

The 2018 Oda Water Survey



THE
ODA FOUNDATION

Research and Report
By
Aaron Charney



Preface

I came to Nepal in August 2017 to work as an Education Fellow for the locally based Oda Foundation. The Oda Foundation is a young NGO that works to foster education and healthcare in one of the most impoverished areas in Nepal.

Since the Oda Foundation began operations in December 2013, the organization's reach has grown immensely. The foundation has its' own classroom that is used 8 hours a day, 6 days a week, to provide students in the village a reliable education. Along with education, the foundation's main focus is healthcare. Having reached and provided for over 40,000 patients in the past 5 years, our scope of operations has grown from the immediate Oda community, to helping surrounding villages.

After being in Oda for 5 months, I had been able to observe daily life in the village. Along with witnessing the beauty of the community, I saw first-hand the various problems and struggles the people of Oda face on a daily basis. Amongst those, access to water. With a degree in Environmental Studies, I was instantly interested in learning more about the problem and finding a way to greater analyze the extent and details of water scarcity in Oda. In order to do this, I decided to survey the Oda population to truly understand the problem from the perspective of the community. Thus, my research project took form, and led to the 2018 Oda Water Survey.

I would like to thank firstly Karan Singh and Bachat Singh, whom without, I wouldn't have been able to overcome the obstacles of a language barrier, and this project wouldn't have been feasible. I would next like to thank all of the current and past staff of the Oda Foundation, everyone who has worked so hard for the organization and the community it serves. Lastly, I would like to thank all of the people of Oda, for firstly welcoming me into their community with everything they have, and for being supportive and cooperative in helping me with my research.



Abstract

Oda is a small village located in the remote Kalikot District of Mid-Western Nepal. Due to its' location and inaccessibility, the community faces a multitude of challenges. Amongst them being access to water. This project aimed to understand the water problem from the community's perspective in order to know what the population needs moving forward. By surveying 60 households throughout the village, the survey collected data having to do with water retrieval, water use, and water sanitation. This project additionally collected flow rate measurements from all water sources in the village. This report found that the average family lives less than 10 minutes from their water source, and has to send someone to collect water between 5 and 6 times per day. The average wait time for water at the tap is just over 2 hours. This reports measured estimate of daily per person water use amongst the entire population surveyed is 28.25 liters/day. However, high caste individuals use on average twice as much water per day as do low caste individuals. The survey found that the most water consumptive activities include cooking, bathing, and drinking; and although the community knows the effects of consuming dirty water, 72% of people don't treat their water. Lastly, the report found that 98% of the community says they need more water, and 61% stated their primary need of more water is for agriculture and food production. It is hoped that the conclusions of this project can be used in the future to create successful projects that help to alleviate water scarcity in Oda.



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Executive Summary

The Project

Oda is a small village located in the Kalikot District of Mid-Western Nepal. With an 8 hour drive from the nearest city, and 5 km hike from the nearest road, the village is extremely isolated and inaccessible, which has left the community facing a variety of daily challenges. A 2016 survey that asked the community about their daily challenges ascertained that 95% of people said lack of water is their largest concern. Thus, this project aimed to understand the water scarcity problem from the perspective of the community in order to work towards finding a solution to this problem.

Survey Methods

This project took the form of a 24-question survey. To overcome the language barrier, all questions were close-ended in order to maintain objectivity in translating from Nepali to English. With the help of a village member as a translator, 60 households were surveyed, including a proportionate representation of each caste (social classes that have evolved in Hindu and Nepali culture). After all data was collected, results were aggregated and analyzed in order to understand the water problem from the perspective of those community members surveyed. In addition to the survey, this report also looked at water availability in the form of liters/minute flow rates from all water sources in the village.

Oda Water Infrastructure

There are currently a variety of different water sources in Oda. Within the village, there are 12 potential water sources: two constantly open taps that are fed from nearby groundwater springs; 5 other 'cement' taps with faucets on them (thus they can be closed), connected to large underground tanks fed by underground springs between 1-3 km away; and a variety of hoses that can be connected to the aforementioned 'cement' taps. In addition to the water sources in the village, many families use one of the nearby rivers as their water source.

Survey Findings

The average family in Oda lives just over 9 minutes from their water source, and goes to the tap to collect water 5-6 times per day. Once at the tap, on average people wait 2 hours and 4 minutes for water, while some people reported a maximum wait time of over 5 hours. Within Oda, there is an extremely uneven distribution of water source use, with 58% of surveyed families using one of the over 10 available sources in the village. Coherently, as the most stated influence for tap choice is water flow, this most commonly used tap is one of the two taps that is open all day. Although people stated the most common reason for going at a certain time of day is to avoid long waits, the most common times for retrieving water are before 8 AM and after 4 PM, the times of day with the longest wait.



Although most families reported using water from the tap for all types of work ranging from cleaning and cooking, to livestock and house building, the most highly water consumptive activities were found to be cooking, livestock, bathing and drinking. The gathered estimate of daily per person water use in the village is 28.25 liters/day. However, the amount of water that is used for livestock is unknown so remains in this number. Thus, the amount of water used for individual needs is assumed to be much lower.

Ninety-eight percent of the population surveyed stated that they are in need of more water. When asked what their primary, secondary, and tertiary needs for more water are the community suggested they most direly need more water for crops, livestock, and bathing. Although people said they need more water for various household and hygienic needs including bathing, washing clothes, and drinking, 61% of the surveyed population said their primary need for more water is for crops and fields. As 98% of respondents rely on rainwater throughout the year for their fields, this suggests that just rain isn't enough to provide sufficient yields.

This survey found that although 100% of respondents stated being aware that consuming dirty water can cause sickness, 72% of the population still doesn't treat their water for at least part of the year. Although 82% of people reported believing that their water is clean, a higher percentage of these people than those who reported their water being dirty, do something to treat their water, showing a lack of understanding of the necessity to treat dirty water. Ninety-two percent of all respondents said they would use a water filter if available, showing an openness to adapting water hygiene habits.

In analyzing the survey results, this report found differences in water use between caste populations. In terms of water retrieval, Dalit, lowest caste, families, walk twice as far to the tap on average as their higher caste counterparts. Additionally, based on which tap they use, middle caste families experience zero water availability on average 6 times per month, while lower and upper caste individuals never experience this. Highest caste individuals (Brahmin) use on average twice as much water per day as do lower caste individuals. Although this is a striking result, higher caste individuals and families on average go to the tap more times per day and have a longer wait time at the tap, thus take on more work to obtain a higher volume of water.

In looking at water needs, the most pressing concern for more water between families of all castes is for their crops and fields. Upper and middle caste families reported a higher need for water for fields and livestock than did the lower caste, consistent with the fact that higher caste families own more land and livestock. Lower caste families have a higher need for more water for hygienic purposes including cleaning, bathing, and washing clothes, potentially suggesting people from the lower caste currently inhabit less hygienic living environments.



Conclusion

Over all, by talking to the community directly about water, this project was able to understand the problem from the perspective of the people who it affects on a daily basis. The findings about tap use distribution, distance between house and tap, wait time, and daily water use, are helpful in illuminating the water problem in a more quantifiable manner. Results showing differences in water dynamics between castes are important in not only understanding the water shortage, but also the culture of Oda as a whole. Lastly, the finding that an overwhelming portion of the surveyed community not only said they need more water, illuminating water scarcity in the village, but a majority stated their primary need for more water being for crops and fields, is important in the future in ensuring that projects to alleviate the water deficiency focus on community stated needs.

Background

About Oda

Oda is a small village located in the Mid-Western foothills of Nepal. In the remote Kalikot district, Oda is extremely isolated and inaccessible. As Nepal is the 28th poorest country in the world (Global Finance), the country's geopolitical situation combined with the remoteness of Kalikot, has left Oda in one of the most underprivileged areas in the developing world. From the nearest city of Surkhet, Oda is an 8-hour drive on a mostly unpaved high mountain pass, only accessible then by a 5 km hike from the nearest road.



Figure 1: A picture of one hillside of the Village of Oda, showing one of the three wards.

Oda is located in the 'Mahabai' Gaunpolika (rural municipality), and is made up of 3 wards, or neighborhoods (Oda-1, Oda-2, and Oda-3). A 2016 survey entitled 'Odanaku Household Survey Report,' written by a previous Oda Foundation Fellow, found that within the 3 wards lives a population of just over 1,700 people, made up of roughly 225 families. The Oda population is almost evenly divided between males and females, and roughly 45% of the population is children.

As is similar in many places throughout Nepal, the population of Oda has evolved under the influence of a Caste System. The castes in Oda fall into three categories: Brahmin, the highest caste, made up of the family name 'Kafle;' Chhetri, the middle caste, with family names Singh and Shahi; and Dalit, the lowest caste, or 'untouchables,' with family names Pariyar and B.K. (pronounced 'Bee-kah'). The distribution of the population is as follows: 10% Brahmin, 60% Chhetri, and 30% Dalit. In addition to the caste system, the culture in Oda has many ingrained gender disparities. Amongst these, is the practice of *Chaupadi*, for which women are required to sleep in cow-sheds separate from their family homes, during menstruation and for a period of time after child-birth.

Households in Oda generally have large numbers of people, and often contain more than just one family. The average household size is just over 8 people, and upwards of 30 houses have more than 15 people living in them.



Oda is primarily a farming community, mainly growing millet, rice, and wheat. However, farming in Oda is hardly sustainable as crop yields fail to provide enough food for families year-round. On average, fields annually produce only 3 months worth of food. Some families are able to grow enough food to feed themselves for 8 months out of the year, while other families are left with yields of less than 1 months worth of food.

In addition to food problems, Oda has a variety of health difficulties. Common health problems include respiratory illnesses such as COPD and Acute Respiratory Infection, digestive and gastrointestinal problems such as gastritis, and other diagnoses such as typhoid, and Urinary Tract Infections. The presence of many of these preventable diseases is due to the lack of hygienic infrastructure. (Dunn, 2016)

In terms of personal hygiene, the survey also found that a third of Oda's population has no access to a toilet, and thus defecates in the fields or surrounding forest. People reported that they bathe on average 4 times per month during the warm season, and 3 times per month during the cold season. 48% of the population reported that they don't brush their teeth, and the survey conveyed that even though people said they commonly wash their hands, this is questioned due to lack of access to water.

Other reported hardships include the inaccessibility of the village, a lack of everyday resources such as oil, salt, and clothes, and hardships in retrieving materials such as stone and wood, which people walk hours from the village to obtain (Dunn, 2016).

While there is a host of factors that create the many challenges that the Oda community faces, one common variable in many of these difficulties is a lack of access to clean and reliable water.

Water in Oda

The Problem

Although working on solutions to the various social, health, and education issues is essential to improving the livelihood of the community, the problem of access to water is imperative and has implications for the rest of the challenges the people of Oda face.

A key finding of the 2016 survey was ascertained when the community was asked about the major problems they face in their daily lives. 95% of respondents said the biggest challenge is the water shortage.

The connection between the water problem and hygiene is exemplified in quotes from respondents to the Household Survey. One respondent stated, "All of the village is dry because there is no water... People work all day long in the fields and



when they go back home they can't drink water or take a shower. With no water, how can people take care of their own sanitary needs?" Another respondent summarized the direness of the situation in saying, "as cleaning and sanitation are all linked to easy access to water, we are having trouble living a healthy life." As is implied through these quotes, the recent water deficiency in Oda has had effects that have cascaded through people's lives and greatly affect their ability to live hygienically.

One of the strongest effects of the recent water deficiency in Oda is its direct effect on food production. There is much farmland in Oda, but "because of the water shortage, the land is barren and production is minimal" (Participant 119, Odanaku Household Survey Report). The 2016 survey reported that the water shortage has been especially harsh in the past 5-6 years. Current conditions are further explained by one of Oda's community members saying, "there are no irrigation canals [here anymore so] we have to depend on rainwater. It has a direct effect on our field production. There is a close connection between the food and water shortage."

The effects of water shortage on both hygiene and food have extreme consequences for health in Oda. As people don't have enough water to bathe frequently, to wash their hands, and to maintain other sanitary habits, there is a strong influence of the lack of water on health. A lack of clean drinking water, in terms of quantity and quality, can lead to higher rates of a large array of diseases including diarrhea, typhoid, hepatitis, scabies, and more (WHO, 2018) A survey respondent stated that in relation to the water shortage, "we only grow millet... there are no vegetables in the village. We eat rice and millet bread only with salt."

While the aforementioned connections between the water shortage and other problems in Oda are more tangible, a less perceptible influence of water problems can be seen within social aspects of the community. "There is a big shortage of water in the village. Our community is pretty close with each other, but the water shortage makes us fight," said a respondent to the 2016 survey (Dunn, 2016). By understanding how water scarcity affects everything ranging from food production to personal relationships, it becomes apparent how significant of a problem it is in Oda.

Current Water Infrastructure

Currently, the water available to the Oda community is almost entirely supplied by nearby groundwater springs. Each ward (neighborhood) has anywhere from 1 to 6 taps of different types available for use.



Figure 2: A natural tap in Oda, with no faucet to control water flow.

Two taps in Oda are supplied directly by nearby springs (Figure 2). These two taps cannot be closed, so as long as the spring has water, they are constantly flowing. Aside from these two taps, the remaining sources are fed from springs that range anywhere from 1 to around 3 km away. The more distant springs feed into large, 10,000-liter, underground tanks that are connected to a number of taps.

One of the large tanks is connected to 4 'cement taps' (Figure 3). Hoses can then be connected to these taps in order to spread water more easily to surrounding areas (Figure 4). The other large tank in the village is only connected to one of these permanent cement taps, and a few portable hoses. All of the permanent cement taps in Oda have a typical faucet; so can be closed in order to control

water flow. Additionally, these taps are only opened for around 2 hours a day, being opened and closed by a community elected village member. In the past, they were open for 2 hours in the morning and 2 hours in the evening, but currently are only opened for a 2-hour period in the morning.

An additional source that provides water for just the Oda Foundation comes from an underground spring 1.5 km away.

In the past, there was additional water infrastructure in Oda. During the most recent civil war, between 1995 and 2006, the national army created a system of hollowed out trees to serve as pipelines from a nearby river. However, due to lack of maintenance, the trees have rotted and are now rendered unusable.

Additionally, there used to be a system of 'gutter' type pipelines coming from the nearby village of Dillikot. Running a distance between 2 and 3 miles, the pipelines provided Oda with a substantial amount of water. However, for various reasons, including population growth in Dillikot, these pipelines no longer supply water to Oda.



Figure 3: A permanent cement tap. Open only 2 hours a day, and controlled by a community member.



Figure 4: A student uses one of the hoses connected to a nearby permanent cement tap.

Moreover, the government recently conducted a project to bring more water to Oda. The project started at the Jagad River, between 3-5 km away from the center of the village. This pipeline was to be gravity fed from the river, ideally providing a reliable and continuous source of water. However, the project ran out of funding, and the pipeline never made it to Oda, so has remained uncompleted and unused.

Thus, it is now imperative to re-examine the water problem, and find a cost efficient, long-lasting, and sustainable way to bring a sufficient amount of water into the community.

Methodology

Survey

In order to better understand the water problem in Oda, this project wanted to see how the people in the community view the problem, and how it affects their daily lives. In order to do so, a 24-question survey was written, aimed towards understanding different aspects of water infrastructure and issues in the village.

The survey was written and structured in three basic sections. The first section focuses on water retrieval: which tap different families use, time to get to the tap, wait time at the tap, etc.. The second section focuses on water use, including questions regarding amounts of water used and what water is used for. The final section concentrates on water sanitation.

The largest obstacle for this project was the language barrier. Thus, in order to write the survey, help was sought from one employee of the Oda Foundation, and one of the oldest students in the village. For ease of data collection and objectivity while dealing with translation issues, the survey consists of closed-ended questions. Although in some ways this limited the amount of information obtained, it made it possible to attain accurate information while translating from Nepali to English.

While writing the survey, in order to make sure that correct information was acquired, and answers weren't drastically limited by the closed ended structure, a village member helped write all potential answers to the questions. Through his life-long experience of living in Oda, he helped ensure that all possible and common



answers to questions were available as choices in the survey. After the questions were written in English, a community member fluent in both Nepali and English, translated them directly into Nepali.

After translation, with the help of a student in the village, 60 households were surveyed. The student, Bachat Singh, asked the questions and stated the answer options in Nepali. Whichever answer was given by the respondent was then recorded according to its given label (i.e. A, B, C....). Houses were chosen at random, but the number of houses surveyed within each caste was chosen in order to correspond to the relative percentage each caste makes up of the Oda population. Out of the 60 houses surveyed, 22 were Dalit, or low caste, representing 36% of respondents; 25 Chettri, middle caste, houses were surveyed, 42% of the surveyed population; and 13 Brahmin, upper caste houses, 22% of the surveyed portion of Oda.

After the surveys were completed, all answers were entered into Microsoft Excel. Analysis was analytical, and done solely through Excel spreadsheets and functions. Results and analysis can be seen in the following sections, and the survey is shown in Appendix A.

Flow Rates

As part of this survey, flow rates were taken from every water source in the village. To measure flow rates, the time it took to fill a container of a known volume was recorded multiple times at each water source. All measurements were then calculated into a liters/minute measurement, and aggregated to obtain an average for each source. As there are 3 different 'types' of taps in the village, all measurements from each type were averaged together in order to look at the difference in flow rates for each type of water source.

It is important to note two things in regards to the flow rate measurements. Firstly, all measurements were made during the months of January through March. In Nepal, these are generally some of the driest months of the year. Thus, the flow measurements represent average flow rates in only the winter months, and they can be assumed to be higher during the summer and monsoon seasons. Secondly, as many of the taps are only turned on and flowing a few hours out of the day, some of the data points for flow rate were zero. However, in calculating the average flow rates, these zero data points were excluded. Thus, the flow rates are average measurements of the liters/minute rate while the tap is open and water is flowing.



Limitations

While this research project and report are thought to be generally thorough and comprehensive in regards to water in Oda, there are limitations to the scope of this project.

As discussed earlier, one of the biggest challenges was that of translation. In order to deal with this, the survey was structured entirely in closed-ended questions. This limited potential answers, thus possibly limiting the information that was obtained. While some respondents gave more extensive answers than were available in the multiple choice options, even with a student as a translator, all of this information was not understood and recorded.

Secondly, there were time constraints on this project. I spent a total of 8 months in Oda. However, due to wanting to fully understand the community, the potential problems, and ensure I was welcome to be doing research, this project was not started until 5 months into my time in the village. Thus, I only had three months to complete this project, from writing the survey, to completion of the report. This limited the number of surveys that were done. Although Oda is a fairly monotonous community, and it is believed that the 25% of the community directly surveyed is fairly representative of the whole, if I had more time, I would have surveyed more households.

Additionally, due to the limited time period for which I was in Oda, this survey was only conducted during the winter, which is the dry season. Thus, water scarcity is generally much worse during this time of the year, so the survey is not indicative of the water problem year round.

Data and Results

Survey Results

Question 1: When you go to the tap, how many people do you retrieve water for?

	# of people water retrieved for
Average	7.35
Max	20
Min	2
Median	7

Table 1: How many people respondents retrieve water for.



The average number of people that somebody retrieves water for is just over 7, with a maximum of 20. It is important to note that the number reported here is not representative of the family or actual household size of the families surveyed. When the word ‘family’ is used throughout this report, it refers to the group of people that the community member (or household member they represent) retrieves water for. Additionally important to note is that it was made clear to survey respondents that when questions had the word ‘you’ in them, it referred to anyone in the household that retrieves water for that group of people, not only the person being surveyed.

Question 2: Which tap does your family use?

As mentioned in the background section, there are a variety of water sources in Oda. The table below shows how the sources were identified, and the percentage of people surveyed who use each source.

Tap ID	Tap Name	Tap Type	% of people surveyed who use that tap
A	Jira Singh	Cement	3.30%
B	Bhan Bahadur	Hose	1.67%
C	Karan's House	Hose	1.67%
D	Dalit/Brahmin	Natural	58.33%
E	Sarita's Rock	Cement	8.33%
F	Singh by Kalpana's	Natural	1.67%
G	New Temple	Cement	6.67%
H	Bishna's Shop	Hose	3.33%
I	Manju's House	Cement	5%
J	Lal's House	Hose	10%
K	Oda Foundation	Private Source	0%
L	River	Nearby River	5%
M	Sangam House	Cement	3.33%

Table 2: Distribution of survey respondents who use each water source in Oda.

*Percentages don't add up to 100% because some respondents cited multiple answers.

A majority of the population represented in this survey (58.33%) uses one water source (Tap D), while the rest of the taps are used by a much smaller percentage of the population.

In addition to understanding the amount of people using each individual tap, the number of people using each type of water source was aggregated. These results are shown below in Table 3.

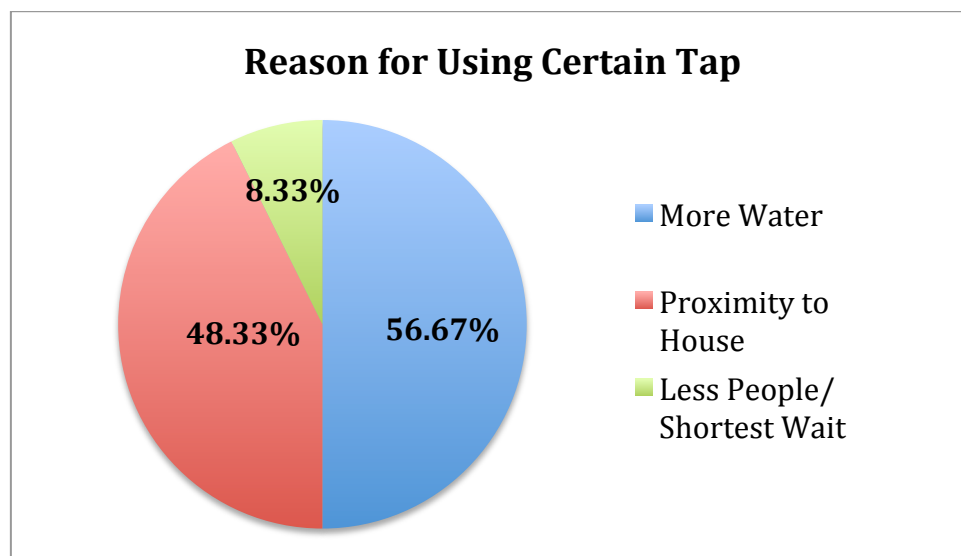
Tap Type	# of people represented in survey using this type	% of people represented in survey
Natural	284	60.81%
Hose	59	12.63%
Cement	105	22.48%
River	19	4%

Table 3: People represented in Survey who use each type of tap in Oda. Examples of the taps are shown in the background section above.

Although there are only 2 ‘Natural’ taps in Oda, a majority of people use one of these two taps. While there is the highest number of ‘Cement’ taps (5 in Oda), less than a quarter of people use all of these taps combined. This statistic highlights the uneven distribution of water source use in Oda.

Question 3: Why do you use that tap?

In order to understand why the use of different tap types is distributed how it is, the survey next asked people their reason for using a specific tap.



Graph 1: Percentage of people surveyed who gave various reasons for why they use a certain tap. *Percentages don't add up to 100% because some respondents cited multiple answers.



This study found that the most common factor in tap choice is water flow, with 56.67% of people reporting this reason. A relatively close number of people, 48.33% of survey respondents, said that another important influence on tap choice is proximity to home. With less than 10% of people reporting that they consider wait time at the tap in choosing which tap to use, this is not as important a factor.

Question 4: How far do you walk to retrieve water?

	Time Traveled To Retrieve Water
Average	9.125 min
Max	60 min
Min	1 min
Median	5 min

Table 4: How long people travel each direction to and from their water source.

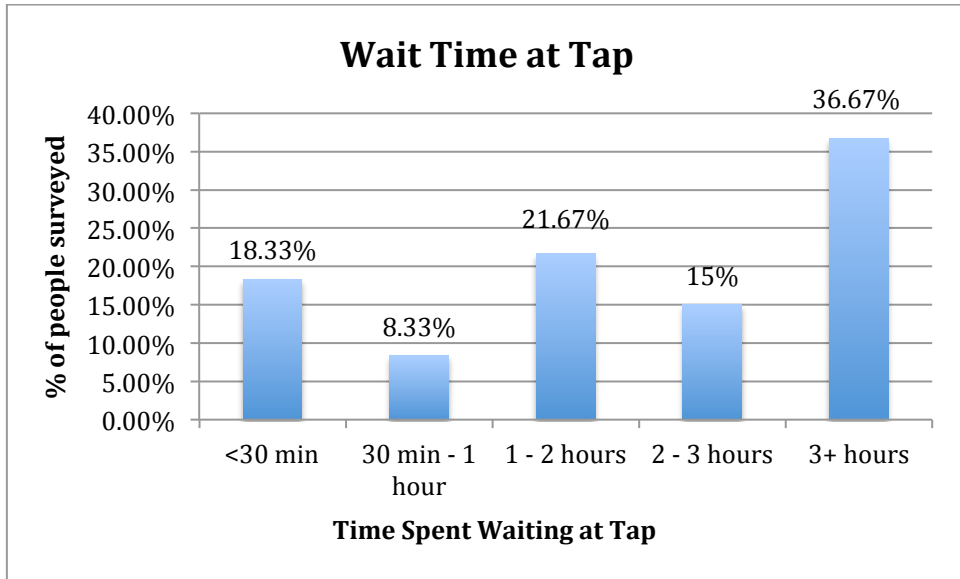
The amount of time that people spend walking to retrieve water is on average (for all castes and families surveyed) less than 10 minutes. With a median number of 5 minutes, only 50% of respondents reported walking more than 5 minutes to get water. 90% of people surveyed walk under 20 minutes. Only 3 respondents walk over an hour to retrieve water, all of who use the river as their water source.

Question 5: How long do you wait at the tap for water?

	Wait time for Water
Average	2 hours and 4 min
Max	5.5 hours
Min	1 min
Median	2 hours and 15 min

Table 5: Wait time for water amongst all people surveyed.

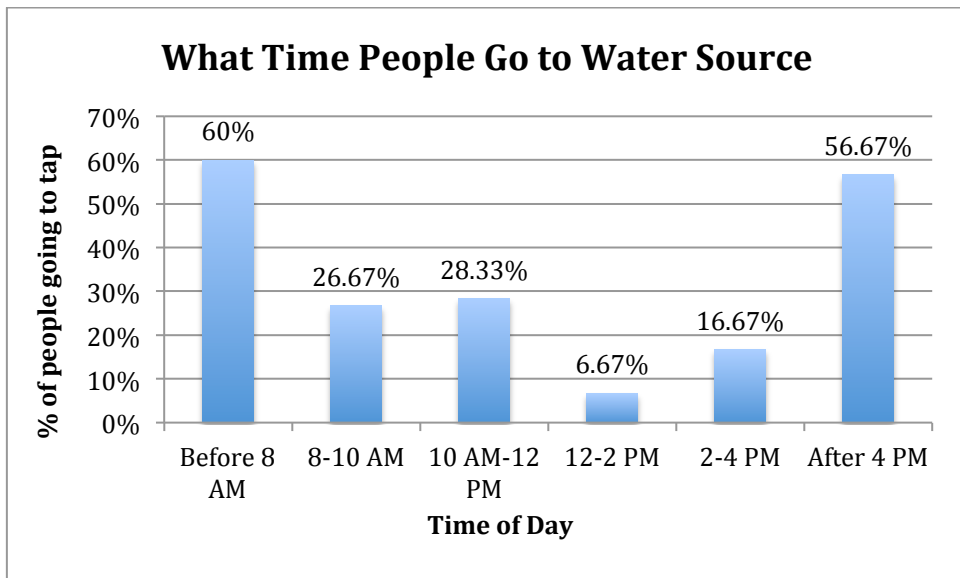
The average amount of time spent waiting at the tap for water is 124 minutes, just over 2 hours. The minimum is one minute, and the maximum shows that some people wait over 5 hours for water. When respondents gave a range of wait times (i.e. 2-4 hours), the median of that range was recorded (i.e. 3 hours).



Graph 2: Breakdown of how long people wait at their source for water.

While the average wait time for water is just over 2 hours, 161 people represented in this survey wait for more than 3 hours. If these results are indicative of the entire village, over 620 people in Oda wait over 3 hours each time they retrieve water.

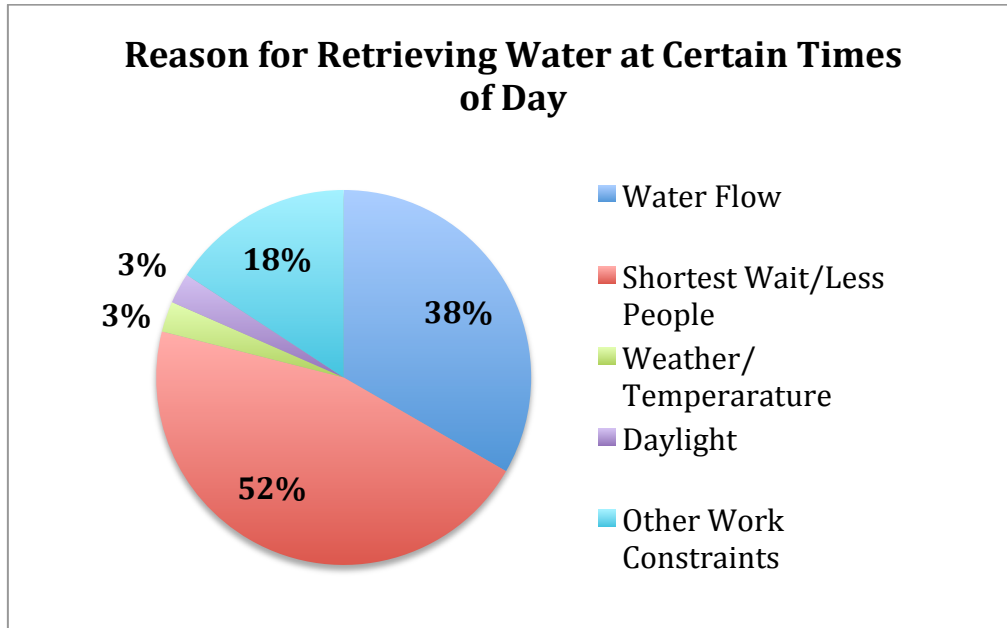
Question 6: What time do you go to retrieve water?



Graph 3: Percentage of people surveyed who go to their water source at various times of day. *Percentages don't add up to 100% because some respondents cited multiple answers, as people go to the tap may times in one day.

Graph 3 shows the most common times to retrieve water are early in the morning, and in the late afternoon. Relatively few people go in the middle of the day, as only 6.67% of respondents reported going to the tap between 12 and 2 PM. Over half of the population surveyed goes to the tap to retrieve water before 8 AM and after 4 PM.

Question 7: Why do you go to get water at that time?



Graph 4: Percentage of people surveyed who gave different reasons for retrieving water at a certain time of day. *Percentages don't add up to 100% because some respondents cited multiple answers.

As well as understanding the factors behind people's choice of which tap to use, the survey sought to understand why people go to the tap at a certain time of day.

Graph 4 shows that the strongest factor influencing what time of day people retrieve water is the perceived wait time. The second most influential reason is the amount of water flowing at different times of day. Environmental factors such as weather and daylight were found to have relatively little influence on what time of day people go to the tap.

Question 8: How many times in one day do you go to get water?

	# of times a family member goes to the tap in one day
Average	5.35
Max	13
Min	1
Median	4

Table 6: Statistical measurements of the number of times a family member goes to the tap in one day, aggregated from all survey respondents. ** It is important to note here that the numbers given for how many trips are made to the tap represent how many times *someone from the family* goes to the tap in one day, not just the person who was surveyed.

The average family (represented in this survey as the group of people the respondent reported retrieving water for) sends someone to a tap over 5 times per day. 11 families reported having a member go to the tap over ten times per day. Only 2% of survey respondents stated only having somebody go to the tap once a day.

Question 9: How much water does your family use in one day?

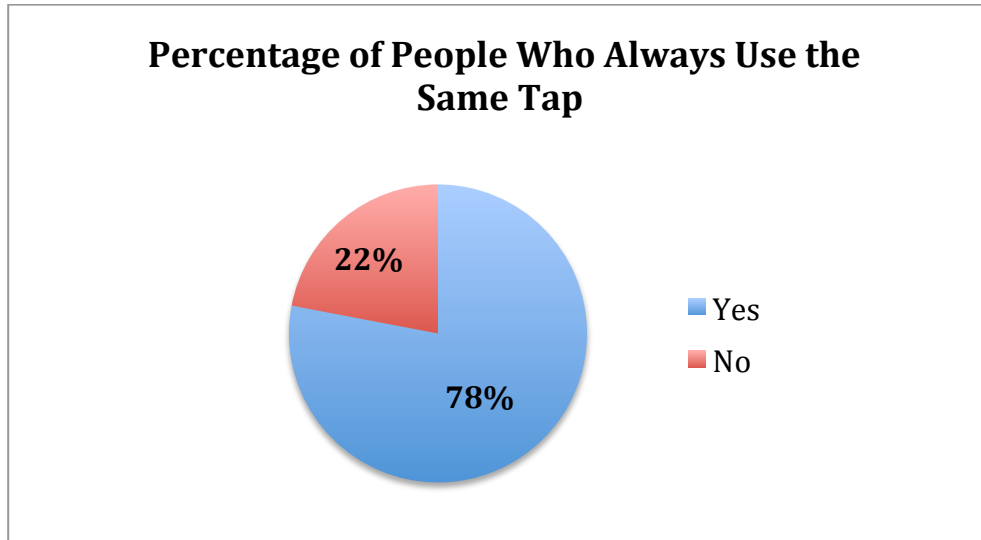
To obtain a rough estimate on the amount of water families use each day, this question was asked in terms of how many containers are filled at the tap. Generally, there are three different size containers used throughout the village. People were asked how many of each of these vessels their family uses everyday, then asked if they use any other receptacles for water collection. Multiplying the volume of the known containers by how many of each type of container is filled led to an estimate of water use. This method gave a measurement of liters/'family'/day. A more descriptive measurement of liters/person/day is examined in the Discussion section.

	Liters/'family'/day
Average	175.59
Max	487.5
Min	23
Median	153.12

Table 7: Statistical measurements of the amount of water each 'family' uses on a daily basis.

The average family in Oda uses 175 liters of water a day. Table 7 shows that within the small village of Oda, there is a huge variance in the amount of water each family uses, with a range of 464.5 liters (Max=487.5 L; Min=23 L). While this range is important to note, there are many factors including family size and different water uses that contribute to this difference.

Question 10: Do you always use the same tap?

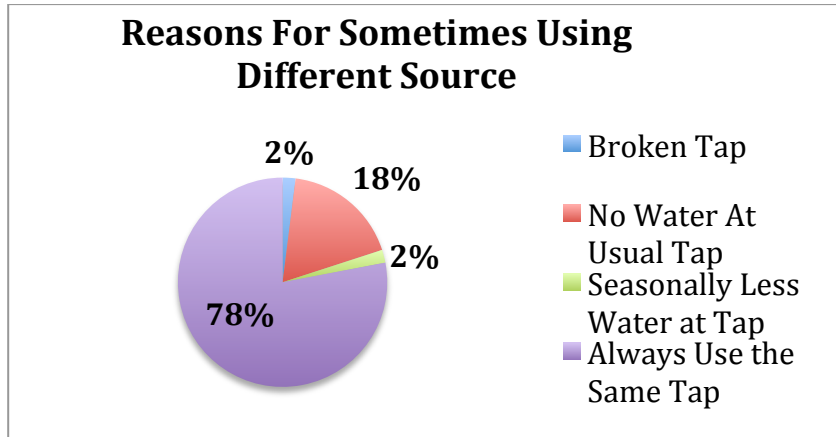


Graph 5: People surveyed who either do or don't always use the same water source.

Of the people surveyed, over three-quarters (78%) reported that they always use the same water source. While less than a quarter of respondents sometimes use a different source, this still represents 97 people who, for various reasons, either have to or choose to go to fluctuate their water source.

Question 11: If you don't always use the same tap, why?

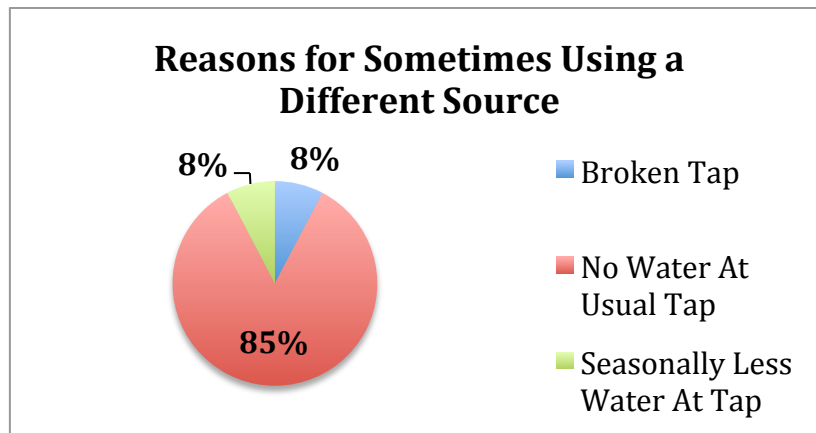
To understand why some people vary their water source and some don't, the community was asked their reason for sometimes changing their water source.



Graph 6: Percentages of surveyed population who always use the same tap, or reason for not always using the same tap.

Graph 6 reiterates the result that a majority of the surveyed population always uses the same tap. Graph 6 also shows the 3 major reasons why some people use alternative sources, including their usual tap being broken, their usual tap not having water, and seasonally lower water flow.

Graph 7 shows the percentages of people who reported these reasons out of the portion of the population that varies which tap they use.



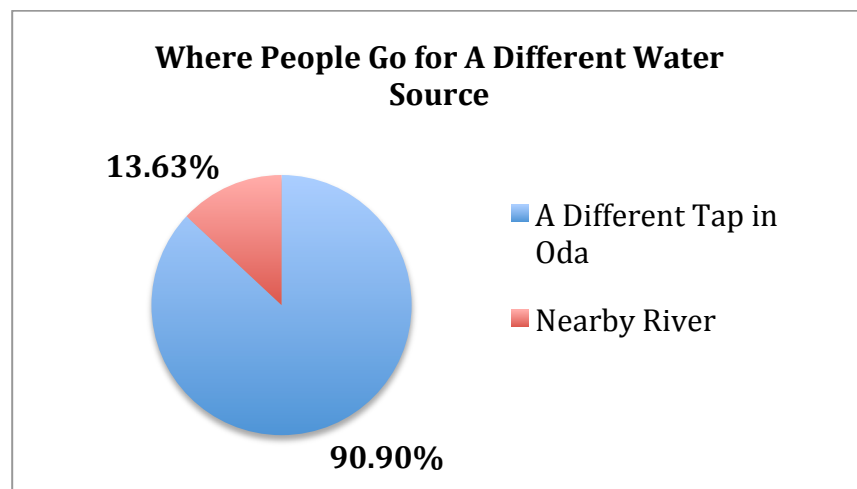
Graph 7: The percentages of people, out of those respondents who sometimes use a different tap, who cited each reason. *Percentages don't add up to 100% because some respondents cited multiple answers.



Out of the people who sometimes use a different tap, 85% stated that no water running from their usual tap is a reason. Broken taps and seasonally lower water flow were cited as reasons, but much less frequently.

Question 12: If you sometimes use a different water source, where do you go?

This question was solely asked to those people who reported sometimes using a different source for water. Thus, percentages are out of the 13 families represented in the survey who vary which source they use.



Graph 8: Where people go for water when they vary from their typical water source.
 *Percentages don't add up to 100% because some respondents cited multiple answers.

Among the families in Oda who differ their water source, a majority, 90.9%, use another tap in the village.

Question 13: How many times do you go to the tap in one month and there is no water?

	# of times in one month the tap has no water
Average	2.26
Max	25
Min	0

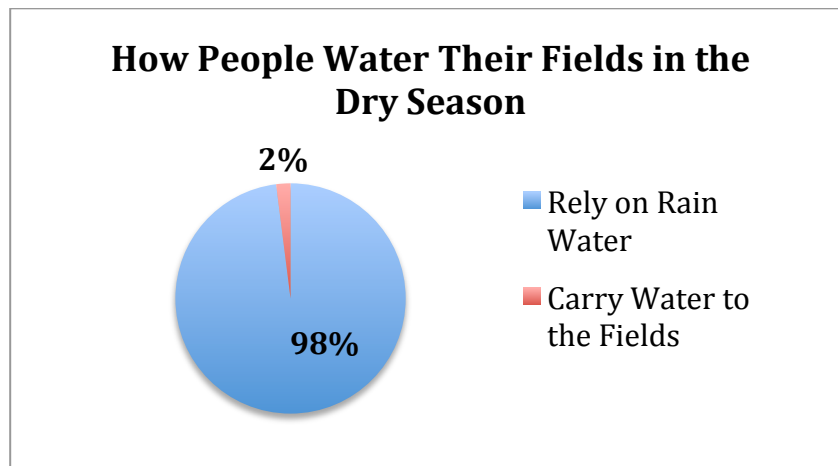
Table 8: Statistical measurements of how many times people experience no water flowing from their tap in a one-month period.

The average amount of times in one month that people get no water at the tap, for all survey respondents, is 2.26 times. Some respondents reported never experiencing this problem, while some reported facing this dilemma 25 times a month, almost once per day.

As mentioned in the background section, there are many taps in Oda that are only open for 2 hours a day. Thus, for many of the responses to this question, the number most likely includes times the respondent goes to the tap and the tap isn't open. Therefore, the measurements found aren't representing only times that the tap has no water, but also times somebody goes to the tap and it is closed.

Additionally, 36 out of the 60 respondents reported never experiencing the problem of their tap not having water, all of whom use the same tap. Thus the average for all of the respondents is greatly skewed towards 0. For people using other taps, the average is much higher. Further analysis into the times this is experienced at each individual tap and type of tap is examined in the discussion section.

Question 14: How do you water your fields in the cold/dry season?

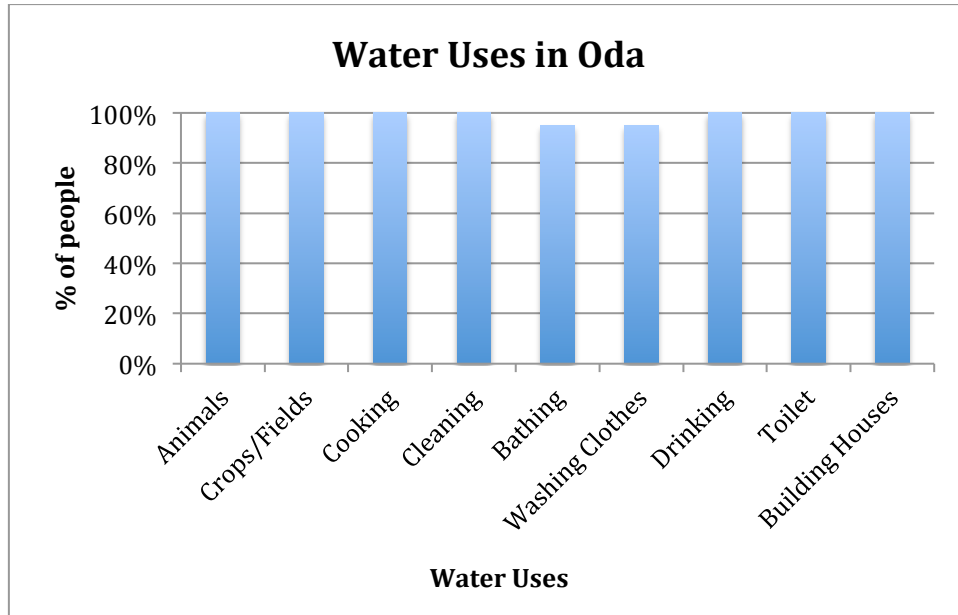


Graph 9: Percentages of people who use different methods to water their fields during the cold season, when there is relatively little rain.

As is apparent in Graph 9, a far majority of people rely solely on rain-water for agricultural needs in the dry season. If this finding is representative of the entire Oda population, there are roughly 1,666 people in the village (98% of the populace) who rely on rainwater for their fields and food production.

Question 15: What do you use water for?

In order to understand where all of the water that people collect from taps is going, survey respondents were then asked which types of work they use water for.

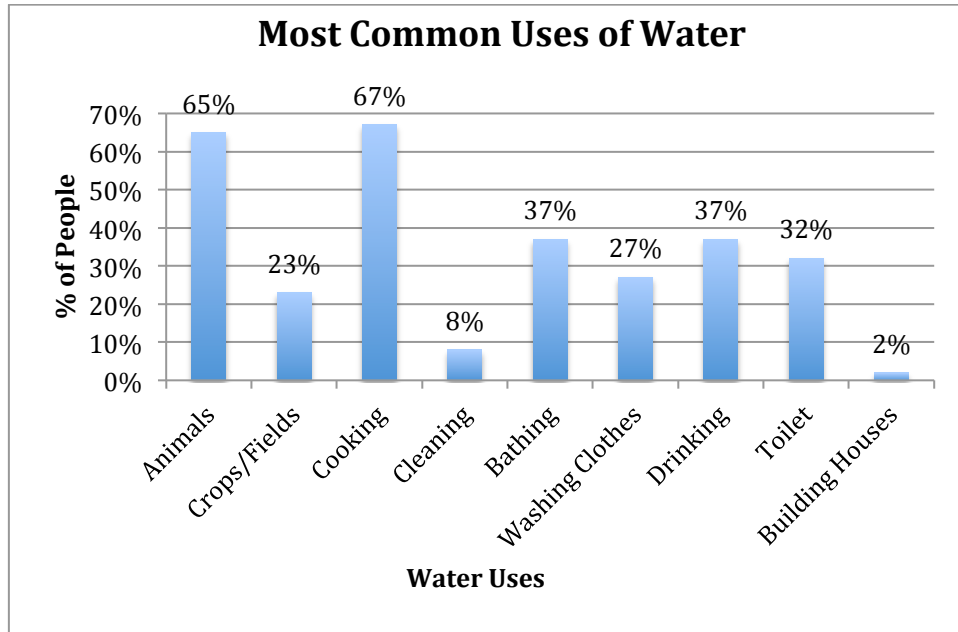


Graph 10: Percentage of surveyed population in Oda who reported using water for each type of work. *Percentages don't add up to 100% because some respondents cited multiple answers.

The important takeaway from Graph 10 is that almost everybody surveyed uses their limited amount of water for all kinds of daily work. The only 2 categories for which not every respondent reported using water were bathing and washing clothes. Upon further discussion, these respondents didn't report using water for these uses because they rely on the nearby river for these activities.

Question 16: What do you use the most water for?

In order to ascertain information on the top uses of water in Oda, people were asked what they use the most water for, then what, and then what. Although the report was unable to obtain what percentage of household water use is going to different types of work, this was the easiest way to learn which types of work are generally the most water consumptive.

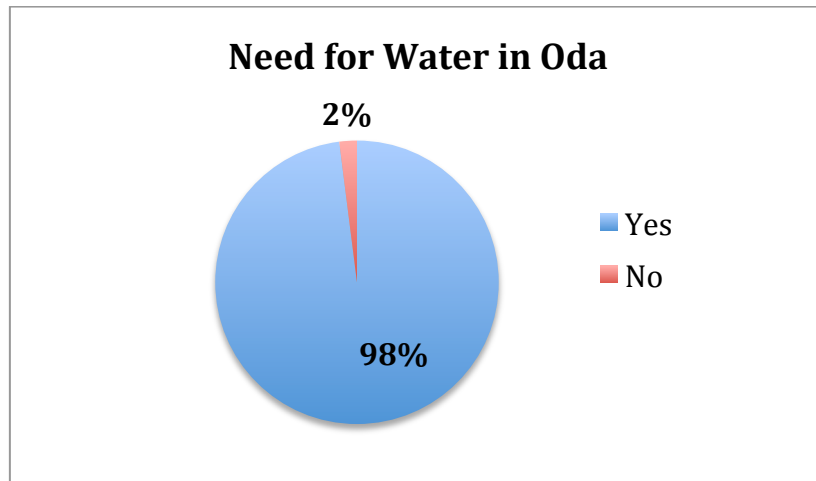


Graph 11: Percentage of people who said each water use was in their top three usages. *Percentages don't add up to 100% because some respondents cited multiple answers.

The numbers in Graph 11 show the percent of people surveyed who said that each category was in their top three usages of water. For example, cooking is reportedly the most water consumptive type of work. 67% of community members surveyed said that cooking was one of the top three highest water-consuming behaviors.

The second highest use of water is livestock; 65% of families said animals are one of their top three uses. While Graph 10 suggests that people use water for all different types of activities and work, Graph 11 shows that certain types of work are much more consumptive than others; over 60% of people said livestock and cooking are in their top three uses, and less than 10% of people reported cleaning and building houses in their primary water usages.

Question 17: Do you need more water?



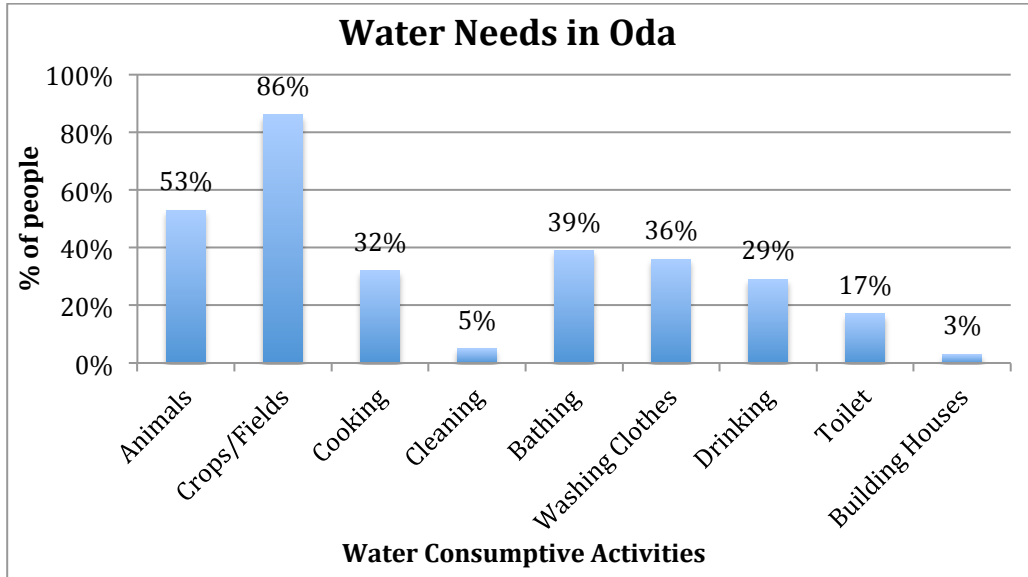
Graph 12: Percentage of people surveyed who stated they need more water.

As Graph 12 shows, the need for water in Oda is far reaching. All but one respondent claimed they are in need of more water. Explanatorily, the one surveyed community member who claimed not needing more water is in outlier in that they are related to the Oda Foundation and have access to the private source the foundation uses.

As 98% of families said yes to Question 17, this directly represents 436 people in the Oda community who are in need of water. If this is representative of the community as a whole, there are close to 1,700 people in Oda, nearly the entire population, who suffer from lack of sufficient water.

Question 18: If you had more water, what would you use it for?

In order to understand the communities top three needs for more water, the survey asked people if they had access to more water, what would they use that water for first, then second, then third.

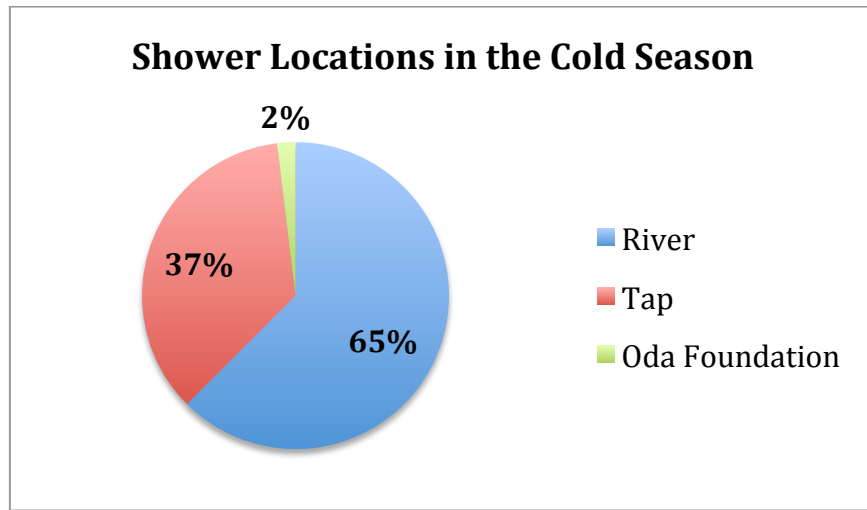


Graph 13: Percentage of Oda community members surveyed who stated each activity in their top three needs for more water. *Percentages don't add up to 100% because some respondents cited multiple answers.

The community's response for the biggest need for more water was crops and fields, with 86% of respondents saying if they had more water, it would be in their first three uses. These results show that the community needs much more water for agricultural and livestock needs than for household needs.

However, it is important to note that people still reported needing more water for a variety of household activities, including bathing (39% of respondents listed in top 3 needs), washing clothes (36%), cooking (32%), and drinking water (29%).

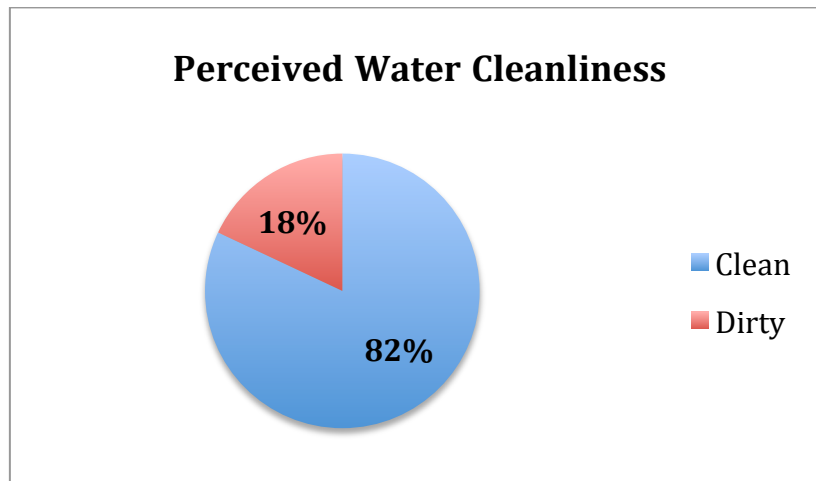
Question 19: If you shower in the cold season, where do you shower?



Graph 14: Different locations where people shower during the cold season.
 *Percentages don't add up to 100% because some respondents cited multiple answers.

A majority of people in Oda bathe at the river during the cold season. Just over a third of people still use the taps for bathing water, much of the time collecting water, and boiling it at home in order to have warm water. The only people to report bathing at the Oda Foundation are in some way connected with the organization.

Question 20: Do you think your water is clean or dirty?



Graph 15: Oda community members' perceived cleanliness of their water.



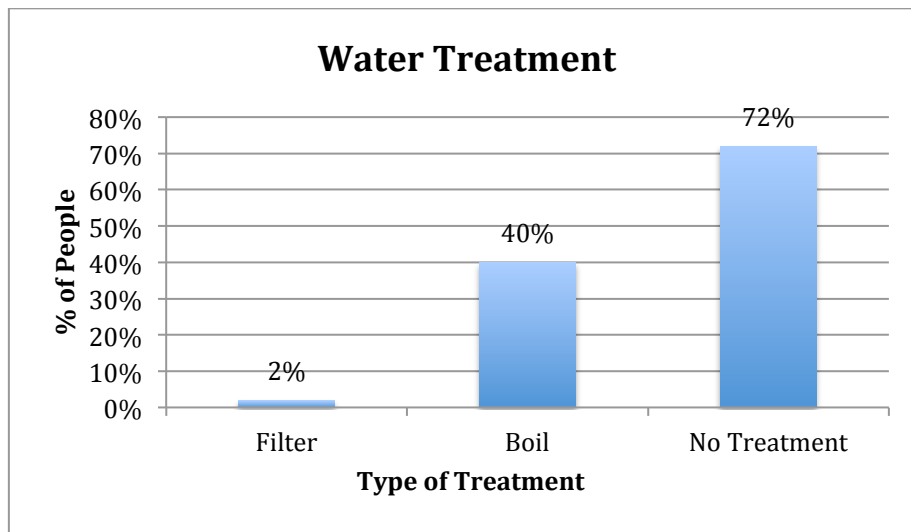
A majority of surveyed community members, 82%, stated that they believe their water is clean, while only 18% said that their water is dirty. It is important to note that for this question, there was no strict way of defining clean or dirty, people's responses are solely based on what they perceive as clean or dirty water.

Question 21: Do you think that drinking dirty water can make you sick?

Every family surveyed stated being aware that drinking dirty water can lead to sickness. Both people who believe their water is clean (82%) and those who think their water is dirty (18%) are conscious of the health implications of consuming dirty water.

Question 22: Do you filter or boil your water before drinking?

As this survey found that people claim to be aware of the health consequences of drinking contaminated water, it then aimed to find out if people take any precautions to avoid potential sickness. Thus, the survey then asked people if they treat their water prior to consumption.

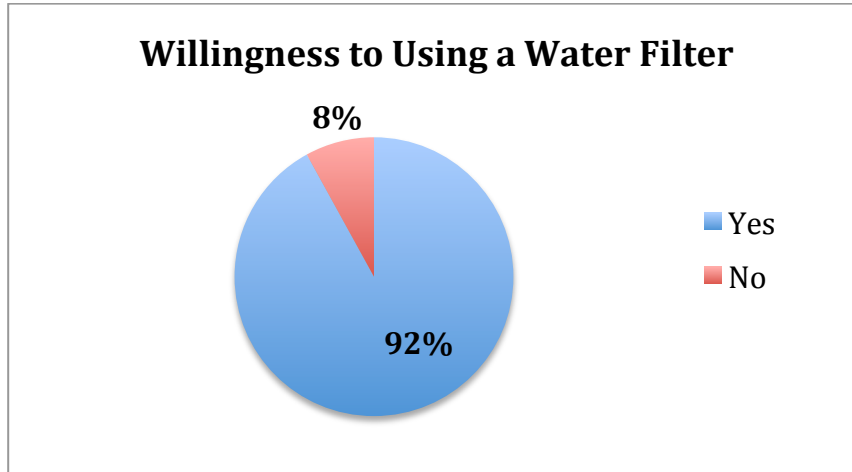


Graph 16: Percentages of people who either don't treat their water, or what method they use for treating. *Percentages don't add up to 100% because some respondents cited multiple answers.

Although 100% of participants stated they understand that consuming dirty water can cause sickness, nearly ¾'s of participants don't treat their water at all. Percentages in Graph 16 don't add up to 100% due to the fact some families said they boil their water during the cold season, but don't treat it at all during warm months. Thus, 72% of surveyed families don't treat their water for at least part of the year.

Question 23: If you could filter your water would you?

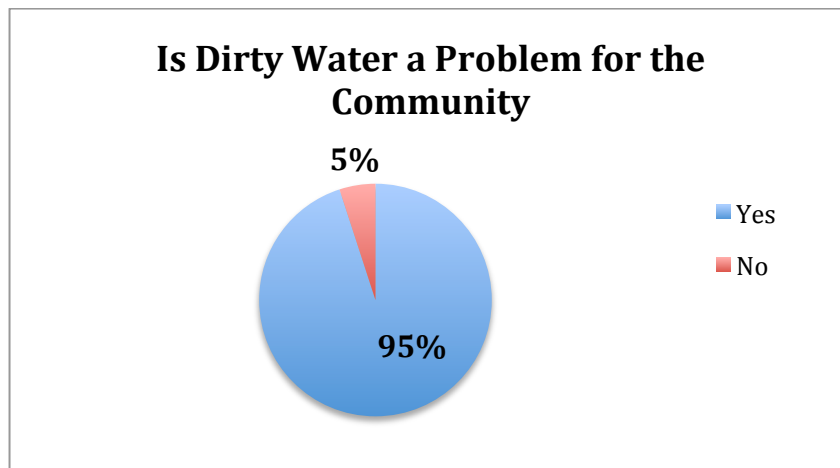
In order to understand if people are open to new methods of treating their water, the survey then asked people if they were given a filter, would they use it. For this question, the concept of a water filter had to be explained to many participants.



Graph 17: Percentage of population surveyed that said they would use a water filter if they had access to one.

After understanding what a water filter is and how to use one, 92% of the surveyed population said they would use it. This is important in understanding that a majority of the population understands and is open to new methods of water treatment.

Question 24: Do you think that dirty water is a problem for Oda?



Graph 18: Percentage of people surveyed that believe that dirty water is a problem for the village of Oda.

95% of people surveyed believe that dirty water is a problem for the community.

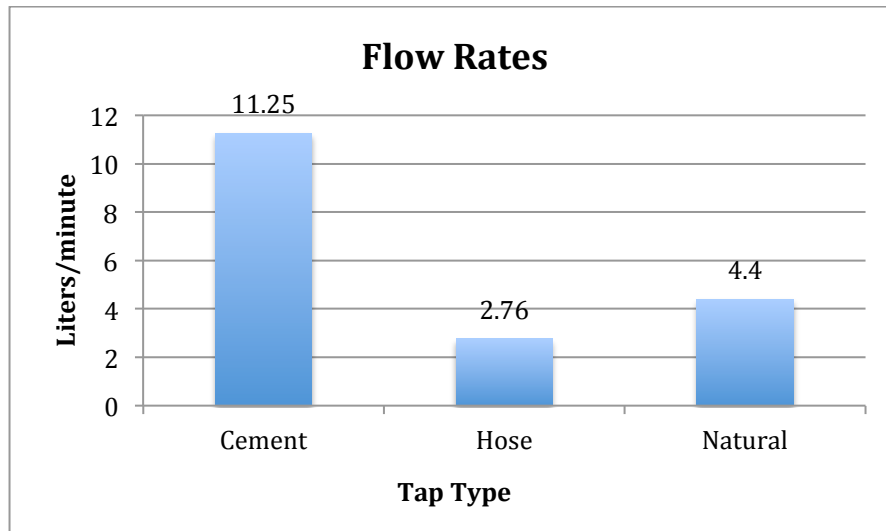
Flow Rates

In addition to the 24-question survey, this project also collected and analyzed flow rates from each individual tap.

Tap ID	Tap Name	Tap Type	Average Flow Rate (liters/min)
A	Jira Singh	Cement	4.97
B	Bhan Bahadur	Hose	3.09
C	Karan's House	Hose	5.3
D	Dalit/Brahmin	Natural	8.2
E	Sarita's Rock	Cement	11.65
F	Singh by Kalpana's	Natural	1.25
G	New Temple	Cement	13.03
H	Bishna's Shop	Hose	0.56
I	Manju's House	Cement	11.64
J	Lal's House	Hose	4.27
K	Oda Foundation	Private Source	4.79
L	River	Nearby River	N/A
M	Sangam House	Cement	12.09

Table 9: Average flow rate in liters/min found at each tap in Oda through the month of February 2018.

This survey found a large variance in the flow rates from various taps. The total average flow rate for all taps throughout the month of February was 6.85 liters/min. The tap with the highest average flow rate was Tap G (13.03 liters/min), and that with the lowest was Tap H (0.56 liters/min).



Graph 19: Average flow rates aggregated for each type of tap in Oda.

The variance in flow rate can be seen across tap type as well as individually. Cement taps have over 4 times the average water flow of the hoses, 11.25 and 2.76 liters/min respectively.

Analysis

Tap Choice and Reason

In further understanding the amount of time people spend obtaining water, average wait times at individual taps were measured. The total average wait time is 2 hours and 4 minutes, but the average wait time at an individual tap reaches over 3 hours.

Tap ID	Average Wait Time (min)
A	107.5
B	5
C	1
D	175.71
E	49
F	200
G	61.25
H	75
I	76.66
J	71.66
K	-
L	6.67
M	12.5

Table 10: Average wait time for each of the individual taps in Oda. Measured by averaging wait time given by each family who uses each tap.

As is seen in Table 10, taps D and F have the longest average wait times, of 175 minutes and 200 minutes respectively. Tap D, known in this report as the 'Dalit/Brahmin' tap, is also the tap that is used by the most people (58.33% of the surveyed population).

The results to Question 3 (Graph 1) show that only 8.33% of people cited wait time as a reason for their tap choice, and that water flow has a much stronger influence on this decision. The fact that a majority of people use one of the 2 taps with the longest average wait time (taps D and F, the two 'Natural' taps) gives evidence that people aren't concerned with this dynamic when deciding which water source to use.

However, as is seen in Graph 20, the 'Natural' taps have an average flow rate of 4.4 liters/min, while the 'Cement' taps have a much higher average flow rate of over 11 liters/min. If water flow is the main factor in people's tap choice, as is suggested by



56% of the surveyed population, it could be assumed that more people would use 'cement' taps. As a large portion of the population uses taps that don't have the fastest flow rates, this suggests there are other reasons as well as water flow that are significant factors in which tap people use.

Amongst these potential reasons is the fact that although the cement taps have the highest average water flow, this is only while they are running, which is limited to 2-4 hours a day, whereas the 'natural' taps are always flowing. Although the natural taps have a slower flow rate, the reliability of constant flow could cause many people to use these as opposed to the cement taps. Additionally, there are possible caste related factors involved in tap choice, which are discussed later.

Time of Day and Reason

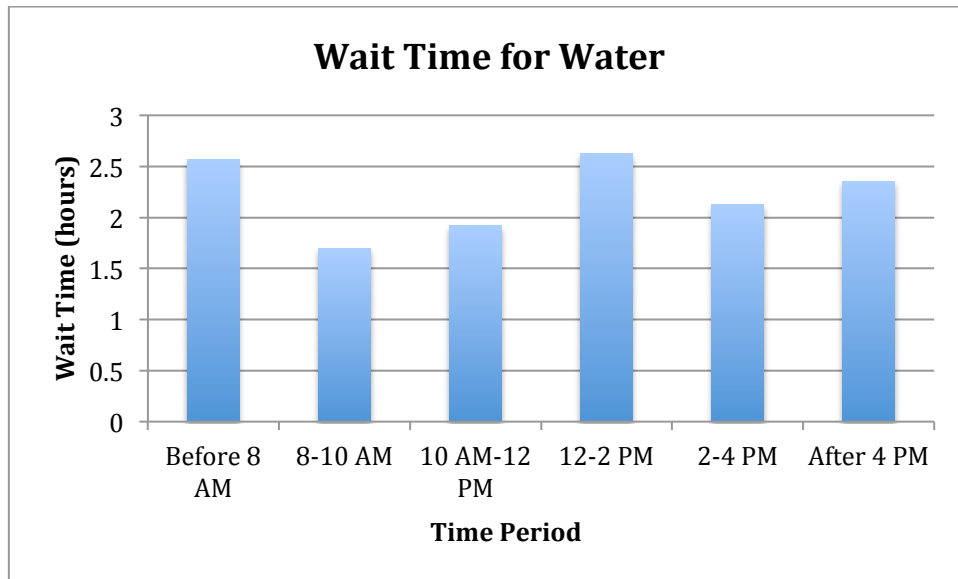
Although wait time doesn't play a large role in tap decision, it is a substantial determining factor in what times of day people go to the tap. 52% of people stated that wait time (or the amount of people at the tap) is an influential factor in what time they retrieve water, while only 38% said water flow is influential in this decision.

Looking further at the different influences on when people go to the tap, the most reported reasons were analyzed for each time period separately.

Time Period	Most common reasons for going at that time of day
Before 8 AM	-Wait time/less people: 53% -Water flow: 42%
8-10 AM	-Wait time/less people: 50% -Water flow: 38%
10 AM-12 PM	-Wait time/less people: 47% -Other work: 41%
12-2 PM	-Wait time/less people: 50% -Water flow: 50% -Weather/temperature: 50%
2-4 PM	-Water flow: 50% -Wait time/less people: 30%
After 4 PM	-Wait time/less people: 62% -Water flow: 29%

Table 11: Percentages show the amount of people who go to the tap during each time frame who cited each reason for going at that time of day.

As can be seen in Table 11, at almost all times of day, except between 2 and 4 PM, wait time is amongst the most influential reasons for going at that time.



Graph 20: Average wait time at different times of day, averaged for all taps.

These results show that some of the longest wait times are before 8 AM and after 4 PM, which are also the most common times of day to go to the tap, with 60% of people going early in the morning, and 56% going in the late afternoon. This correlation is cohesive in illustrating that at the busiest times of day, there are the longest wait times.

However, as is displayed in Table 11, people going to the tap before 8 AM and after 4 PM stated the largest reason for going at that time is that there is a short wait time. In fact, people going during these time frames cited shorter wait time more frequently than did people going at other times of day. The fact that the busiest times of day at the tap (with the longest wait) are also the times of day people are going with the leading influence being a perceived shorter wait time indicates a contradiction.

This discrepancy signifies there must be other influences on the time of day people go to the tap that were not accounted for in this survey. It is possible that due to the language barrier, all answers explaining why people choose to go to the tap at a certain time weren't understood and recorded. Additionally, some respondents may have thought they could only give one response, and thus other influences are underreported. It is also possible that due to the closed-ended structure of the survey, all possible decision factors weren't listed as choices, and thus weren't recorded as a potential reason.

Amongst other possible influences is the social aspect of water collection. As many people in Oda are consumed by their work all day, it is possible they enjoy going to the tap at the same time, regardless of the wait, for social reasons.



It is also possible that this contradiction between wanting to avoid waiting but experiencing long wait times is due to people not knowing what times of day have the longest wait, or having not tried going at other times of day. However this discrepancy may be explained, it is important to note that this survey found a missing explanatory piece as to why people go to the tap at a certain time of day.

Time Spent at The Tap

The survey found that the average family in Oda (as represented by the 60 families surveyed) sends a representative to the tap 5.35 times per day. With the average wait time at a water source being just over 2 hours; between all members who collect water, the average family spends **11 hours per day** at the tap.

Experiencing No Water at the Tap

On average people experience no water at the tap 2.26 times per month. However, this is the average for all taps, and as certain taps have less consistent water availability, the people who use these taps experience no water on a much more frequent basis.

60% of the population surveyed reported never experiencing zero water available at their tap. Almost all of the people who reported this use Tap D, the most common tap in Oda. The fact that this tap seems to have the most consistent water, as people never experience zero water availability from this source, and that it is the most used tap confirms water flow/availability as the most influential factor in tap decision.

The people who use other taps experience no water available at a much higher frequency.

Tap Type	# of times in one month with no water
Natural	0.11
Cement	6.19
Hose	4.7

Table 12: The average number of times in one-month people experience no available water at each tap type.

People who use ‘Natural’ taps (Tap D and F), almost never experience the problem of zero water available, while people using ‘Cement’ taps experience no water over 6 times per month. 96% of people who don’t use Tap D reported experiencing no water at least once per month, and 12% of survey respondents reported experiencing this 6 or more times per month.



Thus, the problem of no water available at the tap is greatly confined to people who use 'cement' and 'hose' taps. This is most likely due to the fact that these taps only run for 2-4 hours per day.

Reliance on Rain Water

In this survey, 98% of the population reported relying on rainwater for their crops and fields during the dry season. This reliance on rainwater has not been sufficient, as is apparent through community members' quotes in the 2016 Household Survey stating a correlation between water and food shortages.

Although a majority of people reported relying solely on rainwater, there is some agricultural infrastructure to help with bringing water to fields. There were ditches/gutters built in the past in order to water fields. Although for the most part these are no longer used, a few families were occasionally observed using one of them to direct water to their fields.

Additionally, 100% of families reported using water for work involving their crops and fields. This most likely involves occasional use of the aforementioned channels. Some families also have smaller vegetable fields near their homes, and were observed watering these fields by hand or with a hose connected to a cement tap.

Consequently, although the far majority of people reported exclusively relying on rainwater for their crops, there are some means to, and a few people use these other methods of getting water to their fields. However, reliance on rainwater still seems to be the norm in Oda, and thus, there is a large connection between amount of rainwater and food availability.

Water Uses

A majority of people surveyed reported using water for every listed category of use, from livestock and agriculture, to hygienic needs and building houses. Graph 11 shows the percentage of people who put each category of water use in their top three uses. This is further understood by looking at the first, second, and third uses separately.

Water Use	Primary Use	Secondary Use	Tertiary Use
Animals	23%	13%	28%
Crops/Fields	3%	17%	3%
Cooking	28%	25%	13%
Cleaning	2%	3%	3%
Bathing	10%	15%	12%
Washing Clothes	7%	12%	8%
Drinking	18%	7%	12%
Toilet	8%	8%	18%
Building Houses	0%	0%	2%

Table 13: Percentages of people who stated each type of water use as their primary, secondary, and tertiary uses of water.

The most common primary uses are cooking, with 28% of people saying it is their top use; livestock with 23%; and drinking with 18%. The highest second choices are cooking with 25%; crops and fields with 17%; and livestock with 13%. Most highly reported tertiary uses of water are: livestock with 28% of people stating it as their third highest water consumptive work; toilets with 18%; and cooking with 13%.

In Graph 11, cooking was reported in peoples' top three uses by 67% of people surveyed, and livestock was reported by 65%, a relatively small difference. However, Table 13 shows then when only looking at primary and secondary water uses, cooking is purportedly much more water consumptive than livestock.

Bathing, drinking, and toilet were reported similarly in the top three uses as a whole, with 37%, 37%, and 32% respectively. Amongst these, drinking was the highest reported primary use (18%), bathing is the most common secondary use (15%), and toilet is the highest tertiary use (18%). This suggests that drinking is the most water consumptive of these activities, followed by bathing, and then toilets.



Amongst all household hygienic water-consuming activities, bathing is the most consumptive, as a higher percentage of people reported bathing than cleaning, washing clothes, or toilets for their primary and secondary water uses. Although 23% of people said crops and fields were in their top three uses of water, only 3% of people said it was their primary use.

Water Needs

Reported needs for more water were also broken down from the initial responses of top three needs, into primary, secondary, and tertiary needs.

Water Use	Primary Need	Secondary Need	Tertiary Need
Animals	8%	24%	20%
Crops/Fields	61%	14%	12%
Cooking	3%	7%	22%
Cleaning	2%	2%	2%
Bathing	8%	14%	17%
Washing Clothes	8%	14%	14%
Drinking	5%	14%	10%
Toilet	3%	10%	3%
Building Houses	0%	3%	0%

Table 14: Percentages of people surveyed who listed each water consumptive activity as their primary, secondary, or tertiary need for more water.

The top three reported primary needs were crops and fields with 61% of people saying it is their top need; and livestock, bathing, and washing clothes all with 8%. The highest reported secondary water needs were livestock with 24%, and crops, bathing, washing clothes, and drinking all with 14%. The most frequently stated tertiary needs for more water were cooking, reported by 22% of the surveyed population, livestock by 20%, and bathing by 17%.

When asked what they would use water for if given more (as a way of asking what people need more water for) 86% of people said crops and fields in their top three needs. Amongst this, 61% of people said more water for crops and fields **is their primary need for more water**. Less than 10% of people listed any other individual option as their principal need. This again shows the extent of the water shortages' effects on food production, and the need for agricultural related water infrastructure.



Although cooking was reported by 32% of people in the top three needs and drinking by 29%, in just primary and secondary needs, drinking water was reported almost twice as much as cooking. This suggests that lack of drinking water is more serious than lack of water related to cooking.

In the future, when looking at potential water infrastructure projects in Oda, it is essential to understand the community needs for more water. If people are most concerned with lack of water for household needs, it is best to make more household water accessible. However, as of now, a far majority of people stated that the direst need for more water has to do with fields and food production. Thus, based on the data found in this report, when working to bring more water to Oda, the focus should be on agricultural related water projects.

Health Implications

As the community in Oda is extremely susceptible to many preventable diseases, it is important to understand how the water problem is related to these. While only 18% of people believe *their* water is dirty, 95% of the population surveyed said they believe dirty water is a problem for the community as a whole.

This survey found that 72% of the population doesn't treat their water during at least some part of the year. Although 82% of people said they believe that their water is clean, it is unclear what they believe constitutes 'clean' water. Thus many of these people who don't treat their water under the belief that it is clean, could still be drinking dirty water.

Additionally, 41% of people surveyed who said their water is clean treat their water (either filter or boil), and only 27% who said their water is dirty treat their water. Thus, even though 100% of people reported knowing that dirty water can lead to sickness, there seems to be a misunderstanding in what truly constitutes dirty water, and or no connection between an awareness of dirty water and treating it.

When asked if they would use a water filter if available, 92% of respondents said they would. This insinuates that a large majority of the population is open to changing their water hygiene habits. Moving forward with development in Oda, the community seems to be open to water cleanliness education. Informing the community about what truly constitutes dirty water, what sicknesses dirty water can cause, and how people can easily make their water safer to drink, could be critical in helping the health problems in Oda.

Caste Discussion

Water Use Differences

Family and Per Capita Water Use

The average 'family' uses 175.59 liters of water per day. However, there is a range of over 450 liters. It is important to note that this range is spread through different castes, with higher caste families generally having much higher water use than lower caste families.

Caste	Average (liters/day)	Max (liters/day)	Min (liters/day)
Brahmin	235.59	343.75	123
Chhetri	160.83	487.5	23
Dalit	147.44	445	31.5

Table 15: 'Family' per day water use by caste. Brahmin is the highest caste, and Dalit represents the low caste families.

The average amount of water that each 'family' uses per day is higher for the highest caste families, and lowest for Dalit families. The 'family' per day water use measurement is important to note, although is not extremely significant due to fluctuation in family size. A more important measurement, and one that shows caste difference in water use even more drastically, is that of daily per person water use.

Caste	Average (liters/person/day)	Max (liters/person/day)	Min (liters/person/day)
Brahmin	40.61	163.12	12.3
Chhetri	27.23	121.88	3.83
Dalit	19.48	29.31	7.18
Total	28.25	163.12	3.83

Table 16: Daily per person water use by caste.

Per person daily water use measurements were found by dividing each 'families' estimated daily use of liters by the number of people the water is collected for. Average daily per capita water use amongst the entire population surveyed is 28.25 liters, with a maximum of 163.12 and a minimum of 3.83. The exact amount of water used by each person for livestock and agriculture is not known, and was not taken out of the daily per person measurement. Thus, these measurements include animals' water, and the amount used for only individual hygienic and consumptive purposes can be assumed to be much lower.



With a Brahmin average of 40.61 liters/person/day, and a Dalit average of 19.48, higher caste individuals use on average **two times as much water per day** as do lower caste individuals. As Dalit families constitute 30% of the Oda community, if these averages are consistent throughout the entire population, over 500 people making up the Dalit populace use less than half the amount of water as people in the same village, with a factor being caste discrimination.

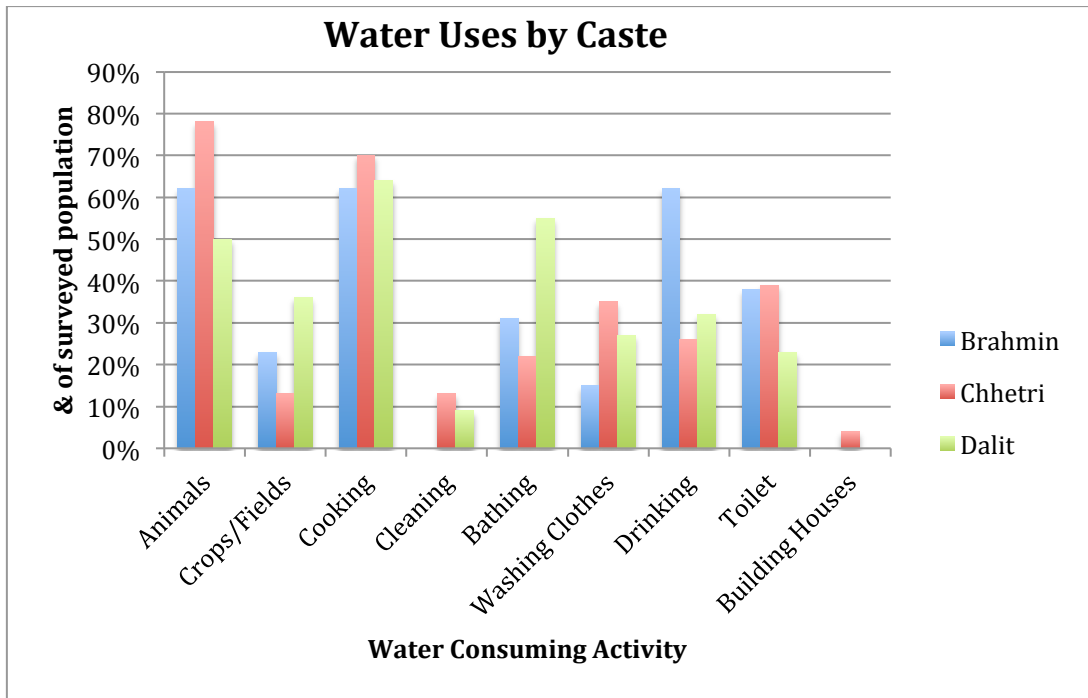
There are a host of potential explanations for this difference in water use between castes. One possible reason could be structural discrimination. As the caste system has been prevalent in Oda for a long time, differences amongst castes have evolved to be engrained in the community.

Another likely explanation to this difference is that Brahmin families tend to have more land and livestock than Dalit families. Again, the exact amount of water used for livestock wasn't measured, so that amount remains in the daily per person measurement. Therefore, families that use more water for animals have a higher per person per day amount. The finding that 23% of Kafle families said livestock is the primary use of water, while only 9% of Dalit families said the same, reinforces the theory of higher water use for livestock amongst Brahmin families.

Whatever the reason may be, the finding that the average Brahmin individual uses more than twice as much water as their Dalit counterpart, is important to understanding water in Oda, and the culture of the community as a whole.

Water Usage Differences

In order to gain a further understanding of why Brahmin families use more water, and where that water is going, this report compared the percentages of each caste that stated different water uses in their top three water consumptive activities.



Graph 21: Percentages of each individual caste population who listed each type of work in their top three uses of water.

Graph 21 shows the difference in how people from each caste use their water. An immediate difference is in water used for animals. Both Brahmin and Chhetri families reported using more water for animals than Dalit families, consistent with the fact that higher caste families generally own more animals. As animals are highly water consumptive (23% of total families said animals are their primary water usage), this could be a factor in much higher daily water usage by the Brahmin and Chhetri populations. However, within all castes, animals were among the top three water-consuming activities.

The top three uses of water amongst the Brahmin families surveyed include animals, cooking, and drinking water. The Chhetri families reported their primary, secondary, and tertiary water uses to be animals, cooking, and toilets. Lastly, Dalit families top three water usages are cooking, bathing, and animals.

Brahmin households use a higher percentage of their water for drinking than do the Chhetri or Dalit populations. Chhetri families reported cooking, cleaning, washing clothes, toilets and building houses in their top uses more than Dalit or Brahmin

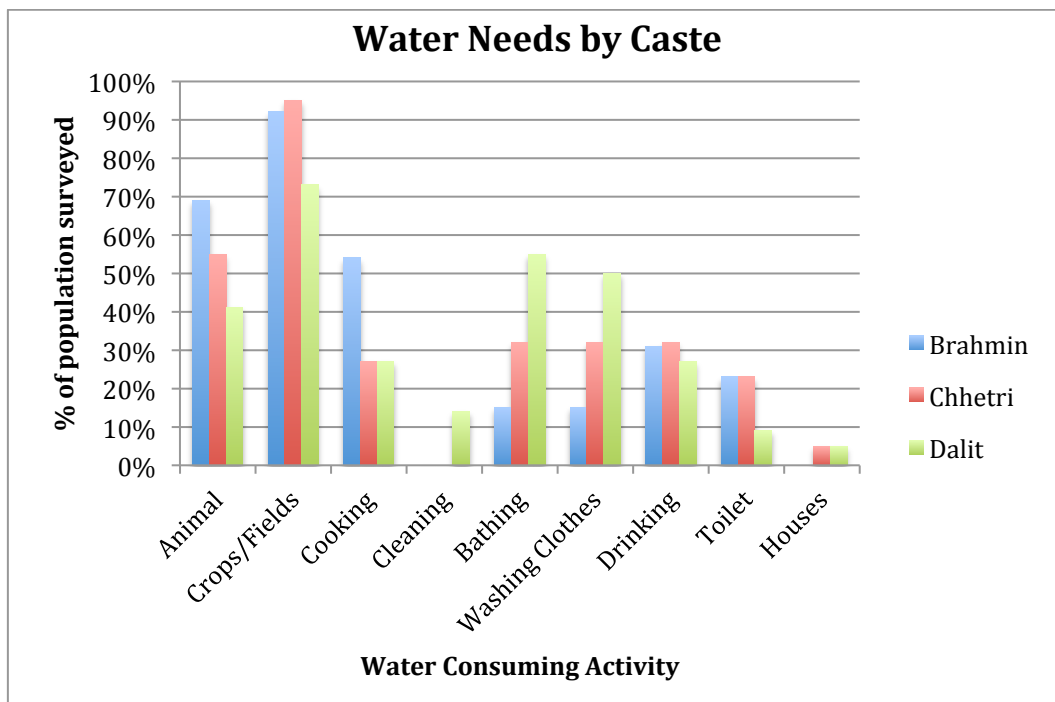
families. Finally, a higher percentage of Dalit families than Chhetri or Brahmin reported crops and bathing in their top uses of water.

Brahmin water use is greatly concentrated among a few types of work, namely animals, cooking and drinking. Dalit water use seems to be more dispersed among various types of work, with percentages of people reporting each activity in their top uses spread more evenly within the Brahmin community.

A breakdown into primary, secondary, and tertiary water uses of each caste highlights these differences even more, and is shown in Appendix B.

Water Need Differences

In addition to looking at the most frequent water uses by caste, this survey also analyzed the top reported needs of water by caste. The results for what families from each caste listed as their top 3 needs for more water are shown below.



Graph 22: Percentages of each caste population who listed each water consumptive activity in their top three needs for more water.

An initial important take away from these results is that for all castes, crops and fields was the most reported need for more water. This elucidates that for all people in Oda, regardless of caste, water scarcity as related to food production is an imperative issue that needs to be solved.



The top three needs for Brahmin families include crops and fields, animals, and cooking. The reported primary, secondary, and tertiary needs of Chhetri families, the middle caste, are crops and fields, animals, and bathing, respectively. Those of the Dalit caste are crops and fields, bathing, and washing clothes.

A higher percentage of Brahmin and Chhetri families reported animals in their top needs for more water than did Dalit families. This again is most likely based in that higher caste families generally have more animals. Crops and fields were also reported by a higher percentage of higher caste families than lower caste, which is also most likely due to the higher caste population owning more land.

Another important result from this caste comparison is seen in the need for water for hygienic and cleaning activities. A much higher percentage of Dalit families listed cleaning (which includes hand-washing and general home cleaning), washing clothes, and bathing, in their top three needs for more water than did either Brahmin or Chhetri families. This suggests that higher caste families are possibly able to maintain a cleaner and more hygienic living environment, while the lower caste population lacks the water to be able to do so.

To further see these differences, a breakdown of percentages of caste population who listed each activity as their primary, secondary, and tertiary water needs can be seen in Appendix C.

Water Retrieval Differences

Tap Choice and Reason for Using Certain Tap

As noted before, a majority of people represented in this report use one tap, Tap D (one of the two 'natural' taps). Further, it was found that all Brahmin and Dalit families surveyed use only Tap D, while no Chhetri families use this tap. All Chhetri families use one of the 'cement' or 'hose' taps throughout the village.

Of the Brahmin and Dalit families that use Tap D, 86% cited water flow as a reason for their tap choice, and only 23% also cited proximity to their house. As Tap D is one of the only taps that is constantly open with flowing water, this is coherent with people citing higher water flow as a primary factor for using this tap.

The rest of the population surveyed, comprised of Chhetri families who all use either 'cement' or 'hose' taps, cited different reasons for their tap choice. 84% of families using taps other than Tap D stated proximity to house as a reason for tap choice, while only 16% said water flow is a factor.

As the different wards or 'neighborhoods' in Oda are for the most part caste segregated, this leads to many of the distinctions in tap usage and reason for different tap use. In the area of the village occupied by Brahmin and Dalit families, there is only one tap in very close proximity, Tap D. Within the area that most



Chhetri families live in, there are many more available taps; all of which are ‘cement’ or ‘hose’ taps. Thus, Chhetri families have more nearby taps of which to choose from, but the tap closest to Brahmin and Dalit families has much more consistent water than do any of the ‘cement’ taps.

This shows indications as to the difference in reasons for tap choice between castes. Although Brahmin and Dalit families only have one tap nearby, it makes sense to use this tap because it has the highest water availability. Chhetri families have more taps to choose from, most of which have relatively similar water flows and are all only opened for the same 2 hour period of the day, thus they choose their tap based on proximity to their house.

Additionally, all Dalit and Brahmin families reported always using the same tap (Tap D). On the other hand, as Chhetri families have a larger selection of nearby taps, with less consistent water, they change tap more frequently, with only 52% of families stating that they always use the same tap.

One of the possible explanations for higher tap variation among Chhetri families can be seen in Table 17.

Caste	# of times with no water in 1 month
Brahmin	0
Chhetri	5.39
Dalit	0

Table 17: Number of times the average family from each caste experiences zero water availability at their tap in a one month period.

Not a single Dalit or Brahmin family said they experience zero water available at their tap, while the average Chhetri family experiences this over 5 times per month. As the most cited reason for changing which tap is used was found to be lack of water at tap, the fact that Chhetri families more frequently experience zero water availability explains why these families also more frequently vary which tap they use.

It is important to note that although there are obvious differences in availability of taps, reason for tap choice, and tap variation between castes, high and low caste families (Brahmin and Dalit) are similar in terms of these issues while the middle caste families (Chhetri) are generally the outliers.

Distance to Tap

As families from different castes use different taps and live in different parts of the village, the time it takes to walk to the tap varies amongst caste.



Caste	Average Walk Time to Tap (minutes)
Brahmin	5.46
Chhetri	8.17
Dalit	12.79

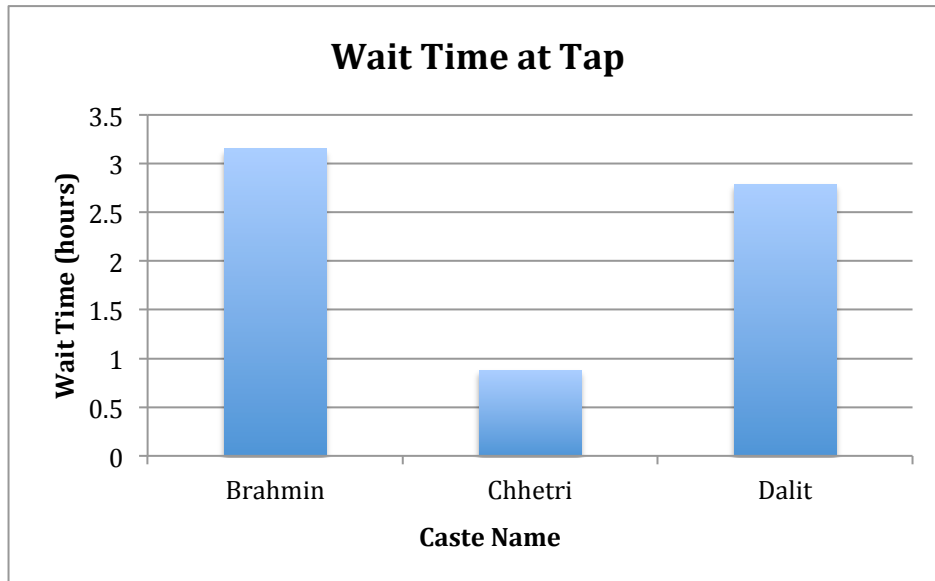
Table 18: Average time it takes to walk one way from house to tap for each caste.

Although all Dalit and Brahmin families surveyed use the same tap, on average it takes Dalit families more than twice as long to reach the tap. 100% of Brahmin families walk under 10 minutes, while only 32% of Dalit families do so.

The average time for the middle caste (Chhetri) was found to be in between those of the Brahmin and Dalit times. While the three respondents who reported walking over an hour were all Chhetri, they all live in the further most part of the village and two of the three go to the river for water. 91% of Chhetri families reported walking less than 15 minutes to reach their water source.

Wait Time at the Tap

As well as caste differences in distance to tap, the survey found differences in the amount of time the average family from each caste waits at the tap.



Graph 23: Average wait time for water for each caste in Oda.

The results for wait time for each caste were different than hypothesized, as the highest caste (Brahmin), has the highest average wait time of just over 3 hours.



The fact that Dalit and Brahmin families experience a much longer average wait time than Chhetri families is consistent with the fact that all Brahmins and Dalits use Tap D, the tap with the longest reported wait time. Chhetri families have more nearby taps to choose from, and thus the tap usage is more greatly dispersed, creating lesser wait times.

The minimum wait time for a Dalit family is 30 minutes, while the minimum reported wait of a Brahmin family is 90 minutes. 45% of Dalit families reported waiting over 3 hours for water, while 70% of Brahmin families reported the same. As Dalit and Brahmin families use the same tap, the reason for this disparity is unknown. One potential explanation is that Brahmin families on average use more water than Dalit families, and thus could have to wait longer to collect larger volumes of water.

Time of Day Water is Retrieved

In order to try and understand the differences in wait time further, this survey then looked at the percentages of each caste that retrieve water at different times of day.

These results did not give any further insight into the difference in wait times between Brahmin and Dalit families. It was found that 77% of Brahmin families and 41% of Dalit families go to the tap between the hours of 10 and 4. But as these times of day generally have shorter wait times than early in the morning or later in the afternoon, this difference has no explanatory significance.

While a majority of Brahmin and Dalit families go to the tap before 8 AM and after 4 PM, only 17% of Chhetri families go before 8 AM, and less than half go after 4 PM. Additionally, while a much smaller amount of Brahmin and Dalit families go to the tap between 8 AM and 12 PM, a majority of surveyed Chhetri families go during these hours. This is due to the fact that these are the hours during which the 'cement' taps are open, thus the only times Chhetri families have water available at their taps.

Trips to the Tap in One Day

Another of the many differences between castes in terms of water retrieval is the amount of times that families send a representative to the tap every day. These differences are shown below.

Caste	# of times somebody goes to the tap in one day
Brahmin	6.38
Chhetri	5.65
Dalit	4

Table 19: Average number of times a ‘family’ member goes to the tap each day.

As is shown, Brahmin families send someone to the tap the most times per day, followed by Chhetri, and then Dalit families. This is most likely explained by the fact that Brahmin families use the most water, and thus need to send someone to fetch water more frequently than do Chhetri and Dalit families.

As Brahmin families send someone to the tap at least 2 more times each day than do Dalit families, and the average wait time for Brahmins is just over three hours, this suggests that between all of the members of a Brahmin family, they spend 6 hours more per day retrieving water than do Dalit families. Thus, even though Brahmin families have a much higher average daily water use measurement, they also put much more effort into retrieving their water.

Water Hygiene Differences

In terms of perceived water cleanliness, there is not a large difference amongst different castes. For all castes, approximately 80% of families reported believing their water is clean, while less than one-quarter of families think their water is dirty.

In regards to water treatment, Chhetri families are the most proactive. Only 57% of Chhetri families don’t treat their water at all, while more than $\frac{3}{4}$ of both Brahmin and Dalit families surveyed neither boil nor filter their water.



Suggestions for Further Research

As the information from this report suggests, there is much potential future work to be done in Oda to help alleviate the water problem. Although this would eventually mean some sort of infrastructure project to bring more water into the village, there is other research that could be done prior in order to further understand the problem.

Firstly, research on the water itself, including sampling and testing for bacteria and pathogens would be helpful in understanding the connection of water to health problems. This would make it possible to directly link the water to different diagnosis, and help in explaining to the community exactly how consuming dirty water is hazardous. Along with this, community education on what constitutes dirty water and the importance of water treatment is critical to minimizing the frequency of water-borne illnesses.

This report briefly mentioned that the community views the water problem as having been particularly bad in the past 5-6 years. Thus, in order to try and fix the problem, it could be imperative to understand what has caused the problem to become worse in recent years. Research into more completely understanding why water is no longer brought in from the nearby village of Dillikot and research into why no maintenance or upkeep was done on past infrastructure projects could be useful in making projects more successful in the future. Additionally, as it is possible that climate has played a role in water scarcity, research of recent climactic and precipitation trends in the area could be important.



Conclusion

Overall, this report achieved its goal of understanding the water problem in Oda more thoroughly. By asking the community how they view the water problem, the survey was able to analyze the issue through understanding the needs of the people. These methods were able to obtain information about water use, water retrieval, and water hygiene. By relating and correlating answers to individual questions, the report was then able to understand different factors in peoples' decision-making processes regarding water. Additionally by looking at answers from different parts of the population, this study analyzed how the caste system plays a role in water distribution, and was able to illustrate an interesting dynamic within the community. It is hoped that the information found in this report can be used in understanding community needs regarding water, and thus be helpful in moving forward with a solution to water scarcity in Oda.



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Photos: Aaron Charney, 2017-2018

Appendices:

Appendix A: The Survey

- Question 1: When you go to the water tap, how many people do you get water for?
 - Open Ended Question

- Question 2: Which water source does your family use?
 - A: Near Jira Singh's House
 - B: Near Bhan Bahadur's House
 - C: Karan's House
 - D: Dalit/Brahmin by the Shed
 - E: Near Sarita's House/Big Rock
 - F: Near Singh/Kalpana's House
 - G: Near New Temple/Gogan's House
 - H: Near Bisna's Shop
 - I: Near Manju/Sapan's House
 - J: Near Lal's House
 - K: Oda Foundation
 - L: River
 - M: Neary Sangam's House

- Question 3: Why do you use that tap?
 - A: Higher water flow/more water available
 - B: Closest tap to house/proximity
 - C: Fewest people use that tap/shorter wait time

- Question 4: How far do you walk to get water?
 - A: < 5 minutes
 - B: 5 minutes
 - C: 10 minutes
 - D: 15 minutes
 - E: 20 minutes
 - F: 30 minutes
 - G: 45 minutes
 - H: 60+ minutes

- Question 5: How long do you wait at the tap for water?
 - A: < 5 minutes
 - B: 5 minutes
 - C: 10 minutes
 - D: 20 minutes
 - E: 30 minutes
 - F: 45 minutes



- G: 1 hour
 - H: 1.5 hours
 - I: 2 hours
 - J: 3+ hours
- Question 6: What time do you go to the tap?
 - A: Before 8 AM
 - B: 8-10 AM
 - C: 10 AM-12 PM
 - D: 12-2 PM
 - E: 2-4 PM
 - F: After 4 PM
- Question 7: Why do you go to the tap at that time?
 - A: Higher water flow/more water available
 - B: Fewest people/Shortest wait
 - C: Weather/temperature
 - D: Daylight
 - E: Other work constraints
- Question 8: How many times do you go to the tap in one day?
 - A: 1
 - B: 2
 - C: 3
 - D: 4
 - E: 5
 - F: 6+
- Question 9: How many containers do you fill in one day?
 - Open Ended: Answered how many of each different volume container are used in one day.
- Question 10: Do you always use the same tap?
 - A: Yes
 - B: No
- Question 11: If no, why?
 - A: If usual tap is broken
 - B: No water running
 - C: Seasonally less water
- Question 12: If you get water from a different tap sometimes, where do you go?
 - A: Different tap in Oda
 - B: River



- C: N/A, always use the same tap
- Question 13: How many times in one month do you go to the tap and there is no water?
 - A: 1
 - B: 2
 - C: 3
 - D: 4
 - E: 5
 - F: 6+
 - G: 0
- Question 14: How do you water fields in the dry season/cold months?
 - A: Bring a hose to the fields
 - B: Rain
 - C: Carry water from taps to fields
- Question 15: What do you use water for?
 - A: Animals
 - B: Crops/fields
 - C: Cooking
 - D: Cleaning and hand washing
 - E: Bathing
 - F: Washing clothes
 - G: Drinking
 - H: Toilet
 - I: Building Houses
- Question 16: What do you use the most water for, then what, then what?
 - A: Animals
 - B: Crops/fields
 - C: Cooking
 - D: Cleaning and hand washing
 - E: Bathing
 - F: Washing clothes
 - G: Drinking
 - H: Toilet
 - I: Building Houses
- Question 17: Do you need more water?
 - A: Yes
 - B: No



- Question 18: If you had more water, what would you use it for first, then what, then what?
 - A: Animals
 - B: Crops/fields
 - C: Cooking
 - D: Cleaning and hand washing
 - E: Bathing
 - F: Washing clothes
 - G: Drinking
 - H: Toilet
 - I: Building Houses

- Question 19: If you bathe in the cold season, where do you bathe?
 - A: River
 - B: Tap
 - C: Oda Foundation

- Question 20: Do you think your water is clean or dirty?
 - A: Clean
 - B: Dirty

- Question 21: Do you think that drinking dirty water can make you sick?
 - A: Yes
 - B: No

- Question 22: Do you filter or boil water before drinking it?
 - A: Filter
 - B: Boil
 - C: Don't treat water

- Question 23: If you could filter your water would you? (If you were given a filter, would you use it?)
 - A: Yes
 - B: No

- Question 24: Do you think dirty water is a problem for Oda?
 - A: Yes
 - B: No

Appendix B: Water Uses by Caste

Breakdown of primary, secondary, and tertiary water uses by caste. Percentages show the amount of families surveyed from each caste that listed each water consumptive activity in their first, second, or third uses of water.

	Primary Use	Secondary Use	Tertiary Use
KAFLE			
Animals	23%	15%	23%
Crops/Fields	0%	23%	0%
Cooking	15%	15%	31%
Cleaning	0%	0%	0%
Bathing	8%	15%	8%
Washing Clothes	8%	8%	0%
Drinking	38%	15%	8%
Toilet	8%	8%	31%
Building Houses	0%	0%	0%
CHHETRI			
Animals	30%	13%	35%
Crops/Fields	9%	4%	0%
Cooking	35%	35%	0%
Cleaning	4%	4%	4%
Bathing	0%	17%	4%
Washing Clothes	4%	13%	17%
Drinking	13%	0%	13%
Toilet	4%	13%	22%
Building Houses	0%	0%	4%
DALIT			
Animals	9%	14%	27%
Crops/Fields	0%	27%	9%
Cooking	32%	14%	18%
Cleaning	0%	5%	5%



Bathing	23%	14%	18%
Washing Clothes	9%	14%	5%
Drinking	14%	9%	9%
Toilet	14%	5%	9%
Building Houses	0%	0%	0%

Appendix C: Water Needs by Caste

Breakdown of primary, secondary, and tertiary water needs by caste. Percentages show the amount of families surveyed from each caste that listed each water consumptive activity in their first, second, or third needs for more water.

	Primary	Secondary	Tertiary
Brahmin			
Animal	8%	31%	31%
Crops/Fields	77%	8%	8%
Cooking	0%	15%	38%
Cleaning	0%	0%	0%
Bathing	0%	0%	15%
Washing Clothes	8%	8%	0%
Drinking	8%	15%	8%
Toilet	0%	23%	0%
Building Houses	0%	0%	0%
Chhetri			
Animal	5%	23%	27%
Crops/Fields	59%	18%	18%
Cooking	5%	5%	18%
Cleaning	0%	0%	0%
Bathing	5%	14%	14%
Washing Clothes	14%	9%	9%
Drinking	9%	14%	9%
Toilet	5%	14%	5%
Building Houses	0%	5%	0%
Dalit			
Animal	14%	18%	9%
Crops/Fields	50%	14%	9%
Cooking	5%	5%	18%
Cleaning	5%	5%	5%
Bathing	18%	18%	18%



Washing Clothes	5%	23%	23%
Drinking	0%	14%	14%
Toilet	5%	0%	5%
Building Houses	0%	5%	0%