring and summer.[38]

[38] Senjid is not common in Baghlan (found only in two shops), a little more in Taloqan. Instead Beed is very common and grown in Takhar (Taloqan wood markets), less so in Baghlan (found also only in two shops). Badam is grown in Kunduz districts Chahar Darah and Qala-ye Zal, hardly in Takhar. On the opposite there is no Charmaghz (Walnut) in Kunduz, only few in Taloqan, but considerable amounts in Baghlan. These distribution patterns are linked to natural conditions (water, soil and climate) in the particuar areas.

Table 17: Percentage of fuel wood use in sampled restaurants

	Kunduz	Taloqan	Baghlan municipalities
Toot	3,8%	36,7%	36,7%
Zardaloo	24,4%	15%	20%
Beed	3,8%	n.a.	18,3%
Safedar	n.a.	n.a.	15% (boards)
Chinar	26,3%	18,3	6,7%
Senjid	11,3%	21,7%	1,7%
Archah	n.a.	n.a.	1,7%
Charmaghz	5%	11,7	n.a.
Badam	25,6%	n.a.	n.a.

The most popular and common fuel wood species traded (and sold in wood markets and shops) in all three provinces are shown in the table below (Table 18). For each species the purchasing and selling prices per ser and kg are indicated.

Table 18: Purchasing and selling prices of most common fuel wood species in urban bazaars[39]

		Baghlan municipalities		Taloqan City		Kunduz City	
Species	Purchasing (P) Selling (S)	AFs per ser	AFs per kg	ser	kg	ser	kg
Archah (dry)	P	49	7	50	7,1	47	6,7
	S	59	8,4	60	8,6	57,5	8,2
Baloot (dry)	P	49	7	50	7,1	45	6,4
	S	59	8,4	60	8,6	60	8,6
Badam (f)	P	-		30	4,3	31,5	4,5
	S	-		40	5,7	39	5,6
(dry)	P	-		-		41	5,8
	S	-		-		49	7
Toot (fresh)	P	23	3,3	24	3,4	21	3
	S	34	4,9	33	4,7	30	4,3
(dry)	P	-		-		39,5	5,6
	S	-		-		47	6,7
Zardaloo (f)	P	29	4,1	30	4,3	25	3,6
	S	45	6,4	39,5	5,6	31,5	4,5
(dry)	P	-		-		41	5,9
	S	-		-		48	6,9
Senjid (f)	P	24	3,4	26	3,7	21	3
	S	34	4,9	37	5,3	29	4,1
(dry)	P	-		-		40	5,7
	S	-		-		48	6,9
Beed (f)	P	21,5	3,1	19	2,7	18	2,6
	S	31	4,4	28	4	25	3,6
(dry)	P	-		-		39	5,6
	S	-		-		48	6,9
Chinar (f)	P	-		21,5	3,1	17,5	2,5
	S	-		30	4,3	29	4,1
(dry)	P	45	6,4	-		39	5,6
	S	50	7,1	-		47,5	6,8

[39] Not listed, because far less common in wood shops and markets at the time of data collection were Pasha khana and Akasi (Baghlan only) as well as various Poplar varieties in Taloqan and Kunduz.

It is striking that most of the local species are traded freshly cut – with the exception of Kunduz, where all wood types are also available dry. Fresh wood is reportedly not sold at all in Kunduz during the summer. For obvious reasons (fire value) dry wood is significantly more expensive than fresh wood. This explains also the high price for Archah and Baloot which show additional values, e.g. Archah is said to develop a long-lasting heat without smoking; besides charcoal can be made from it and sold on (see Table 19). Bakers in Baghlan explicitly mentioned these characteristics of Archah to underline their preference for Archah wood.

As the authors have not been able to trace the wood which leaves the districts (Burka and Ishkamish) to the urban centers, the question of how the prices change from local sellers to the end consumer becomes negligible. Narrative accounts of sellers and traders in the districts state that Archah is sold by collectors to traders for 25-30 AFs per ser and would be sold in Kunduz for 50-60 AFs per ser, thus the trader double the price and gain 100% profit. The bulk of the trade out of Burka leaves from Folol valley. Here people from Saei Hazara[40] at the remote end of the valley and respective close access to the still forested areas of the mountains often sell wood to car owners in the middle of the valley (Folol Bala/ Payin) or further (Nawabad-e Folol). These local traders are said to take the wood to Kunduz and Baghlan during nighttime (one to two cars per night on average in late autumn) and sell it there, especially to bakeries.

As the purchasing prices for Archah in Table 18 indicate, trading Archah could be quite lucrative in theory. While 1kg of Archah wood is sold in the district bazaar for 3 AFs per kg, the purchasing price woodsellers pay for it in the urban provincial centers is more than double: between 6,7-7,1 AFs. This supports the narrative accounts presented in the previous paragraph. However, the qualitative interviews that were conducted with the urban market survey brought to light, that most likely wood shop owners, hotal owners/ cooks and bakeries would only buy Archah wood it traders would offer it for a lower price than the market rate indicated because with Toot (bakeries), Zardaloo, Beed, Senjid and Badam in Kunduz there are too many alternatives for good fuel wood available to the ultimate consumer. Moreover, growing seasons for Toot, Badam and Zardaloo condition a higher demand of the non-fruit wood species.

Table 19: Fuel value of selected tree species in urban centers[41]

Fuel value	Fuel species	Comment
5	Badam	Burns very well (more heat and long burning), no smoke and gives charcoal
5	Zardaloo	Burns very well (more heat and long burning) no smoke and gives charcoal
5	Baloot	best burning, but smoke and bakers do not prefer it like Badam
4-5	Archah	Archah gives charcoal and is also used to light the fresh woods in winter
4	Senjid	Burns fast, less charcoal
4	Toot	Burns fast, less smoke and less charcoal
2	Beed	Burns very fast like straw and leaves, less heat, no charcoal
2	Chinar	Burn very fast like straw and leaves, less heat, no charcoal
2	Safedar	Like Beed, dried Safedar is sold as old dastak and purchased by hotel owners to light other wood types

As for urban marketing patterns, Table 18 allows the following conclusions: The bulk of the wood traded in the urban centers for fuel purposes is garden wood (fruit trees or other fast-growing species in farm contexts) as opposed to wild-growing Archah and Poosh (plus other kind of beta) in the districts (Chapter II). Accordingly it can be assumed that Senjid and Beed are grown commercially for fuel purposes where both species are planted around rice fields in irrigable areas (villages around Kunduz and Takhar); not notable, however, in the research districts Burka and Ishkamish. Here Poplar types (Ar Ar and Safedar) prevail largely (see 5.1). The average profit in fuel trade is 9,3 AFs per ser or 1,3 AFs per kg of wood. Compared with the above calculated average selling price of 2,8 AFs per kg wood fuel in the districts

[40] These people do not necessarily include the local Gujirs.
[41] Interview with fuel wood sellers in Kunduz bazaar, October 18, 2010.

(section III) the selling purchasing-selling comparison in the provincial centers would mean a 46% value gain of the sold wood for the intermediate trader.[42]

4 Timber

The same shift in use patterns indicated above for fuel (section 2.2 and summarized in 2.4) can be traced for timber over time. While 20-35 years ago everybody reportedly just cut in the mountains whatever was needed for own use and construction needs, timber today is often bought from people's gardens in neighbouring villages. Besides Archah which is cut in the mountains, the main garden timber is Ar Ar, Shulmak and Safedar, all three Poplar species. Ar Ar and Safedar are also considered wood fuel species as their treetops are used for firewood whereas the stem is cut into timber logs. Archah trees are being harvested by people in remote parts of the valleys surveyed, where close proximity is the decisive factor in combination with a relative locational abundance of Archah wood. Many areas have already been deforested to large extents so that only small fresh trees are left there which are not suitable for log-making. From this follows that there are regional differences and very localized patterns of timber growing since it is always dependent on the availability of irrigated land. One distinction between Burka and Ishkamish seems to be that due to the existence of many gardens in different parts of Ishkamish Poplar-growing can be seen here as livelihood strategy, whereas fuel wood is not sold or marketed as was shown in Chapter 3. On the contrary, in Burka, Archah seems to be cut for timber purposes on a larger scale because its stocks are still comparably large, yet it can only be taken out of the districts if mixed up with ('hidden under') other garden timber.

The whole complexity of the timber economy has not been fully understood due to the fact that the objective of the survey was focused on the fuel economy. No systematic data for timber cutting and selling was collected, yet from questions 4b-d and 5/5a insights about species grown, the sales units, prices, harvesting and preferences (question 7) have been obtained. Furthermore, the qualitative interviews included questions regarding marketing patterns and trading of timber wood. The results are presented in the following sub-section.

4.1 Marketing and trade

Local timber markets do not exist in the district towns of Burka and Ishkamish because all local timber needs are met by either cutting timber in the mountains or buying it up from others' gardens or from households who still cut in the mountains. This is cheaper for covering local demands as no intermediate trader becomes involved. Timber is marketed first of all in Kunduz city, also in Baghlan. Takhar/Taloqan is not a prominent destination for timber leaving both districts as people there have lots of gardens and can meet their own demands from these gardens. Besides destinations like Kunduz and Baghlan, wood from Ishkamish and Burka is going to Kabul, Badakhshan, Mazar-i Sharif (traders from Sar-i Pul and Mazar-i Sharif appeared in spring of 1386 to buy up gardens) and Faryab even.

The main timber trading seasons are spring and summer, as fuel is mainly traded in winter and autumn. For example, in the months of Hut, Hamal, Saur and Jawza (from February 20th until June 21st) one to three Lorries timber are said to leave Ishakmish district daily. Yet the same amount was given to be traded in the following months until late November (end of Aqrab, November 21st) while at the same time it was stated that this was the peak season also for local timber demand as people would mend and carry out construction works for own housing after the agricultural activities of the summer season finished. Interestingly, in late summer 2007, two months before field research was conducted, the first timber market

[42] However, as no link between districts and urban centers for wood trading could be established, the 'production' cost for wood that is brought to the cities are likely to be much lower than calculated for the districts (1,5 AFs per kg). The reason is plain because – as has been shown – the bulk of the wood traded in urban centers is garden wood. It can easily be cut and transported to the markets, energy and time efforts are unlikely lower. As these figures were not collected, no comparison of the profit rate for primary wood sellers can be made.

saray opened in Ishkamish. Yet upon request the owner left it unclear how he hoped to make a living from it given that the bulk of marketing does take place beyond the bazaars.[43]

According to different accounts wood traders from far destinations as mentioned above, but mostly from Kunduz come to visit the districts up to several times a week in peak seasons to buy up gardens from local people. Different trading patterns have been highlighted by an insider-informant from Ishkamish who reported that Kunduzi traders do have counterparts/sub-contractors (so-called kamishan kar) in Ishkamish district who are involved in the buying up of gardens and sending Lorries to Kunduz. Different arrangements are possible: either the Kunduzi trader provides start-up funding 100% so that the kamishan kar is able to buy up gardens in order to stock as many Lorries as demanded, or they share the initial cost 50-50%, or the sub-contractor spends the money entirely from his own pocket. Accordingly he will earn 3.000 AFs (60 USD) per lorry in the first arrangement, 100 USD in the second, 300 USD in the third arrangement, yet the costs for transport and cutting plus loading (labour) are always on the kamishan kar. In Ishkamish district there are said to be three of these sub-contractor types of local wood traders working with Kunduzi traders. Besides, there are a lot of other people who trade timber. At the time of field research in Darah Kalan in mid-October 2007 the timber wood market-insider estimated that since Hamal (starting from 21 March), i.e. within a period of seven months, approximately as many as 300 Lorries of timber wood had left the district to Kunduz, another 30 Lorries each to Kabul and Mazar-i Sharif, plus an additional 5-10 Lorries to Badakhshan.

As mentioned above (3.2), people in the middle section of Burka's Folol valley (Folol Bala NSP), who own cars, have taken over trading activities and channel the timber wood from the tail end of Folol valley (Saie Hazarah) to users elsewhere. According to locals' accounts two to three cars (which are rather pick-ups, not Lorries) were leaving Burka district each week in autumn (at the time of data gathering). This is usually garden timber on the surface, but mixed up with larger proportions of Archah wood. The traders buy up wood from the different villages and transport it to Kunduz during the night. Moreover traders from outside the district come once a week on average to buy up timber wood in addition, so that estimates amount to one to two Lorries of timber leaving Burka district each week. In the side-valley of Kariz degradation is so much advanced that there is no timber wood left in the mountains. Moreover, households do not have irrigated land to grow timber trees, thus they buy timber from other villages.

As for prices, a distinction has to be made according to sales-units. Locally timber is sold by the tree with a certain diameter, so that from the tree people could get two logs (dastak, which literally means 'timber') of 4m length, sometimes an additional one of 3m length, at times each log is also sold separately. Thus, the Gujirs of Saie Hazarah in Folol/Burka are said to sell one log for 300 AFs to people in Folol (proper) or they barter one log for one sack (qanar) of chaff. One tree which is giving two 4m-dastak is sold for 600 AFs accordingly, if Fololis buy it for 300 AFs they will sell it on in Kunduz or Baghlan for 400 AFs.

[43] There are two bazaars in Ishkamish district, the main bazaar in Ishkamish town and another one called Qainar.

Table 20: Overview of timber prices from source to market (incomplete field data)

District location	local prices (in AFs)	market price (AFs)	garden (AFs)
Burka			
Saie Hazarah	per 4m-dastak 300 or one sack of chaff	400	50.000-200.000 (1.000-4.000 USD)
Kariz	per 4m-dastak 400-500		300.000-400.000 (6.000-8.000 USD) depending on garden size/ number of trees
Folol Bala	3x4m dastak = 1.000-1.200; one tree (2 dastak with treetop/ khada) = 1.000 as paid to Gujirs		
Ishkamish			
Aluchak Bala	in summer/autumn = 700 per tree (2x4m dastak) in winter/spring 500	700-800 per tree	
Chap Darah	700-800 per tree		
Darah Kalan	300-400 per dastak 700-900 per garden tree 1.000 up to 10.000 for very large Poplars	50-600 AFs per log in Kunduz bazaar depending on diameter	prices decrease in winter by 5%
Shar Shar	700-800 per tree		
Zarmukh	500-1.000 per tree		

Garden timber is sold in garden-units, though sizes vary of course. The prices for gardens range from 50.000 AFs to 200.000 AFs respectively (1.000-4.000 USD) according to accounts of people from the far end of Folol valley. In Kariz (side-valley of Folol) people reported much higher prices for gardens as they stated not to have big gardens themselves due to lack of irrigated land. The comparably higher dastak-prices can thus be interpreted as a function of local degradation, i.e. nobody of the locals can just go very far and deep into the valley anymore to get timber wood because nothing is left. The same seems to be true for Shar Shar, Darah Kalan, Chap Darah and Aluchak Bala in Ishkamish district. Timber is being bought in neighbouring valleys and villages due to the advanced degree of degradation in their own vicinity. In Ishkamish, from the NSP-communities studied, timber wood seems only to be left accessible from Zarmukh valley.

5 Preferences and attitudes of local people regarding fuel usage

This section attempts to provide some understanding about people's attitude towards the whole fuel complex (including the role of fuel for local livelihoods, i.e. cultivation, harvesting and use) and preferences as have been asked in the questionnaire's questions 7 and 8. The goal was to gain basic insights into motives of fuel users, to learn about incentive structures and to deduce ideas for building up alternative incentives for sustainable fuel use in the upper catchment. Before going into these details the question whether fuel trees are commercially grown will be discussed briefly (5.1).

5.1 Growing trees

When asked if households do grow trees for fuel and timber, one third answered in the positive (Table 21). Almost every fourth household stated growing trees for fuel, 29% grow timber species – mostly on irrigated land (except 2,1% of all farmers).[44]

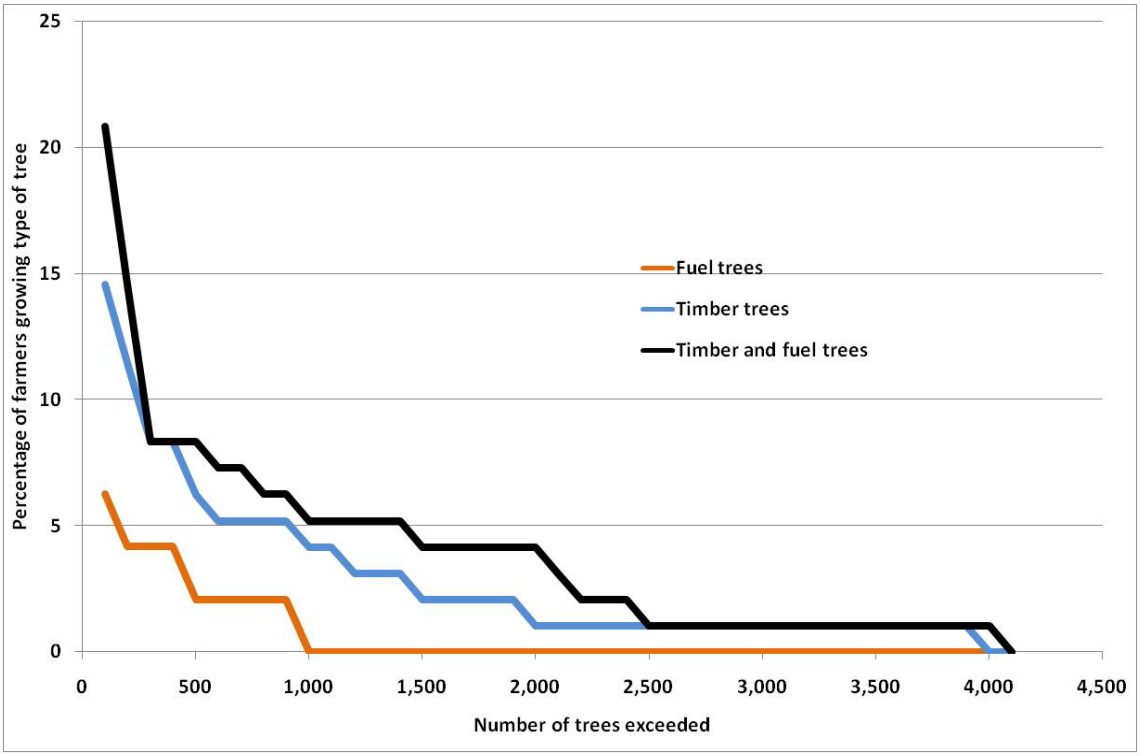
Table 21: Percentages of households growing trees

Percentage of households that grow trees for timber	29.2%
Percentage of households that grow trees for fuel	24.0%
Percentage of households that grow trees for timber or fuel	33.3%

As indicated in the graph below, no farmer growing fuel had more than 1.000 trees and only four farmers (14,3% of those growing timber trees) had over 1.000 trees. Only five (15,2% of those having either) farmers had more than 1,000 trees for either timber or fuel (especially Ar Ar, Safedar, Toot, Beed-e roosee).

No farmer sold wood every year. Of the 29,3% of farmers who grew trees for timber only just over half (57,1%) reported having harvested trees in the previous 12 months and only 21,4% of those growing timber trees reported having sold any of the wood harvested. The average amount harvested was 32,8 pieces of 3m, 33,8 pieces of 4 m. However, the range was very high. The number of pieces harvested varied from 387 down to 3. Only the Poplar species Safedar and Ar Ar is reported to have been sold (slightly more Safedar than Ar Ar). The average income from Safedar was AFs 613 per tree ($12,26) and from Ar Ar it was AFs 572 ($11,44).

Figure 24: Number of fuel and timber trees being grown



[44] Seven percent of those growing timber grew 95% of the trees on irrigated land and only 5% of the trees on rainfed land. Only two farmers grew any of their fuel trees on unirrigated land (8.7 % of those growing fuel trees). One farmer grew all his fuel trees on unirrigated land and one grew 5% of the trees on unirrigated land.

Against this backdrop of timber growing and marketing, the research sub-question whether there is a trend to grow fuel wood commercially in the districts, must be answered with 'no'. The fuel trees that are planted are not sold but used for own firewood needs.

5.2 Prospective fuel preferences

Respondents were asked to list their preferred fuels for different purposes in order of preference: "If you had all kinds of fuel available (including gas, coal; other energy sources), which type would you prefer to use for the different purposes? Please rank." As a result (Table 22) it turned out that the most popular fuel types for cooking and heating water are gas and Toot, the most preferred for baking bread are Toot, Beed and Senjid. The most popular fuels for heating are coal, gas, Archah and Toot.

Table 22: Summary of preferred fuels for different purposes[45]

Fuel	Cooking and heating water		Baking bread		Heating	
	combined index based on ranking	% of households incl. in list	Combined index based on ranking	% of households incl. in list	combined index based on ranking	% of households incl. in list
gas	0,41	86,5	0,07	12,5	0,27	55,2
Toot	0,15	57,3	0,28	75,0	0,11	40,6
electricity	0,14	31,3	0	0	0,03	6,3
Archah	0,09	32,3	0,09	29,2	0,15	46,9
Beed	0,07	29,2	0,18	53,1	0,01	5,2
Senjid	0,06	29,2	0,19	65,6	0,06	33,3
coal	0,02	10,4	0	0	0,32	89,6
Chinar	0,01	5,2	0,05	18,8	0,01	4,2
Beed-e r.	0,004	3,1	0,03	12,5	0,01	3,1

The 31% of respondent households which would like to use electricity for cooking and boiling water can be read as an indicator for the prevalence of strong illusions about rural electricity supply in Afghanistan at this stage. The common strategy is currently to build micro-hydropower facilities to power single bulbs and maybe a water boiler for the whole community. Such constructions will not deliver sufficient power for electric ovens etc., grid electricity will not stretch out to the rural areas of Afghanistan in the near decades.

Neither coal nor gas was in common use at the time of the survey as indicated in the first column of Table 23. The availability of gas in the district bazaars should be investigated to clarify whether the reason for people of not using gas is in insufficient supply or – more likely – can be traced back to non-affordability of gas and given the biomass alternatives for fuel. Moreover 55% of the households would like to use gas for heating.

Coal is in fact available in Burka bazaar[46], but reportedly only affluent people do afford it. The price of one ser of coal was 20 AFs at the time of field research. Compared to calculated average price of wood per donkey load of 200 AFs or 19,4 AFs per ser (section III) the difference is almost negligible. Actually, calculated selling prices of Archah near the village and in the bazaar in Burka district turn out to be higher than the coal price (20 AFs vs. 24 AFs per ser Archah sold near village and 27,5 AFs/ ser in the bazaar). So despite coal being actually cheaper than Archah and preferences over it are clearly announced, it is not used as preferred in the investigated communities. The reason is simply that fuel wood is available 'for free' in the mountains and it even offers an opportunity to gain cash income in the bazaar or in-kind income from bartering in neighbouring villages. In addition, Poosh is substantially cheaper than coal – one ser sold near the village is 11 AFs, in the bazaar approximately 13 AFs, thus on average 7-9 AFs below the price for coal

[45] A combined index was calculated as before. Indices over 0.15 and percentages over 20 are shown in bold.

[46] Burka bazaar is supplied with coal by traders from Nahrin during Mizan and Aqrab months (23 September-21 November) and sold in one place. Ishkamish has several places in different parts of town where coal can be bought.

(20 AFs). Why should anybody want to spend money (the fewest have cash) on coal if there are these 'alternatives'?

The 12,5% of respondents who stated to use coal in the winter are likely to be inhabitants of those communities which do not have free access to fuel wood or are able to afford buying coal. However, both types of coal users would never use coal exclusively, but always mix it with other fuel types, especially Archah. Thus they have to be classified into the first column of Table 22. This must be understood against the backdrop of local heating practices, i.e. the use of different types of ovens. Usually wood is burnt in a bukhari to make tea first. Then the ember residuals are taken to heat sandali stoves in other rooms. At the same time coal is put into the bukhari to keep up the heat for some time, because it burns slowly.

Comparing the percentage of households that reported they wanted to use a particular fuel with the percentage of households that reported they actually did use the fuel shows that households would like to stop using animal manure – sargin, peshqul and tapi – not least because these are considered dirty, but they would also like to decrease Poosh usage – the second most widely used fuel in the districts – because it is hard to collect[47] and to transport.

Those who said they wanted to use Archah were 28% less than the percentage using Archah at the time of the study. This seems to reflect a broad awareness for the fact that the large-scale cutting of Archah has already caused widespread degradation resulting ever more regular mudslides that wash away houses, gardens, fields and pastures.[48] This and the fact that also the 10 to 20% of households that were using Beed, Irghai, Bashal, Matraq wanted to reduce its use, seems to be informed by the knowledge that wood cutting in the mountains (harvesting of fresh wood fuel) is prohibited by Decree of the Interim President # 736.[49] Against this backdrop it is not much of a surprise that 33% of households stated they would like to use Senjid – while so far none actually used it – because it is known for its fast growth and comparatively good fuel value (Table 25).

Table 23: Comparison of percentage of households currently using fuel for heating compared with percentage that said they would like to use at least some of that fuel

fuel	% of households who said they currently use at least some of this fuel	% of households who wanted to use at least some of this fuel	decrease (-) or increase (+) wanted
Coal	13	90	+
Gas	0	55	+
Archah	75	47	-
Toot	13	41	+
Senjid	0	33	+
Beed	11	5	-
Irghai	14	4	-
Bashal	16	1	-
Matraq	11	1	-
peshqul	51	0	-
sargin	52	0	-
tapi	41	0	-
lar	17	0	-
Poosh	46	0	-

[47] This is also reportedly the main reason why collectors do not cut Poosh, but pull it out in one piece with all the roots – it is easier.
[48] In addition the intricate harvesting procedures incl. the long walking distances might fuel these disincentives.
[49] Dated 7 August 2002. See GoA 2009, 23. A Forest Law and a Rangeland Law have been drafted, but are still under review by different government institutions and finally have to be adopted by parliament.

The preferred decrease of Khar-e jantaq is due to the fact that it has thorns and is hard to fetch. The reason why people would also like to decrease the use of Sabzgul is that it is hard to pull out of the soil and its collection is very time consuming. Only 1% of households wanted to use diesel for heating and 25% said they wanted to use it for lighting. It is inferred that over 70% of households want to stop using diesel and replace it with something else, though it is not entirely clear whether this is due to cost, smell, safety or some other factor.

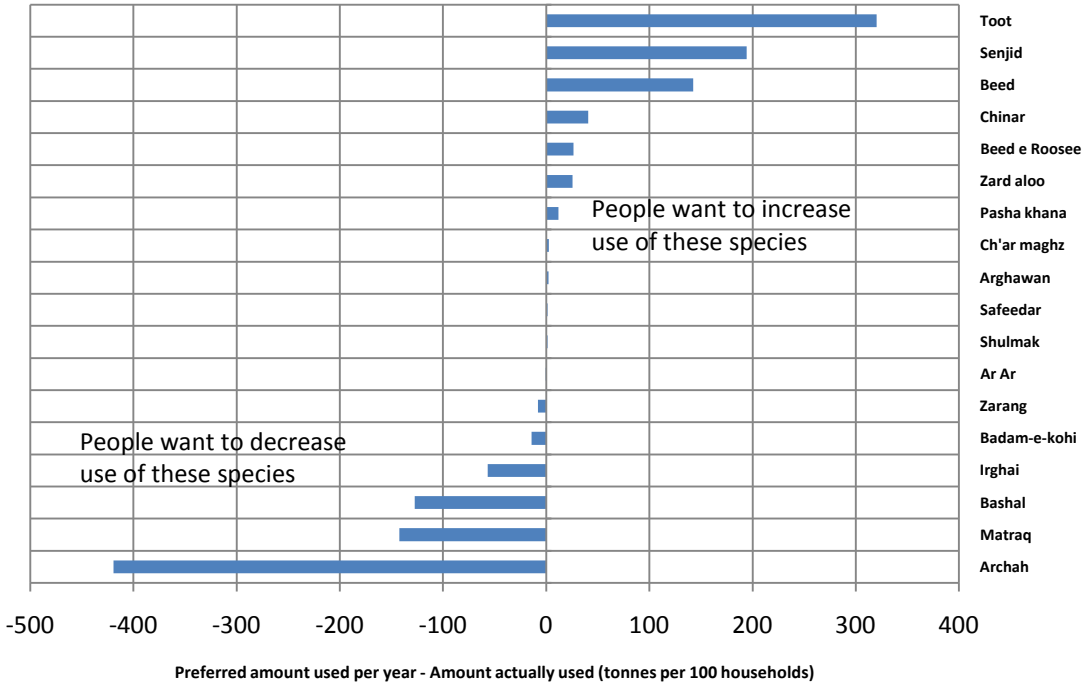
Table 24: Difference between percentage of households preferring a particular fuel and the percentage actually using the fuel – for any purpose[50]

Fuels that people want to REDUCE use of	Difference between % preferring and % using	Fuels that people want to INCREASE use of	Difference between % preferring and % using
sargin	-82.8	Senjid	97.4
Poosh	-76.0	electricity (micro-hydro)	92.7
diesel	-73.4	electricity (solar)	84.4
peshqul	-70.3	coal	78.1
tapi	-54.2	Toot	76.0
Archah	-19.3	Beed or Jaw beed	49.0
Iar	-19.3	gas	29.2
Sabzgul	-16.7	Chinar	22.4
Khar-e jantaq	-15.6	Beed-e roosee	16.1
Matraq	-15.6		
Mosh khar	-14.1		
Shapash	-14.1		
Bashal	-13.5		
Flax straw	-10.4		

If only wood fuel is considered, the picture that emerges from the research shows that Toot, Senjid and Beed are favoured for future increased use (Table 24, 25). The popularity of trees like Archah and already far diminished stocks like Matraq, Bashal and Irghai has outlived itself.

[50] The difference was calculated between the percentage of households preferring a particular fuel for any purpose and the percentage actually using the fuel. The percentage using the fuel used was an average of answers obtained from two questions, one that asked the respondents to rank fuels currently used (in each season) and another question which asked how much fuel (for any purpose) was currently being used.

Figure 25: Indicative changes people would like to see in use of different tree species



Toot, Senjid and – to a lesser extent – Beed are typically grown in people's gardens in Folol valley, Darah Kalan and Zarmukh. Unlike Senjid, Beed is also used as timber wood. For fruit trees like Toot, Badam and Zardaloo it is quite common to regularly cut the branches for fuel wood. These contribute considerably to individual households' fuel supply.

These findings are also reflected in the fuel value column of Table 25, according to which Zardaloo, Badam, Arghawan, Badam-e kohi and Toot are the most valued species for fuel in Burka and Ishkamish. The fact that all but Arghawan and Badam-e kohi are orchard trees points to the potential that the establishment of more orchards could have for locals – both, for income generation but also to generate sources of fuel – and for the halting of deforestation in the villages' surroundings. Furthermore, besides the fruit trees Zardaloo (apricot) and Toot (mulberry), Beed (willow), Beed-e roosee and Senjid (Russian Olive, also considered a fruit tree) seem to be most worthwhile planting in the districts for fuel purposes. Badam (almond) was only selected by 2,1% of households as it is not suitable for cultivation in the concerned districts – the excellent growth rate mentioned here does rather apply to other districts. Given this Badam should not be seen as a priority for orchards in Burka and Ishkamish.

Table 25: Scores given to tree species in the districts based on different criteria[51]

	% selecting	Growth rate	Fuel quality	Timber quality	Market price	Average score
Zardaloo	5,2	3,4	5,0	0,0	5,0	3,4
Badam	2,1	5,0	5,0	0,0	5,0	3,8
Arghawan	1,0	5,0	5,0	0,0	5,0	3,8
Badam-e kohi	1,0	3,0	5,0	0,0	5,0	3,3
Toot	90,6	4,1	4,9	0,0	4,8	3,5
Archah	43,8	1,4	4,8	4,6	5,0	3,9
Senjid	75,0	4,7	4,8	0,1	4,8	3,6
Irghai	14,6	2,8	4,4	0,6	4,8	3,1
Chinar	44,8	3,7	4,1	2,4	4,7	3,7
Beed	88,5	5,0	3,8	1,3	4,4	3,6
Bashal	3,1	3,0	3,7	0,0	5,0	2,9
Akasi	2,1	5,0	3,5	2,0	4,0	3,6
Matraq	2,1	2,0	3,5	0,0	5,0	2,6
Pasha khana	13,5	4,7	3,5	2,6	4,3	3,8
Zarang	2,1	2,0	3,5	0,0	5,0	2,5
Chub-e khar	1,0	2,0	3,0	0,0	5,0	2,5
Beed-e roosee	76,0	4,9	2,9	3,4	4,4	3,9
Charmaghz	4,2	4,3	2,8	0,0	4,5	2,9
Jaw beed	3,1	4,7	2,0	2,3	3,7	3,2
Safedar	86,5	4,8	1,4	4,9	5,0	4,0
Ar Ar	83,3	4,8	1,3	5,0	5,0	4,0
Shelmak	1,0	5,0	1,0	5,0	5,0	4,0
Pistah	1,0	1,0	0,0	0,0	5,0	1,5

Picture 10: Jaw beed

[51] When inquiring about sales of wood, respondents were asked about the relative advantage of their preferred species. Each criteria was scored on a scale from 1 to 5; 5 being the best and 1 the worst. As this study focuses on fuel, the criteria have been arranged in order of the average scores for burning properties. Note that the number of households (1st column percentages) actually using a species does not necessarily indicate its value but more probably its availability.

Picture 11: Beed-e roosee

5.3 An awareness-subsistence dilemma?

Finally, as a summary of this chapter, the subsequent paragraphs will discuss and try to answer the questions why deforestation takes place to the extent that it does, what can be concluded to be the underlying motives and where do entry points exist to halt the massive clearing of vegetation cover for fuel purposes in the districts concerned?

Against the backdrop of what has been said and concluded in Chapters II (fuel use patterns over time 1977-2007), III (marketing of fuel) and V (locals' preferences and attitudes) so far, it has become clear that resource-dependence of all inhabitants of the rural districts is extraordinary high and can be seen as major reason for deforestation processes. The fuel and fodder value attached to trees, plants, and vegetation in general in both districts highlights this dependence more specifically. Furthermore, it can be stated that there is no environmental value so far attached to fuel species in the research area. Only slowly – with progressing degradation and negative consequences thereof, experienced, for example, as flash floods that wash away agricultural land and settlements – signs appear which seem to hint at an emerging sense of environmental value attachment to tree and plant vegetation. The distinction of three different income groups has shown that they use about the same amount of fuel, and that plant and wood fuel losses are not caused by just one group singularly. Moreover, what so far has not been taken into account is what can be described as the absence of management for fuel withdrawal. Two factors are worth mentioning in this regard: the legal dimension that has been hinted at in section 5.2 and the local management dimension. As statutory laws have not yet been issued by the government for access and use of forests, rangelands and pastures, the provisional Decree of the Interim President # 736 constitutes the only statutory rule, but is limited to the mere prohibition of cutting fresh wood.

However, the passing of a rangeland and/or forest legislation is unlikely to bring any immediate changes on the local ground unless the local government institutions (all departments) are endowed with competencies and resources to meaningfully interact with the local population, i.e. responding to the complexities necessary to support local livelihoods. Until then local legal provisions will keep on fostering existing inequities in resource access and usage. One reason for this seems to be the historic experience of forest/rangeland management in Afghanistan which does not square with contemporary natural resources management-concepts because the idea of sustainability never entered legal or other management provisions. For example, the forest law and practices under former 'peace regimes' of King Zahir Shah and/or Mohammad Daud (until 1978) did not foresee reforestation measures but were limited to regulating the extraction/cutting of trees which reportedly at that time were enforced more successfully than today.[52]

At the time of data gathering, the following observations were made regarding the provisions for forest/rangeland management: The sub-national government institutions at provincial and district level formally dispose of forestry and land use sections as part of their agricultural departments, yet do not have

[52] Reported in qualitative interviews with respondents of Darah Kalan, Shar Shar, Aluchak of Ishkamish, October 21-23, 2007.

any resources and often lack basic competencies. Then again, as the line of command in the centralized administration of the GoA provides, district forest guards (muhafiz-e jangal) get appointed from Kabul upon the suggestion of district and provincial authorities. Yet, they often do not receive a salary. At community level the following picture emerges: Some communities have taken the initiative to appoint a forest guard on their own behalf, in other communities the district forest guard – sometimes joined by an assistant – is on duty. Either type proves to be more an entrepreneur and seller of the forest than a guard, because every donkey load of wood coming down from the hills is 'taxed' by him with a certain amount of money – locally labelled as 'tax', 'fine' or 'bribe' depending on the respondents' sense of morale and/or humour. In any case the money collected this way stays with the forest guard and constitutes his income. Similarly, the district police are regularly bribed by wood traders once they get caught taking Archah and other wood fuel out of the districts to the surrounding urban centers. Thus, the venality of the government representatives is a fixed cornerstone of the local fuel economies.

In addition, this evidence from qualitative interviews shows that the fuel economy is not merely a barter economy but that (cash) money is very well involved as well. On the one hand this was shown with the corruption cases above. On the other hand the difference between the amount of biomass collected/cut and the amounts used showed that for many rural dwellers fuel-selling basically constitutes their livelihoods and survival in the resource- and employment-scarce surroundings. It provides them at least with the possibility to get the most necessary household items and remain part of the local 'economy of indebtedness' because the small cash in their hands enables them to serve some of the many debts rural families have with each other, with several shopkeepers, and with doctors etc. in order to restore their credibility (partially) when needed. For example, a spot check with shopkeepers at the bazaar in Burka indicated that the indebtedness of people with shopkeepers is not less than what is known from other locations in Afghanistan, i.e. a high interdependence of families where usually everybody is debtor as well as borrower at the same time (Klijn/Pain 2007). One shopkeeper stated his outstanding lending amounts to 320.000 AFs (equalling 6.400 USD), among his 500 debtors are small store-owners in remote villages who pay some money back every bazaar day, several families who receive remitted cash money from Iran, but average people balance borrowings by bringing beta or wood instead of repayments in cash.[53]

The aspect of illicit wood harvesting and marketing in the districts allowed a shadow market to evolve, the main locations of which are the eating joints (hotal) in town and buyers' doorsteps. If somebody needs wood he tells a certain person in town who usually knows the cutter-sellers, the bargain is concluded with delivery at the buyer's doorstep at night. It remains unknown to what extent the wood is paid in cash and/or kind and in the latter case what the exchange item would be. For coverage of these activities, either from the side of research or with the aim of prevention/interception by government authorities, the entry point is almost impossible to define as the whole wood fuel business is more or less a 'ghost venture'. This 'shadow' characteristic of the fuel economy draws out the moral tightrope walk of the woodcutters between being aware of committing a formally (defined as statutory) illegal activity and the need for survival in a subsistence economy where everything that is being earned one day (no matter whether in cash or kind) is spent instantly to keep up physical existence.

The question to what extent poverty is to blame for the progressing deforestation and degradation in Burka and Ishkamish was not in the center of the research but – on an academic level – embodies an open debate among development researchers in the field of natural resources management and forestry which has to rely on empirical findings.[54] Against this backdrop, what can be learned from the case presented in this paper is that poverty – despite above pointed out high resource dependence and the woodcutters need for survival – is not the sole driver for deforestation of the woodlands and rangeland vegetation. It was shown that all income groups almost equally depend on the fuel resources of their surroundings. The example of traditional heating practices, e.g. in sandali ovens, showed that even upon the availability of coal, wood usage prevails and coal is used with limitations. Thus, also the affluent households do largely rely on fuel wood – with the only difference that their household members do not cut themselves but can afford to buy it off some poorer woodcutters who make a living from cutting more than they personally need for heating, cooking etc. The demand steers the supply and deforestation subsequently. Interestingly enough, though, the findings of this paper suggest, that the fuel market is mainly a local one as the urban centers are provided with fuel wood from their surrounding rural settlements and mainly burn old or coppiced garden woods. No

[53] Interview Burka bazaar, March 31, 2009.
[54] See exemplarily Khan/Khan 2009, McGranahan 1991, Swinton 2003.

proof was found for a causal linkage between large-scale deforestation in the upper catchment areas and fuel demands of the urban centers in Afghanistan's northeast region.

For any development intervention that aims at halting the deforestation processes in the rural areas of Burka and Ishkamish the findings would call for not only providing alternative fuels and at the same time changing the traditional heating and cooking inventory[55], but also providing licit employment opportunities for people in the districts. These offers must go beyond establishing orchards with fruit trees for as many people as possible because experiences in other KRBP projects show that land plots distribution is limited and assistance with the establishment of private orchards would not benefit the neediest.[56] The establishment of orchards can be only one of several entry points for intervention that aim to improve local livelihoods, help achieve food security and – in the long term – halt degradation. In this case the findings about preferences hint that Zardaloo and Toot are the most favoured species that dispose of several superb qualities (fast growth rates, high fuel value, fruit-bearing). For non-orchard species the setting-up of enclosures of fenced plantations of fast-growing trees like the largely diminished kinds Matraq, Irghai, Badam-e kohi, Bashal and Zarang, but also Senjid and Beed poses an option if irrigation is or can be made available. Their cultivation could reduce pressure on Archah, the planting of which is generally considered unrealistic as the time taken to grow juniper precludes its use.

Similarly, the slow growth rates and low fuel value given for Pistah puts the reforestation efforts with large-scale Pistah plantations in many parts of northern Afghanistan that have been undertaken in the last years, under scrutiny. The rationale behind was that large swaths of woodland in the northern provinces were originally made up of Pistah trees and had some importance for Afghanistan's role as exporter of nuts and dried fruits before the wars. During the last three decades many trees have been cut and success with efforts at reforestation have been very limited so far. Thus, given the dire need for fuel resources and income generation in the short and medium term, the emphasis of Pistah cultivation should be reconsidered and replaced with other – faster growing – species.

[55] As has been shown, tea-making on open fire in summer contributes significantly to the amount of fuel wood needed the year over and thus to deforestation. Yet, for example with the introduction of solar cookers the amounts of wood burnt could be reduced considerably.

[56] For example the record of the IDEAS project of Concern Worldwide and Welthungerhilfe in other Takhar districts in the upper catchment of the Kunduz river basin. (Personal communications with project staff, especially community mobilizers, 2006/07.) In addition, the idea to have orchards on common land in a community is likely to be of limited use because internal power structures and a lacking sense of responsibility would have these orchards go dry, be plundered or cut down for firewood long before they mature to bear fruits.

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Appendices

A1 – Acronyms

AFs	Afghani (Afghan currency), exchange rate: 50 AFs = 1 USD
AKDN	Agha Khan Development Network
AREU	Afghanistan Research and Evaluation Unit
CDP	Catchment Development Programme
CE	Common Era
CoP	Commander of Police
DDR	Disarmament, Demobilization and Reintegration Programme
EON	Entwicklungsorientierte Nothilfe (Development-oriented Humanitarian Assistance)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GAA	German Agro Action/ Deutsche Welthungerhilfe (DWHH)
GoA	Government of Afghanistan
GTZ	Gesellschaft für Technische Zusammenarbeit
ha	hectar
hh	household/s
IDEAS	Integrated Development, Environment and Sustainability
IDP	Internally Displaced Persons
KRB/P	Kunduz River Basin/ Programme
m	meter
MC	Mercy Corps
NGO	Non Governmental Organization
NR /M	Natural Resources/ Management
NSP	National Solidarity Programme
RLAP	Rural Land Administration Project
t	tonne/s
TB	Tuberculosis
UN	United Nations
USD	US-Dollar
ZEF	Zentrum für Entwicklungsforschung/ Center for Development Research (Bonn University, Germany)

A2 – Glossary

(for an overview table of local fuel plants and trees species see A3 below)

animal fossil	manure-based fuel types, i.e. manure and products thereof like *tapi*
bala	upper
Baloot	holm oak; botanical name: *Quercus baloot*
bandar	meeting point of arterial road in a city's bazaar
bazaar	market
beta	bushes/ brushes; forage and fuel plants growing in the mountains
bukhari	oven
buri ara	sawdust
Chayer	plant harvested as devil's dung (*hing*)-surrogate because it looks similar, English plant name unknown
chub-e sukht	fuel wood, including all kinds of fuel fossils, not only wood fuel, i.e. animal fossils, plant fuels, wood fuels etc.
coppicing	cutting back trees in order to have new branches grow fast, practiced with the following species: *Ar Ar*, *Safedar*, *Beed*, *Beed-e roosee*, *Toot*, *Senjid*
darah	valley
dastak	timber
dead wood	dry parts of a tree, e.g. fallen down branches etc.
firewood	wood fuel (woody), i.e. dead wood and fresh wood
fresh wood	parts of a green tree
fuel	any material that produces heat or power, usually when it is burnt, wood is considered to be a solid fuel type in comparison to atomic energy for example
fuelwood	wood and plant materials used as fuel, even if they are not strictly 'woody', e.g. in local research sites includes also *beta*-varieties like Artemisia and animal fossils
Gujir	originally nomads, descendants of immigrants from Gujirat region/ Northwest India; today mainly livestock herders, settled very scattered in mountain regions of all provinces of NE-AFG
hotal	restaurant
jangal	forest; but often used for any land that has some plant cover, e.g. shrubs, open woodland
kamishan kar	intermediate timber trader without own investment
khada	treetop/ crown
khar	thornbush/es (different varieties)
khar bar	donkey load
Kunjid payeah	sesame straw
lalmi	rainfed

lar	sheep and goat manure extracted from animal shelters, hardened and broken into pieces
muhafiz-e jangal	forest guard
mullah emam	prayer leader in a mosque
naqel	Pashtun migrants from South Afghanistan who were provided land by the government in other provinces
Pakhal	flax straw
peshqul	dried pellets of sheep or goat dung
qanar	big sack (usually for sale and transportation of straw)
samt-e shamol	Northeastern Provinces of Afghanistan
sandali	ember-based heating source with blanket cover
saray	market with several shops of one specialization in the bazaar area, locked at night
sargin	dried loose cattle manure
ser	local weight measure, 1 *ser* is about 7 kg
shura-ye inkeshafe dehat	Community Development Council (CDC)
tapi	dung cakes made from cattle manure
tel-e khak	diesel
zon	territorial meta-unit including several sub-units (‘communities) of a certain number of households (20-300) established according to NSP-categories (e.g. *zon-e* Folol includes all NSP-communities in Folol valley)

A3 – Overview: Fuel plant and tree species used in Ishkamish and Burka

There is still uncertainty about the identification of many of the fuel tree and bush species being used and sometimes the same name is used for different botanical species in different districts.[57] Thus the local names have mostly been retained, though occasionally where the English or botanical name is certain, these have been used interchangeably. The identification as it stands at the moment is given here:[58]

Local name	نام محلی به زبان دری	English name	Botanical name
Akasi	عکاسی	False acacia	Robinia pseudoacacia
Ar Ar	عر عر	Black Poplar	Populus sp. prob. P. nigra
Archah	ارچه	Juniper (stem and scrub type)	Juniperus excelsa (subs. macropoda?)/ Juniperus communis
Arghawan / Bashal	ارغوان/بشال	Judas Tree / Red Bud	Cercis siliqastrum (or Cercis griffithii?)
Badam	بادام	Almond	Prunus amygdalus syn. Amygdalus ebrahmica
Badam-e kohi	بادام کوهی	Mountain almond	Amygdalus spp. tangutica?
Beed	بید	Willow	Salix wallichiana and other species
Beed-e roosee ('Roosee')	بید روسی	Russian willow	Ailanthus sp.
Charmaghz	چهار مغز	Walnut	Juglans regia
Chinar	چنار	Oriental Plane	Platanus orientalis
Chub-e khar	چوبی خار	Caper	Capparis spinosa L.
Diktak (Angur-e wahshi)	دیکتاک (انگور وهشی)	Wild grapes	Vitis silvestris
Irghai	ارغی	Hawthorn or Cotoneaster	Crataegus sp.
Jaw beed	جو بید	Willow & White willow	Salix afghanica?
Kamal	کمل	not identified (non-woody plant fuel)	
Kawel	کاول	Desert volute	Convovulus spinosa
Khar-e jantaq	خار جنتاق	Berbery	Berberis Vulgaris
Matraq	مطرق	Ephedra	Ephedra spp.
Mosh khar	موش خار	not identified (non-woody plant fuel)	
Pasha khana	پشه خانه	Elm	Ulmus spp.
Pistah	پسته	Pistachio	Pistacia vera
Poosh	پوش	Artemesia	Artemesia spp
Sabzgul (Mawul)	سبز گل (ماول)	Great Blue	Lobelia inflate or Salvia sp.?
Safedar	سفیدار	White Poplar	Populus alba
Senjid	سنجد	Russian Olive; Oleaster	Elaeagnus latifolia or E. angustifolia?
Shapash	شاپش	not identified (non-woody plant fuel)	
Shulmak	شلمک	Poplar	Populus sp.
Sheter khar	شتر خار	Camel bush	Alhagi camelorum
Talkhak	تلخک	not identified (non-woody plant fuel)	
Toot	توت	White mulberry	Morus alba
Zarang	زرنگ	Maple	Acer semenovii
Zardaloo	زردالو	Apricot	Prunus armeniaca

[57] One side-product of the research presented in this working paper was also the attempt to establish a Fuel Plant Inventory for the respective districts with photographs and brief descriptions of the most important trees and bushes.

[58] Further clarification might be possible with the help of the forthcoming Field Guide Afghanistan. Flora and Vegetation, edited by Breckle, S.-W.; Dittmann, A.; Rafiqpoor, M.D. (in press end of November 2010, forthcoming as non-commercial publication in Scientia Bonnensis series).

A4 – Maps

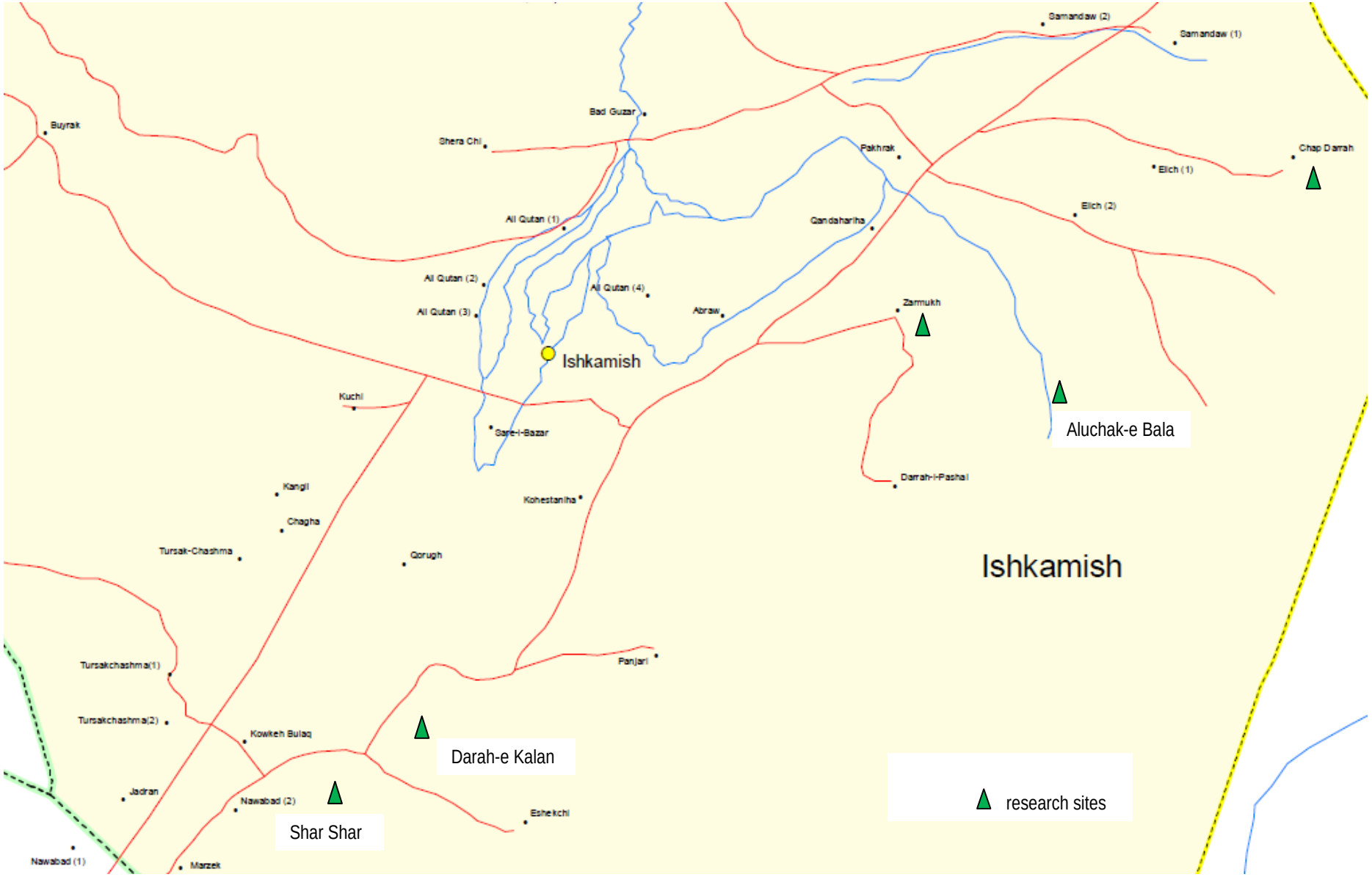
M1 – Northeast Afghanistan

Source: http://www.aims.org.af/maps/national/regions/north_east.pdf (detail, adapted)

M2 – Map of Burka district (detail) with research sites indicated

Source: http://www.aims.org.af/maps/district/baghlan/burka.pdf (detail/ adapted)

M3 – Map of Ishkamish district (detail) with research sites indicated



Source: http://www.aims.org.af/maps/district/takhar/ishkamish.pdf (detail/ adapted)

A5 – Research Design: Notes on Methodology

1) – Household survey in the districts

The household survey took place between September and December 2007 and was intended to examine the following issues:

- trends in use of different types of fuel over the last 40 or 50 years,
- estimates of the quantities of the main types of fuel being used now,
- estimates of changes in the amount of time taken to collect various types of fuel,
- selling of collected fuel,
- growing of tree species for timber and fuel.

A copy of the English version of the questionnaire is presented in Appendix 6. The number of respondents was 96 in 22 villages of Ishkamish district of Takhar Province and Burka district of Baghlan Province. The sample was stratified as follows:

a) households whose main source of income was from laboring and that do not own livestock or land,
b) households diversified income structure (remittances/ laboring, livestock, agriculture),
c) households that rely mainly on livestock and do not have irrigated land.

The sample was made up of 34.4% of the first stratum (labouring), 34.4% of the second stratum (diversified) and 31.3% of those households enaged mainly in livestock herding. The sample was stratified.

Dates

The questionnaires used Persian dates as the Persian calendar is the offical system and the only system understood in rural areas. The Persian years are therefore shown as the major axis with the CE year shown on the top secondary axis. The starts of the years do not correspond but the CE year was calculated approximately by adding 621 to the Persian year.

Respondents were asked to name the fuels used in order of amounts used for four periods:

(a) “before the revolution“, i.e. last days of Zamir Shah to Russian invasion (1348 to 1358 [1969 to 1979 CE]);
(b) “pre-Karzai“, i.e. Russian withdrawal to fall of Taliban - (1370 to 1380 [1991 to 2001 CE]);
(c) “two years ago“, i.e. 1384 [2005 CE];
(d) “now“ i.e. 1386 [2007 CE].

As the terms used were deliberately rather vague and because of how people remember events many years ago, the graphs showing variations with time are indicative only.

Weight units

Respondents were asked to estimate the minimum and maximum of the weight of a donkey load of wood in ser (7 kg). The calculated average was 10,31 ser or 72,2 kg. The standard deviation was 14%. Though the estimate was made only for donkey loads of trees, the same figure was used for a donkey load of bushes. However because bushes are more bulky than trees, the weight of a donkey load of bushes could be rather less than a donkey load of trees though judging by the extent to which donkeys are loaded with Artemesia (Poosh) for example, the difference is probably not great.

Manure weigths vary widely because of differences in density and water content. Amounts used and collected refer to the original wet weights. In practice the weights of fuel actually burned will be considerably less because of drying out. No measurements of water content or density were made. The weights of sacks of the different types of manure were as follows:

sargin	27,2 kg
peshqul	44,9 kg
lar	54,3 kg
tapi	33,9 kg

The standard deviation was around 30% in each case.

Fuels used in the past for different purposes compared to now – relative amounts

It was considered unfeasible to ask respondents to try to estimate the amounts of each fuel used many years ago. They were asked to rank the fuels in order of importance. In order to make maximum use of the order in which the fuels were given, several methods were considered by which to allocate an index that would reflect the relative amounts used. Several methods were considered and it was decided to use a harmonic system. In this system, a weight of 1/1 is allocated to the most used fuel, 1/2 to the second most used fuel, 1/3 to the third most used fuel and so on. These weights from every respondent are totalled for each fuel type and then a ***normalised index*** calculated by dividing each weighting for each fuel by the total for all the households. Thus the sum of the indices for all fuels used adds to unity, an index of one meaning that all households depend entirely on that fuel.

In order to allow for the higher use of fuel by households with larger number of members, a ***combined index*** (i.e. by using household size and fuel ranks) was calculated for each fuel used in each household by multiplying the index calculated as above by the number of household members. The totals of all the combined indices for each fuel were again normalised by calculating a grand total and dividing each total by the grand total. This produces a ***normalised combined index***. As it turns out, there is little difference between the normalised index based simply on the ranking by each household and the ***normalised combined index*** based on a combination of fuel rank and family size.

In analysing changes and trends in the indices, only those fuels for which the index was 0.1 or more for at least one time period have been focused on, other fuels being of relatively minor importance. Similarly when analysing trends and changes in percentage of households using a particular fuel (this analysis only takes into consideration that a fuel has been used by a household not the quantity or ranking), only fuels used by 10% or more of households have been analysed.

Relationship of use to size of households and number of people

Correlation between the amount of fuel used and the number of people in the household (R^2 for regression = 0.029) and the number of separate families in the household (R^2 for regression = 0.129) is not as good as might be expected though the number of families is a better predictor than the number of people. Using both the number of people in the household and the number of families increases the R^2 value to only 0.161. The multiple regression equation is:

Annual fuel use = 17.36 + 3.49 x number of families + 0.003 x number of people

Because the intercept is so large compared to the average (22.8), it would seem that there is quite a large amount of fuel that is required independent of the number of people and number of families in the household. The fuel usage for households with different numbers of families is summarized in Table A5-1. However the difference between the amounts is not significant.

Table A5-1: Relationship of household size to fuel usage

Number of families in household	Number in sample	Percentage of households	Number of people in household		Average number of people per family	Annual fuel use (t) [biomass + manure]	
			Average	Standard deviation		Average total fuel use	Standard deviation
1	66	68.75	7.61	2.63	7.61	20.87	6.52
2	16	16.67	10.38	3.87	5.19	24.27	9.46
3	9	9.38	12.22	3.49	4.07	25.25	7.93
4	3	3.13	20.00	4.35	5.00	41.96	26.10
5	1	1.04	25.00	NA[59]	5.00	38.24	NA
7	1	1.04	54.00	NA	7.71	31.96	NA

2) – Wood markets survey in the urban centers

As was mentioned in section 1.2 the second research component focused on fuel marketing in the urban centers, including a survey of bakeries, restaurants (hotals) and wood shops/ markets. In a first step data about the number of shops, markets, bakeries and restaurants were obtained from the provincial municipalities (Kunduz City, Taloqan, Pul-i Khumri). The sheer numbers registered with the municipality departments (Table A5-2) plus time constraints for the research did not allow drawing truly representative samples.

Table A5-2: Number of markets, shops, hotals and bakeries existing and sampled

	wood markets		wood shops		*hotal*s		bakeries	
	total	sample	total	sample	total	sample	total	sample
Kunduz	11	5	65	8[60]	105	8	110	8
Taloqan	9	3	15	6	60	6	112	6
Baghlan[61]	3	2	111	7	83	6	109	6

Kunduz has four bandar (meeting point of arterial roads in the bazaar: Imam Sahib, Khanabad, Velayat, Kabul). Since goods are usually being sold where they enter the city (from a particular direction) the sample was drawn to include each bandar – thus 4 (bandar) x 2 wood shops, restaurants and bakeries were sampled in Kunduz (sample total: 8). In Taloqan six of each were sampled because the city has three bandars (3x2 wood shops, hotals, bakeries). No similar pattern exists for Baghlan's municipalities which are mere passing zones along the Kabul-Kunduz road.

The inquiries in hotals and bakeries aimed to find out

- the amount of fuel wood used per day in ser
- How much is 1 ser of fuel wood (species listed)?
- Seasonal variations in fuel species usage
- Percentages of fuel species used
- Origin of wood (where/how bought?)

[59] Not applicable: standard deviation cannot be calculated if there is only one in the sample.
[60] In addition, six mobile wood sellers were interviewed regarding prices, species and origin of wood in Kunduz city. It turned out that each mobile wood seller belongs to one fuel wood shop.
[61] Baghlan comprises of four municipal entities which all were included in the survey: Pul-i Khumri, Baghlan-e Jadid, Baghlan-e Kohna and Fobrika.

In addition, specific information inquired included

a) the number of customers per day in the restaurants
b) in bakeries
   - the amount of flour used per day
   - the price of 1ser of flour
   - the number of breads baked per day
   - the selling price of bread

This information doomed necessary in order to aggregate the results and compare them with amounts of wood cut in the districts. But because no physical link (Archah wood) between deforestation in Ishkamish and Burka and urban marketing patterns was found, the aggregations were waived.

In a separate paper or upon request the data can possibly be used to aggregate fuel usage and spending/ benefits for the population in each of the municipalities. Furthermore, calculations regarding 'how much wood is necessary to bake a certain number of breads or to serve a certain number of customers?' can be conducted. However, to aggregate city (whole population) demand for fuel wood, e.g. via breads, is not possible. First, there are a high percentage of households which bake their own bread on daily basis. Secondly, the estimates of how many households or people live in one city are vague at best and unreliable.[62] Calculations based on such data would be of no validity and explanatory value.

[62] Afghanistan has never had a census, only once was one begun, but never completed (1970s). Similarly, even population figures for the provincial centers are unknown.

A6 – Questionnaire for household survey in villages (English version)

No. of questionnaire:

Date:

GENERAL INFORMATION

A – village information

a) Name of village: _____

b) location of village (district, hauza, valley etc.) _____

_____

c) NSP-shura name: _____

d) name of mosque: _____

d) GPS (mosque used by household members): _____

B – household information

a) household category

_____ main source of income laboring (no livestock and land property)

_____ main source of income livestock (household without irrigated land)

_____ diversified income (from all kinds of sources)

b) number of families (khona/ zandor)_____ and persons _____ living in the household

c) name of interviewee/s _____

& his/ their status in the household _____

1. What kind of fuel is used in your household for…

… Purpose	Fuel type			
	today	2 years ago/ 1384	before Karzai government	before revolution/ 1358
Baking bread				
Cooking				
Making hot water (washing)				
Heating				
Lighting				
storage and selling on bazaar as fuel				

Comments:

2. How much fuel wood does your household collect/ buy, and how much is used at different times of the year?

- ask first how much they use and what the usage units are
- then fill in the table a) 1 unit = how many ser, b) how many units of different fuel types are they using….

Type of fuel/ unit measures[63]	How many units do you use for own consumption in one week?				How many units do you collect in one week?				Do you store fuel?	Do you sell fuel?
	spri	sum	aut	win	spri	sum	aut	win	Yes/ No	Yes/ No
(lose) Manure (sargin) (in ser)										
Dungcakes (topiq) (sacks) 1 sack is approximately …… ser										
Wood (donkey loads)[64] total → 1 donkey load is from ……. ser up to ……. Ser										
1.										
2.										
3.										
4.										
5.										
Type of fuel/ unit measures[65]	How many units do you use for own				How many units do you collect in one week?				Do you store	Do you sell

[63] Because donkey loads might vary, informants will be asked to estimate the donkey load of each fuel type. Measuring donkey loads will not provide sufficient information on the average weight, thus it is better to ask fuel collectors for their estimate of the weight.

[64] While for collection of wood the appropriate measure would be donkey loads, the measure for wood selling at the bazaar will be ser (fuel market questionnaire).

	consumption in one week?								fuel?	fuel?
	spri	sum	aut	win	spri	sum	aut	win	Yes/ No	Yes/ No
Artemisia / Poosh (donkey load) 1 donkey load is appr. ..... ser										
Other kinds of shrubs/ bushes (beta) (donkey load = appr. ..... ser) total →										
1.										
2.										
3.										
4.										
Other kinds of shrubs/ bushes (beta) (donkey load = appr. ..... ser) total →										
1.										
2.										
3.										
4.										

[65] Because donkey loads might vary, informants will be asked to estimate the donkey load of each fuel type. Measuring donkey loads will not provide sufficient information on the average weight, thus it is better to ask fuel collectors for their estimate of the weight.

	How many units do you use in one month?			
Gas (kg)				
Coal (ser)				
Diesel ('tel-e khak') (paw (1 kg= 2paw+100g) or liter)				

2a. What type of fuel and how much do you sell (cash) or barter (in-kind)?

What types of fuel do you barter/ sell?	In own village, how much sold/ bartered b=bartered/ in-kind s = sold/ cash			In neighboring villages, how much sold/ bartered b=bartered/ in-kind s = sold/ cash			Sell at local bazaar, how much (district centers or other) & price per unit		Sell to traders who come to village, how much & what price per unit		Sell to traders in local bazaar, how much (district center or other) & for what price per unit	
	b/ s	no. of units	price	b/ s	no. of units	price	no. of units	price	no. of units	price	no. of units	price

2b. if people barter, indicate what they get in exchange for different fuel types (per unit)

a) barter exchanges in own village:

b) barter with neighboring villages:

3. Where do you collect fuel

Type of fuel	Collected where?

3a. How far do you have to go in order to collect different types of fuel? Who is collecting different fuel types? How many hours do people of your household spend for fuel collection?

Fuel types	Who is collecting it? M-men W-women G-girls B-boys L-laborer	Distance from village in hours for round way (forth and back)	Amount of time (hours) spent for fuel collection for period of one week* in different seasons			
			spring	summer	autumn	winter

* ask about how many days in one week they go to collect fuel – indicate the days

3b. How far did people have to go in the past for fuel collection (hours):

- first fill in the different fuel types respondents mentioned earlier (in the first line of the table), then ask for how far they had to walk (in hours) to collect the different fuel varieties

Fuel/ tree type →							
2 years ago/ 1384							
before Karzai-government							
before revolution/ 1358							

4. Do you grow trees in order to harvest fuel wood and/ or timber wood?

4a. fuel wood

No .....

Yes ..... for fuel wood on irrigated land (%) _____ on rainfed land (%) ____

Indicate if

- For own consumption _____ (tick), number of trees: _____
- for sale _____(tick), number of trees: _____
- both _____(tick), number of trees: _____

4b. timber wood

No .....

Yes ..... for timber wood on irrigated land (%) ____ on rainfed land (%) _____

Indicate if

- For own consumption _____ (tick), number of trees: _____
- for sale _____(tick), number of trees: _____
- both _____(tick), number of trees: _____

4c. What is the sales-unit?

- for fuel wood: _____
- for timber wood: _____

4d. What is the price for each unit

a) if sold to people who come to the village

price of one unit fuel wood: .....

price of one unit timber wood: .....

b) if sold at local markets

price of one unit fuel wood: .....

price of one unit of timber wood: .....

c) if sold at provincial markets

price of one unit fuel wood: .....

price of one unit of timber wood: .....

5. Which species of timber wood does your household grow? How much did you harvest in the last 2 years?

TIMBER SPECIES	AMOUNT HARVESTED LAST YEAR			INDICAT USE OF HARVESTED TIMBER		PRICE received per unit	Sold to whom/ where?
	3m pieces dastak	4 m pieces dastak	raw (min. 5 m)	% for own usage	% for sale		

5a. Can you harvest timber wood every year? Or do you harvest once every couple years? Please explain.

6. In which seasons of the year is fuel wood and timber wood sold/ traded most?

Fuel wood .....

Timber wood .....

7. Fuel and Timber Preference Ranking

(0-5, zero lowest value, 5 highest value)

Fuel type	Growth rate	Fuel value	Timber value	Market value

8. If you had all kinds of fuel available (including gas, coal, other energy sources), which type would you prefer to use for the different purposes? Please rank.

for heating

1. ……
2. ……
3. ……

for lighting

1. ……
2. ……
3. ……

for baking bread

1. ……
2. ……
3. ……

for cooking/ making hot water

1. ……
2. ……
3. ……

A7 – Afghan *shamsi* (solar) calendar

season	Afghan solar month	Gregorian equivalent
spring/ bahar	Hamal	21 March – 20 April
	Saur	21 April – 20 May
	Jawza	21 May – 21 June
summer/ tabistan	Saratan	22 June – 22 July
	Asad	23 July – 22 August
	Sonbola	23 August – 22 September
autumn/ tiramo	Mizan	23 September – 22 October
	Aqrab	23 October – 21 November
	Qaws	22 November – 21 December
winter/ zemestan	Ja'di	22 December – 20 January
	Dalwa	21 January – 19 February
	Hut	20 February – 20 March

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