



## A Whole Village Project Sector Report: Natural Resources and Climate Change

### Key Findings from WVP Data

*The Whole Village Project collects data on natural resource use with household surveys and focus groups of men, women, village leaders, village natural resource committees and farmers.*

**Water:** Access to water is the primary natural resource concern in WVP villages. Households travel an average of one-and-a-quarter hours to collect water. Only about half of households' primary source of drinking water is protected from contamination.

**Agriculture:** More than 70% of household heads are farmers, yet less than half of farmer focus groups say irrigation is practiced in their village.

**Deforestation and Energy Security:** Wood and wood-based products are the primary cooking fuel for 98% of WVP households. It takes an average of 3-5 hours round trip for villagers to collect firewood.

**Soil Erosion:** Agriculture focus groups judged soil erosion to be "very" or "somewhat" serious in 36 villages.

**Protected Areas:** Rural northern Tanzania is home to spectacular wildlife. While resource use can be limited within the boundaries of officially protected areas, they are not immune to the challenges of shifting climate and environmental degradation in their vicinity.

### The Whole Village Project

The Whole Village Project (WVP) is an interdisciplinary partnership between Savannas Forever Tanzania (SFTZ) and the University of Minnesota. The WVP collects quantitative and qualitative data on public health, nutrition, education, agriculture, wildlife, environmental conservation and food security in 56 villages in rural northern Tanzania. The scope of the data allows for a comprehensive picture of rural life and can help identify gaps in development assistance and national policies.

The WVP analyzes the data and uses a participatory planning model to communicate it back to villagers, local officials and donors. WVP data are also provided to researchers and groups evaluating economic, health, conservation and other development interventions.

Data collection began in 2009 and will continue with biannual visits to each of the 56 WVP villages pending funding. Ongoing data collection is essential to accurately evaluate the effectiveness of policy and development interventions over time. Additional funds to support future data collection and analysis are currently being sought. The WVP also partners with the National Institutes of Medical Research and the Tanzania Wildlife Research Institute.

### Background

The vast savannahs of rural northern Tanzania are home to an ecosystem that captivates the imaginations of people around the world. However, this ecosystem, the wildlife at its core, and the livelihoods of the people who live and work within it are threatened by climate change and environmental degradation.

The land, water and woodland resources that provide food, shelter and energy for people and which sustain a spectacular wildlife population are in decline. Increasingly unpredictable rainfall patterns and soil erosion are particularly detrimental to an overwhelmingly agrarian population. There is evidence that human activity is intensifying these processes.

Environmental degradation in this region cannot be tackled with a solely ecological approach. The motivations of the local human population must also be taken into account. Addressing water, land and woodland resource use requires consideration of agricultural practices, non-agricultural economic opportunity and sustainable household energy sources.

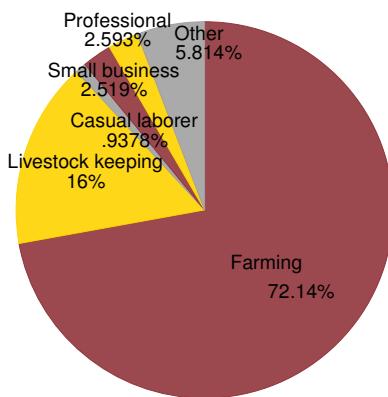
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### Natural Resources in Rural Northern Tanzania

The 56 villages covered by the Whole Village Project (WVP) face a variety of environmental challenges that are intertwined with the causes and consequences of a changing climate. As in much of Sub-Saharan Africa, water shortages, loss of wooded area, and land degradation present daily obstacles to WVP households. Sadly, these very households' pursuit of economic well-being often contributes to environmental deterioration.

More than two-thirds of WVP heads of household are farmers (Figure 1). The next largest occupational category is livestock keeping. Environmental degradation and climate change fundamentally alter the primary resources used by those who engage in agriculture. Shifting weather patterns, deteriorating soil quality and loss of pasture often result in lower yields and increase the uncertainty faced by farming households. However, agricultural activities are arguably primary contributors to the problem.

Figure 1: Occupation of Head of Household



WVP field staff conduct separate focus groups of men, women and village leaders to provide context to the information gathered in household surveys. Participants are asked to identify the three most acute problems faced by villagers. Focus groups in the villages of Naitolia,

Kimokouwa and Eworendeke in the Arusha region and Engusero in the Manyara region all listed environmental destruction in the top three village problems.

Figure 2: Regions of Tanzania



Source: Wikipedia

Overall, inadequate water supply was the most frequently cited village problem (Table 1). This is in part due to the fact that many villages were affected by the catastrophic drought that afflicted East Africa in 2009. Large fluctuations in rainfall patterns, including severe drought are expected to be an ongoing problem in rural northern Tanzania, particularly if forest and grassland resources continue to be used intensively by the human population.

Table 1: Percent of Villages Ranking Problem in Top Three

Problem	Focus Group		
	Men	Women	Village Leader
Poor Water Supply	30%	29%	24%
Environmental Destruction /Natural Disasters	2%	3%	4%
Shortage of Ag Inputs /Good Practices	12%	2%	5%
Food Shortage	0%	6%	6%

Over-use of woodland resources is another major source of environmental stress. Wood is commonly used as cooking fuel and for



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construction materials. Cleared land is used for pasture and farmland, providing short-term economic opportunity for households suffering from poverty and food insecurity. However, the loss of tree cover is linked to land degradation and declining water resources. This presents a real and immediate risk in a region that is already prone to drought.

The predominance of low-productivity agriculture as an economic activity makes land degradation particularly harmful to WVP household well-being. Land degradation has both natural and human-induced causes. Natural causes prevalent in WVP villages include frequent drought and flooding, steep slopes and high-intensity rains. Human-induced land degradation results from removal of woodland, over-grazing and agricultural production practices that do not allow the soil to maintain or replenish nutrients<sup>1</sup>.

### Water

Access to water is the primary natural resource concern in WVP villages. Severe droughts and periodic flooding are expected to plague the region for years to come. A lack of infrastructure for storing and directing water during rainy periods limits opportunities for irrigation and causes some villages to be cut off from markets when heavy rains make roads impassable. As reported in Table 1, nearly 30% of village focus groups ranked poor water supply in the top three village problems. Access to water for drinking and other household activities is often limited, can require traveling significant distance to collect and can be of poor quality. Occasional

cases of typhoid, cholera and diarrhea can be traced to poor water quality.



**Water pipe on the savannah**

Many villages in the WVP sample have established village natural resource committees (VNRCs). WVP field researchers interviewed an individual from this committee about natural resource access, conservation and use<sup>2</sup>. According to interviews from 27 villages<sup>3</sup>, the average village has access to two sources of water. Table 2 lists the number of water sources and the distance traveled for these villages. Eight villages report only one source of water; nine report two sources. While some villages have a water source within the village, others must travel long distances: Households in the village of Engaruka Juu travel up to 20 kilometers to access the sole source of village water.

According to the natural resources survey, the most common source of water is a shallow well, used in 14 villages. Nine VNRC leaders report the water from these wells is either muddy, salty or both. The wells are used an average of about 9 months of the year. Only eleven VNRC leaders report that villagers have access to piped water. In five of these villages, piped water is reported to be salty.

<sup>1</sup> Matari, Eliakim E.(2006) "Effects of Some Meteorological Parameters on Land Degradation in Tanzania." Presentation given at World Meteorological Organization Climate and Land Degradation Workshop, 11-15 December 2006, Arusha, Tanzania.  
[www.wmo.int/pages/prog/wcp/agm/meetings/wocald06/presentations\\_wocald06.html](http://www.wmo.int/pages/prog/wcp/agm/meetings/wocald06/presentations_wocald06.html)

<sup>2</sup> In villages without a VNRC the interview was conducted with an individual recommended by village leaders.

<sup>3</sup> The data from the remaining villages have not yet been processed by WVP staff.



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**Table 2: Access to water according to VNRC leaders**

Village	Number of Water Sources	Average distance to water (km)
Engaruka Juu	1	20
Matui	2	8.5
Naitolia	1	8
Elerai	2	7.5
Makame	3	6.7
Ndedo	2	6
Tingatinga	2	3.5
Boay	5	3.2
Mwada	1	3
Siuyu	1	3
Nduguti	5	2.8
Engusero	3	2.5
Eworendeke	6	2.2
Mtunduru	1	2
Kimokouwa	3	1.8
Nkinto	2	1.8
Kelema Kuu	2	1.5
King'ori	1	1.1
Migombani	2	1
Ngipa	1	1
Filimo	2	1
Masweya	1	1
Leguruki	2	0
Gidas	4	0
Mandi	2	0
Mnenia	3	0
Selela	4	NA

Household surveys tell a similar story. The average WVP household spends almost one and a quarter hours travelling to collect water and return home (Figure 3). In the extreme, a few households in the village of Kiserian in the Arusha region report travel time in excess of sixteen hours to fetch water. There are eleven

villages for which the average household's round trip to collect water takes more than 100 minutes. Figure 4 depicts regional averages without these villages: Even excluding the villages most isolated from water, it takes the average villager in the Shinyanga region over an hour to collect water.

Figure 3: Average Time Round-Trip to Collect Water By Village, Grouped by Region

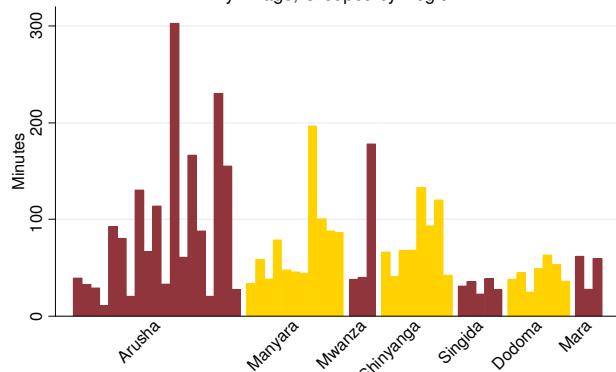
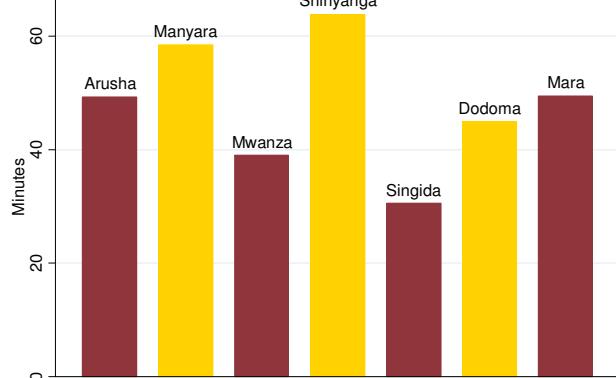


Figure 4: Average Time Round-Trip to Collect Water By Region, Excluding villages with average > 100 Shinyanga



According to household surveys, only about half of WVP households' primary source of drinking water is protected from contamination. The most common source of household drinking water in the overall sample is a public tap or standpipe (Figure 5). However, a different picture emerges at the regional and village levels. In all regions except Mwanza and Arusha, less than half of households obtain most of the drinking water from a protected source. In the

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Dodoma region only 12% of households drink mostly protected water. At the village level, the share of households obtaining most drinking water from a protected source ranges from universal in the villages of Lengijave and Kitendeni in the Arusha region to villages like Matui in the Manyara region, Mbushi in Shinyanga, and Kelema Kuu, Dalai and Songolo in Dodoma where no households report their drinking water comes primarily from a protected source (Figure 6).

Figure 5: Sources of Drinking Water  
Percent using as main source

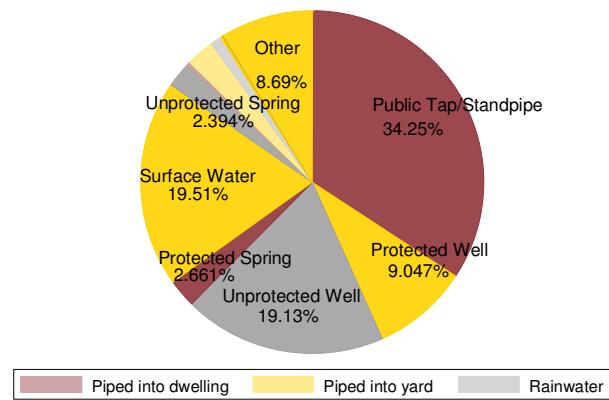


Figure 6: Access to Protected Water  
By Village, Grouped by Region

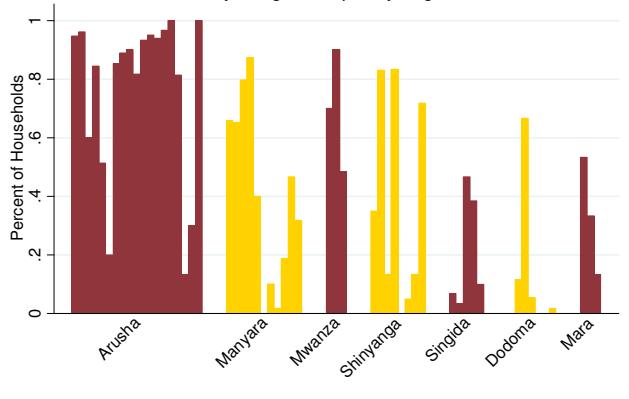
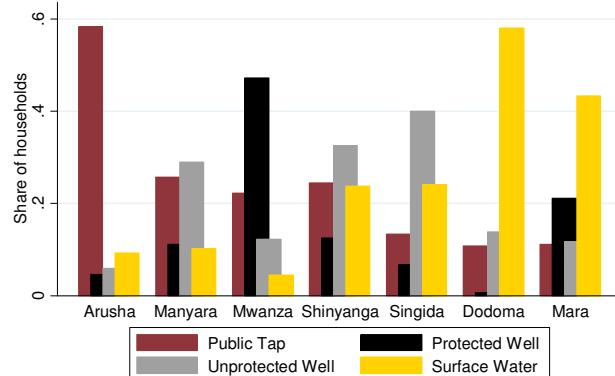


Figure 7 displays regional variation in the most common sources of drinking water. In the Arusha region most households have access to a public tap. In the Mwanza region the most common source of drinking water is a protected well. In Singida, Shinyanga and Manyara the

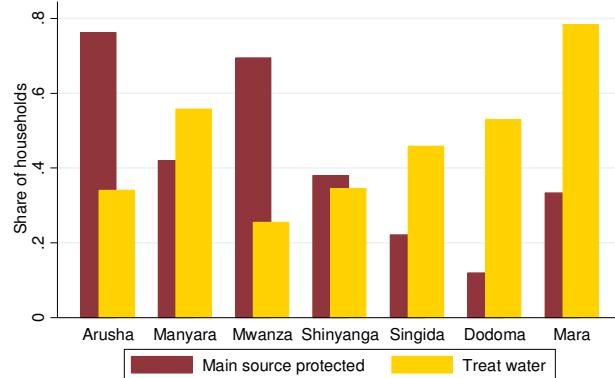
most common source is an unprotected well, and in the Mara and Dodoma regions, households obtain the bulk of their drinking water from surface water.

Figure 7: Main sources of drinking water  
Region



A more indirect indicator of water quality is the share of households that treat water before drinking, typically by boiling it. In Arusha and Mwanza where most households have access to a protected source, relatively few treat their drinking water (Figure 8). It is vastly more common elsewhere – nearly 80% of households treat water before consuming it in the Mara region.

Figure 8: Households Treating Water  
Region



Households are more likely to use water from an unprotected source for other household activities like cooking and handwashing (Figure 9). A comparison of Figure 7 and Figure 10

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Figure 9: Sources of Water for Non-Drinking Uses  
Percent of households using as main source

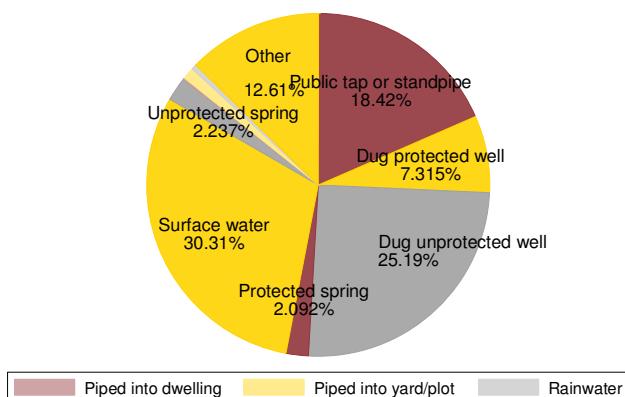
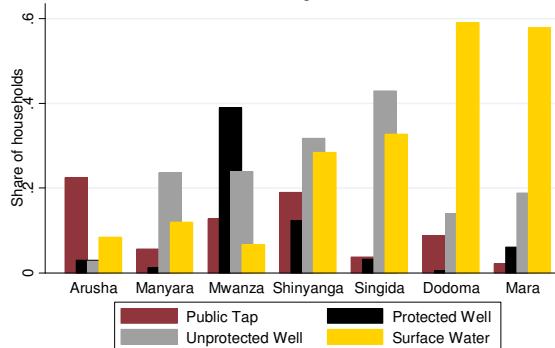


Figure 10: Sources of water non-drinking household purp  
Region



suggests that households that obtain most drinking water from a protected source substitute water from the most common unprotected source for other household needs.

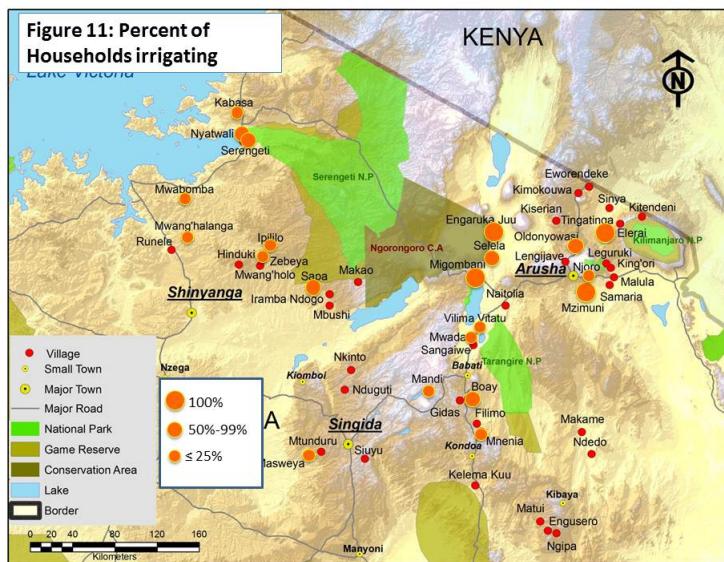
Although most WVP households engage in farming, very little land is irrigated<sup>4</sup>. WVP collects information on agricultural production techniques, including irrigation practices, from focus groups of village farmers. Less than half of the focus groups report any farmers irrigating village fields. Figure 11 shows that most of the villages where irrigation is practiced are either

relatively near Arusha city or a body of water. The most common irrigation method is to dig a water channel. Mechanized irrigation, e.g., using a water pump, is used in only four villages.

### Land Degradation

Land degradation in WVP villages can be most directly connected to the activities of farmers and pastoralists. Over-grazing and unsustainable agricultural practices can lead to soil erosion and otherwise diminish soil quality. This is a further detriment to agricultural productivity. Agriculture focus groups judged soil erosion to be “very serious” in 21 villages<sup>5</sup> and “somewhat serious” in a further 15.

Figure 12 shows that soil erosion is particularly problematic in the drought-hit areas near the Kenyan border and in several villages in the Manyara and Singida regions. Figure 13 summarizes approaches to addressing soil erosion, as reported by agricultural focus groups. Terracing and planting grasses, shrubs or trees are the most common methods village farmers use to combat soil erosion. In general, it is unclear from WVP data how pervasive these practices are among farmers.



<sup>4</sup> Irrigation data had been processed from 52 villages at the time this report was written.

<sup>5</sup> Data from agriculture focus groups has been processed for 52 villages.

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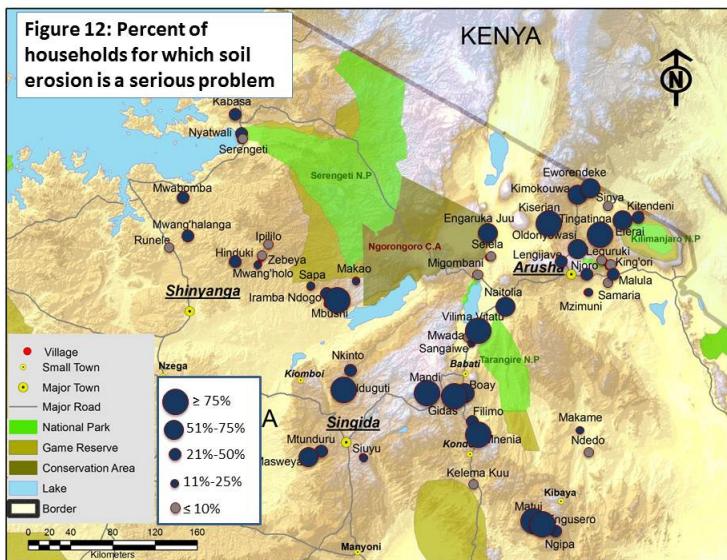


Figure 13: Methods of addressing soil erosion  
Number of villages using method

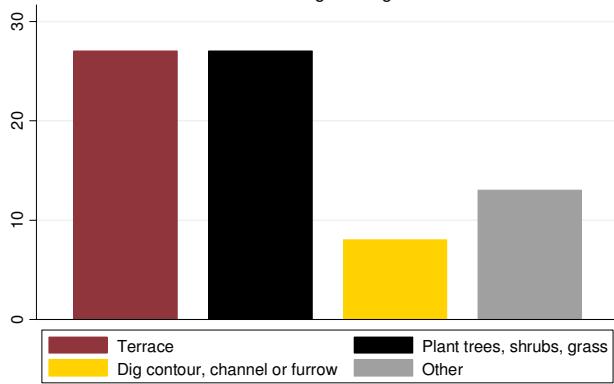
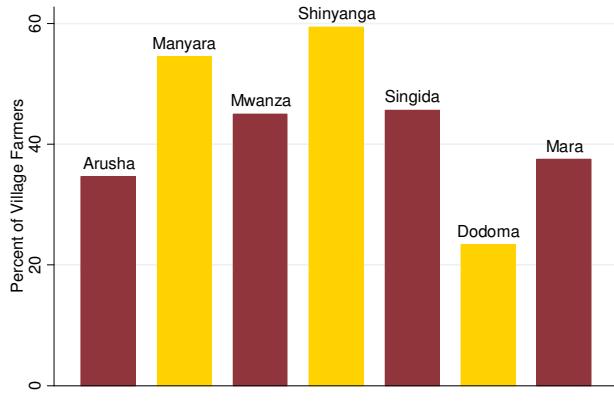


Figure 14: Farming Steep Slopes

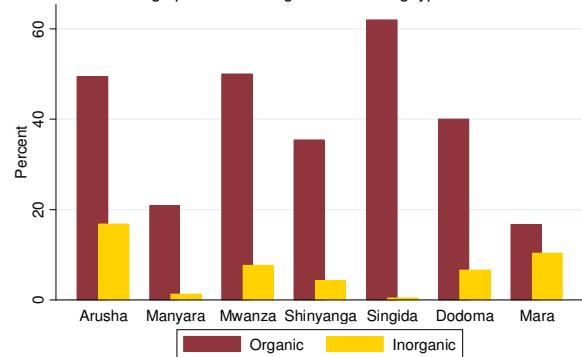


There are 26 villages where half or more of the farmers work steep slopes (Figure 14). Agricultural production on steep slopes has led to soil erosion in many villages. Terracing is a proven method of preventing soil erosion in mountainous regions. Agricultural focus groups report that terracing is common among farmers in 13 villages, only seven of which are in areas where more than half of farmers work steep slopes.

Farmers in WVP villages use intercropping techniques and fertilizers to improve agricultural productivity. Intercropping is very common practice. In 20 villages, the agriculture

focus group reported that all farmers intercrop. While the use of organic fertilizer, i.e., livestock waste, is fairly prevalent in most regions, there is very limited use of inorganic fertilizers (Figure 15).

Figure 15: Fertilizer Use  
Average percent of village farmers using type of fertilizer



### Deforestation

WVP villagers gather non-timber wood products, primarily firewood as a household energy source. Households also make or buy charcoal for cooking fuel and create building poles for construction. Some households also sell or barter these products for additional income. The WVP has collected household-level data on wood use, access to wood supply, and sales of wood

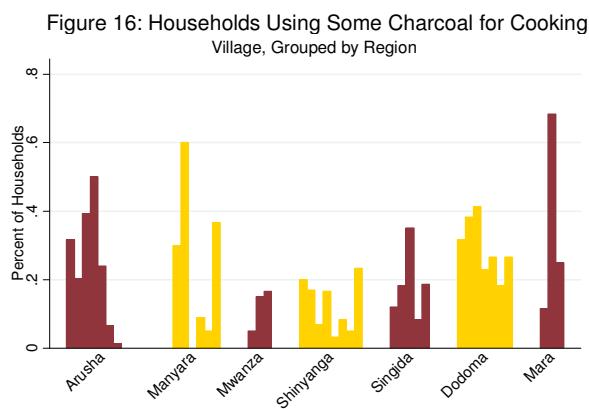
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products. Interviews with VNRC leaders provide further information on trends in woodland resource use<sup>6</sup>.



**A village in Longido District, Arusha Region**

VNRC leaders repeatedly describe a decline in the availability of wood and wood products: Fifteen of 27 VNRC leaders reported a decrease in the supply of firewood in the past year. Fourteen saw a decline in access to building poles in the past year. Twelve reported a decline in access to timber. Eleven reported a loss of access to trees for making charcoal. This is consistent with wider trends in Tanzania: Mongabay.com reports that Tanzania lost 19.4% of its forest cover between 1990 and 2010.



One of the primary sources of deforestation pressure is use of wood as an energy source<sup>7</sup>.

<sup>6</sup> Data from VNRC surveys has been processed for only 27 villages.

Wood and wood-based products are the primary cooking fuel for 98% of WVP households. Ninety-six percent of sample households report using firewood for cooking. A distant second place is 3% using charcoal as their primary fuel but use of charcoal is more common in some villages. In the Mara region charcoal is the primary cooking fuel for about 14% of households.

**Figure 17**



Additional questions were added to household surveys after data for the first 15 villages was gathered. While it might not be their primary source of cooking fuel, about 20% of households in these 42 villages say they use some charcoal for cooking (Figures 16). On average, a household that uses some charcoal uses less than one 20-kg can of charcoal per week.

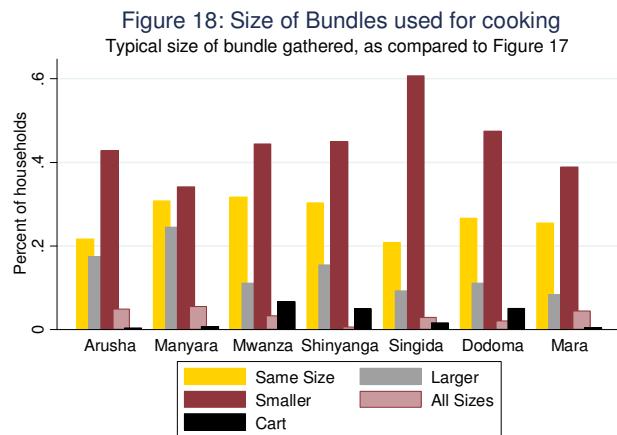
Household survey participants in the last 42 villages were asked to compare the size of wood bundles they typically collect for cooking fuel to a bundle the size of that pictured above (Figure 7). Most indicate that the bundle in the photo is larger or about the same size as the typical bundle collected for household use (Figure 18). On average these households gather 2-3 such bundles per week.

Data on time spent collecting wood and the number of household members participating in

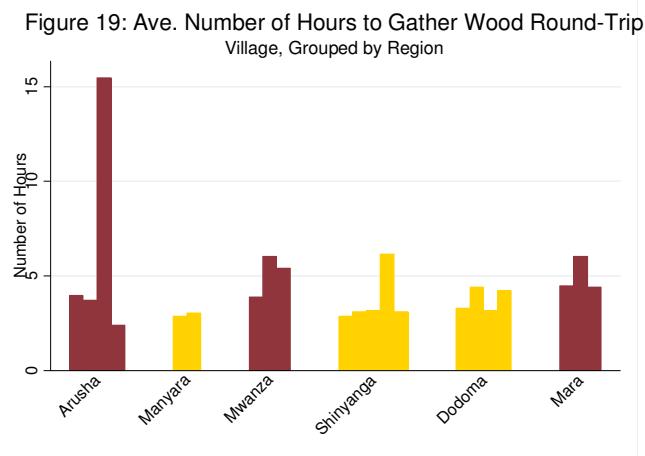
<sup>7</sup> UN-REDD Programme, Tanzania Quick Start Initiative. <http://www.un-redd.org>

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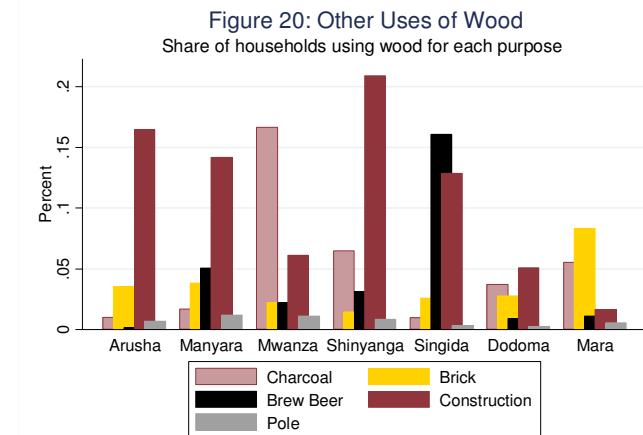
wood collection is available for 21 villages. For these villages, the average time it takes to get firewood and return is between 3 and 5 hours



(Figure 19). For the village of Kiserian in Arusha region, a few households reported spending in excess of 100 hours to gather a load of wood the same size or smaller than the one in the picture. The average household in these 21 villages makes between 2 and 3 trips to gather wood per week. One or two members of the household are typically involved with gathering wood. Only about 22% of WVP households report that they buy any firewood, although it is more common in the Arusha and Mara regions where about one-third of households buy firewood.



After cooking fuel, the next most common use of wood is to make boards for furniture or building (Figure 20). In the Singida region a fair number



of households report using wood for brewing beer. This is particularly common in the villages of Mtunduru and Siuyu.



### Focus Group

Sale of wood products is not a primary economic activity in the 40 villages for which data on household sales of firewood, charcoal and building poles are available. However, it is important in a handful of villages. Nearly 40% of households in the village of Mwanghalanga in Mwanza reported selling firewood and 28% reported selling charcoal. No other village reported more than 13% of households engaged



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in selling firewood. The village of Sapa in the Shinyanga region is the only other village where more than 13% of households sold charcoal.

Although few households are engaged in selling wood products, it is a significant source of income in some villages. Despite the large number of households selling firewood in the Mwanza region, a larger value is sold by households in the Manyara region. Likewise, the largest value of charcoal is sold in the Arusha region. This discrepancy could reflect higher prices, higher quality or simply fewer households selling a larger volume.

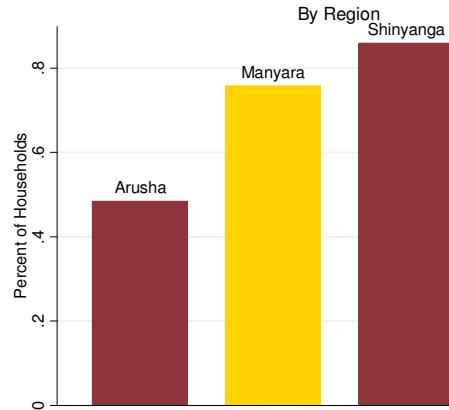
### Protected Areas

Many WVP villages are near areas that have been set aside to protect wildlife habitat and other natural features. Rural northern Tanzania is home to one of the most “intact” populations of large wildlife in the world<sup>8</sup>. Wildlife habitat is preserved on game reserves, in forests, national parks and other protected areas. Although exploitation of the resources within the boundaries of the protected area can be limited, their ecosystems are not immune to climatic shifts and environmental deterioration in their vicinity.

Households in 26 villages were asked about their relationship to nearby protected areas. In those villages more than half of households live near areas where natural resource use is restricted. In the Shinyanga and Manyara regions, well over two-thirds of households live near a protected resource(Figure 21). Most households report that they receive no benefits from living near a protected area. Very few households report a natural resource related benefit such as better access to water or timber or a better overall environment. Most households report no natural resource-related problems with living near a protected area. Those who do report problems

most frequently cite being restricted or punished for using the area.

Figure 21: Households living near restricted resources



Well over half of respondents that are aware of living near a protected natural area indicated they would be “sad” if the protected area were degazetted. Although there is some concern that degazetting would lead to desertification or environmental degradation, the great bulk of the reasons given for this attitude were economic, e.g., loss of tourism revenue, aid projects, employment, etc. Villagers living near game and wildlife reserves spoke less about natural resource-related costs and benefits, although in some cases where villagers are allowed access they remarked on the reserves’ role in preservation of pastureland.



*Women's focus group*

<sup>8</sup> UN-REDD Programme, Tanzania Quick Start Initiative. <http://www.un-redd.org>



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### Conclusions

Data from WVP household surveys and focus groups provide a snapshot of population living off of a land that cannot continue to provide resources at the rate they are presently being consumed. Agricultural production practices and over-grazing contribute to land degradation and the resulting decline in soil quality can turn, lead to lower yields. All the while families are living in extreme poverty and food and energy insecurity.

Household consumption of wood products, primarily for cooking fuel and other energy needs along with industrial use of wood has resulted in a significant loss of woodland cover. This has been linked to a loss of clean water resources in some parts of the country<sup>9</sup>.

Climate change and environmental degradation are fundamentally dynamic processes. Presently available WVP data can provide baseline information on household use of natural resources under the climate and weather conditions prevailing during data collection. To understand the role of climate change, the pattern of resource use and their impacts on socio-economic well-being of households it is imperative to periodically repeat household and village-level data collection in the 56 WVP villages.



*Cattle grazing outside the village of King'ori*

<sup>9</sup> UN-REDD Programme, Tanzania Quick Start Initiative. <http://www.un-redd.org>