Jibu Customer Carbon Savings in Rwanda

Lauren Kelley and Lia Kraaijvanger

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Abstract : Jibu Inc. is a social enterprise in Rwanda that addresses the essential service need for clean drinking water. The following report aims to understand Jibu's potential for acquiring a carbon credit certification by investigating customers' water treatment methods before becoming Jibu customers. Data was collected on Jibu customers by way of a quantitative survey that uncovered customer profiles and carbon savings. Our analysis reveals that before purchasing Jibu water, many current customers treated water at home using carbon-emitting practices such as boiling water with charcoal or gas. Jibu customers are now reducing carbon emissions since they are no longer boiling water, thus no longer emitting as much carbon into the atmosphere. Based on customers' carbon savings, this report asserts that it is worthwhile for Jibu to pursue the carbon credit certification process further. In tandem with pursuing certification, our research confirmed that Jibu should continue to provide an affordable and accessible drinking water source for customers across Rwanda.

Author Bios

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Acknowledgements

We want to thank our parents, Anne Kelley, Mark Kelley, Danielle Kraaijvanger, and Paul Kraaijvanger. We would also like to thank Tom Sanskara and Caroline Kirabo for translating our survey in the field and collecting data alongside us. Additionally we offer thanks to Tosca Terra, Divine Mpano, Jean-Paul Niyongabo, Richard Buntu, and the entire Jibu Rwanda team for supporting us logistically in our data collection and welcoming us to Rwanda. Lastly, we thank the Miller Center for Social Entrepreneurship, specifically Iris Stewart-Frey, Laura Robinson, Jen Merrit, and Linda Gentry, for supporting our field research and data analysis.

Introduction

Access to clean drinking water is a critical problem for millions of people around the globe. To address this issue, numerous social enterprises focused on clean water access and delivery have emerged. Jibu Inc. is a social enterprise that operates in eight African countries. Jibu provides clean drinking water for local communities and provides opportunities for local entrepreneurs to launch and grow their own local businesses.

To assist Jibu in better understanding its customer base, we engaged in action research in the country of Rwanda in 2023. The project sought to better understand customer purchasing and drinking habits as well as how customers are saving on carbon emissions. The purpose of this research was to assist Jibu in the preliminary stages of earning a carbon credit certification.

The following roadmap serves as an overview of our report. We first provide an overview of the customers we surveyed. Using the data from our quantitative survey, we analyze customer demographic information, water treatment practices, and purchasing habits at the household level. This data will provide Jibu with greater insight into its customer base. Moreover, we recommend how Jibu can improve overall product efficiency and customer satisfaction.

Next, we address customer's carbon savings and how customers are saving on carbon *now* compared to before becoming Jibu customers. We provide a data set of preliminary information on carbon savings and an analysis of actionable findings.

Finally, we discuss feedback collected from customers in the field including both positive aspects of Jibu operations and areas that could be improved upon. Overall, this customer profile and carbon savings research will allow Jibu to keep improving clean water access and to enter the emerging carbon credit market.

Jibu's Mission

Founded in 2012, Jibu is a for-profit social enterprise whose mission is to support and equip local entrepreneurs to launch and grow essential service franchises that provide clean drinking water to communities in eight African countries, including Rwanda.. Jibu accomplishes this by funding the establishment of new franchises. This includes providing a four-step water purification system and continued training. Local entrepreneurs then contribute individual capital towards owning and operating one or more franchises.

Jibu's water purification and production processes are close to carbon neutral. Before implementing our survey, we suspected that before purchasing Jibu water many current customers treated water at home using carbon-emitting practices such as boiling water

with charcoal or gas. Due to potential customers' carbon savings, Jibu aims to become Gold Standard Certified to benefit from carbon credit trading. The certification and associated monetary benefits will help to strengthen Jibu's branding presence and allow Jibu to further invest in their end users or customers. To help obtain this certification, our team assisted Jibu in measuring how purchasing Jibu water translates into carbon credits. Through a quantitative survey we provided preliminary data on Rwandan customers that allows Jibu to understand its customer base at the household level with an eye to critical documentation required for Gold Standard Certification.

Rwandan Context

Jibu aims to solve an essential service need and provide economic opportunity to communities throughout Rwanda. According to UNICEF, only 57% of the Rwandan population has access to safe drinking water within 30 minutes of their home (UNICEF, 2023). Jibu's mission focuses on addressing this problem of access.

Furthermore, according to the World Bank, Rwanda's economy is growing exponentially. Between 2009 and 2019, GDP grew an average of 5%. Despite economic challenges due to the COVID-19 pandemic and lack of tourism in 2022, real GDP continued to grow by 8.2%. However, according to the World Bank, public debt has increased substantially in recent years, and external financing has played a significant role in financing public investments (World Bank, 2023). Against that backdrop, the growth of the private sector and social enterprises like Jibu in Rwanda help sustain and accelerate economic growth. While providing safe drinking water is the immediate focus of Jibu, the enterprise has also created a network of independent franchise owners and has provided entrepreneurial opportunities throughout Rwanda.

Background

Climate Change and Impact on Poor Populations

Human-induced global climate change has inflicted numerous environmental repercussions, such as droughts, erosion, floods, storms, sea level rise, and more. These changes to the environment have particularly affected poor populations in both rural and urban areas around the world. According to Barbier and Hochard (2018), people living in rural areas of developing countries are particularly susceptible to climate change, as it negatively impacts agricultural productivity and income. Further, an overreliance on marginal agricultural land and resources due to climate change can lead to stagnant and low incomes, defined as poverty-environment traps (Barbier and Hochard, 2018). With respect to urban populations, Gasper, Blohm and Ruth (2011) explain how climate change may provoke social and economic challenges in cities like energy shortages, damaged infrastructure, and heat related mortality and illnesses. These events make it difficult to maintain livelihoods, and can exacerbate poverty and hunger (Gasper, 2011).

In addition, people living in urban and rural areas experience climate change directly through issues with drinking water safety. Climate-related hazards compromise water quality and access in developing countries. Specifically, events like intense rainfall or dry spells may damage or destroy water supply infrastructures, resulting in diminished quality and availability of water for consumption (Kohlitz, Chong & Willetts, 2020). Within urban areas, water sources have become scarce from these climate events (Gasper, 2011). As global warming continues and accelerates, accessibility to clean water sources will decrease and impact vulnerable populations (Kohlitz, Chong & Willetts, 2020). The poorest and most marginalized people will bear a disproportionate burden of climate change impacts.

Safe Drinking Water Management

Safe drinking water is considered a human right and remains largely inaccessible to many people in developing countries. “Clean water and sanitation” is listed as a United Nations sustainable development goal, and many environmental, social, and economic initiatives focus on improving safe drinking water access (The 17 Goals, United Nations, n.d.). Water is used for many purposes, including cooking, drinking, and personal hygiene, and it is crucial to maintaining public health, considering the existence of waterborne diseases. Improved sanitation and management of water resources have the potential to reduce poverty and boost a country’s economic growth (Treacy, 2019). Safely managed water services are those that are accessible on a premise, available anytime, and contamination-free. Additionally, strategies to manage safe drinking water must address risks related to climate change, particularly in rural areas of the developing world (Kohlitz, Chong & Willetts, 2020). Ultimately, the research, development, and deployment of clean water technologies are crucial to ensure access to safe drinking water as a fundamental human right (Treacy, 2019).

Carbon Credit Market

Increased carbon emissions have resulted in severe environmental consequences on a global scale. The Kyoto Protocol was an international treaty that committed nations to reducing greenhouse gas emissions by setting quotas on how much emissions commercial entities can produce. If an entity surpasses the allocated amount of CO2 emissions, it is able to buy carbon credits from organizations that either save or sequester carbon through their business activity. One carbon credit equals one ton of CO2 to be released into the air (Gupta, 2011). Businesses that exceed their carbon quota must buy carbon credits to account for excess emissions, and businesses below the quota can sell the remaining credits for revenue. Credits can be exchanged between businesses or traded in international markets. As a result, global carbon emissions remain within permissible limits, and companies develop sustainable ways to conduct business (Gupta, 2011).

The Gold Standard for Household Water Treatment Projects

According to Summers et al. (2015), the carbon credit market is a growing mechanism for subsidizing household water treatment technologies (HWT). Such projects generate credit by reducing carbon emissions from boiling water by providing a HWT that reduces greenhouse gas (GHG) emissions linked to global warming. Materials used to boil water may include charcoal or gas. Charcoal is the principal energy source for heating and cooking for most urban households in sub-Saharan Africa. More specifically, burning charcoal emits high levels of carbon dioxide into the atmosphere (Otieno, 2022). Selling carbon credits associated with HWT projects demands diligent monitoring to ensure households are using the HWT and benefiting from the project (Summers et al. 2015). The most significant HWT projects registered for carbon credits utilize the Gold Standard, a Switzerland-based non-profit organization that certifies emission reductions for international compliance and voluntary carbon markets (Summers et al. 2015). The guidelines established by the Gold Standard methodology for safe drinking water projects are considered the most rigorous in monitoring and validating emission reductions. Some examples of strict standards include high standards for verifying the microbiological safety of water and analyzing the project's life cycle emissions (Summers et al. 2015).

Summers et al. (2015) conducted interviews with key stakeholders from the water, sanitation and hygiene (WASH) and carbon credit development sectors. These interviews explored perspectives of these different stakeholders on the use of carbon credits to finance HWT projects with respect to the procedures enforced in the Gold Standard methodology for trading Voluntary Emission Reduction (VER) credits (Summers et al. 2015). The results of this study suggest that perspectives from stakeholders have differences and commonalities. There was disagreement on the need for water quality assurance for carbon credit projects, with carbon credit experts maintaining this is unnecessary and WASH experts requiring this guideline. There was evident agreement that carbon credits are a valuable tool for accessible financing to developing countries, however, more efforts are necessary to develop more agreement between both stakeholder groups on the methods applied in carbon credit projects for drinking water equality (Summers et al. 2015). In all, this study illustrates controversial perspectives regarding the standards required for HWT carbon projects.

Research Goals and Questions

Before purchasing Jibu water, many current customers presumably treated water at home using high carbon-emitting practices such as boiling water with charcoal or gas. These materials emit high volumes of carbon dioxide into the atmosphere. Now, however, Jibu customers are less likely to treat water at home, so the amount of carbon dioxide emitted into the atmosphere has decreased. Due to customers' carbon savings, Jibu aims to become Gold Standard Certified to be able to sell carbon credits. The certification will help to strengthen Jibu's branding presence and to further invest in its end users.

Research Questions

To help obtain this certification, our team assisted Jibu in measuring how its processes translate into carbon credits. Our goals were to provide preliminary data that allows Jibu to understand its customer base at the household level and to understand if customers are saving on carbon emissions through the use of Jibu water products. These goals resulted in three research questions:

1. Does using Jibu water impact customer habits related to obtaining clean water?

2. Are customers' carbon savings sufficient for Jibu to pursue a carbon credit certification under the Gold Standard?

3. Does Jibu improve customers' well-being per the United Nations Sustainable Development Goals?

Data Collection and Research Methods

Data Collection

In July of 2023, we traveled to Kigali, Rwanda for four weeks to implement our survey. We surveyed 320 Jibu customers, which surpasses the minimum amount of responses required for the Gold Standard of 100 responses. Surveys were carried out from 31 different franchise locations in all five provinces throughout Rwanda, ensuring we gathered a representative sample. We deployed the survey on mWater, a surveyor tool and application that guaranteed the data was collected digitally, a requirement of the Gold Standard. We traveled in person to 14 different franchise locations.

For many of these visits, we traveled as far as two hours outside of Kigali to remote rural areas, as well as urban neighborhoods within the city. Using addresses provided to us by Jibu, we visited various franchise locations and consulted the franchise manager about where we could locate their customers and resellers. From there, we walked through the surrounding neighborhoods, going door to door to both homes and reseller boutiques to find Jibu customers.

In addition to in-person surveys, we called customers of 13 franchise locations. We carried out these virtual surveys from Jibu’s headquarters in Kigali, Rwanda. This allowed us to reach customers in distant provinces that were too far away to drive. Overall, we averaged 12 customer survey responses per franchise location surveyed.

Research Methods

Customer Profile

The first section of our survey addressed customer profile information. This section consisted of questions focused on background information such as gender, age, household size, household role, employment status, and income. The purpose of this section was to collect data so that Jibu can better understand its customer base and also to inform the calculations necessary for carbon credit certification.

Carbon Savings

The second part of our survey regarded the carbon savings of current Jibu customers. The purpose of this section was to understand customers' carbon emissions before they became Jibu customers in order to compare to their current emissions. We asked customers how they sourced and treated their water before Jibu to inform our research question regarding how Jibu water has impacted customer habits related to obtaining clean water. If customers indicated that they previously boiled water for treatment before Jibu, we asked them questions that investigated what materials they used, how often they boiled, how much water they boiled, and how long it took to boil water per session. This section of the survey will help to answer our second research question, that is directed towards how much carbon Jibu customers are saving in relation to a potential carbon credit certification under the Gold Standard.

Customer Feedback

The final section of our survey consisted of two free-response questions that asked customers about their favorite aspect of Jibu as well as how they can improve their business operations. This section aimed to answer our final research question regarding if Jibu improves customers' well-being per the United Nations Sustainable Development Goals.

Limitations and Ethics

We aimed to conduct the project in an ethical manner, supported by the IRB approval process at Santa Clara University. Prior to collecting data, we obtained informed consent from each customer surveyed.
In addition to ethical parameters, there are limitations to this study. Our in-person surveys, for example, were conducted within walking distance from Jibu franchisees, which circumscribed our data collection to only those customers who lived in close proximity to a franchisee. This may have potentially excluded customers who lived farther away from franchisee locations and purchased from other reseller locations (see Figure 2.3). In addition, our findings are only generalizable to Jibu and cannot be used to draw larger conclusions for Rwanda or other companies.

Customer Overview

To inform our findings, we included a customer overview section that describes the customers we surveyed and their purchasing behaviors. The first subheading describes demographic information on customers. The second subheading illustrates the purchasing behaviors. The following sections are not a part of our findings, but they contextualize Jibu's understanding of its customer base and inform our analysis of customer carbon savings. In the following sections, the Jibu customers that we surveyed are referred to as respondents.

Demographic Information

To better inform the location data we collected, we will provide a brief overview of the geographical divisions in Rwanda. There are five provinces in Rwanda. Each province is divided into several districts. Within each district, there are smaller sectors. In this report, we will identify the provinces that respondents were surveyed in, as well as the districts within the province of Kigali only. For reference, figure 0 is a map of Rwanda's five provinces.

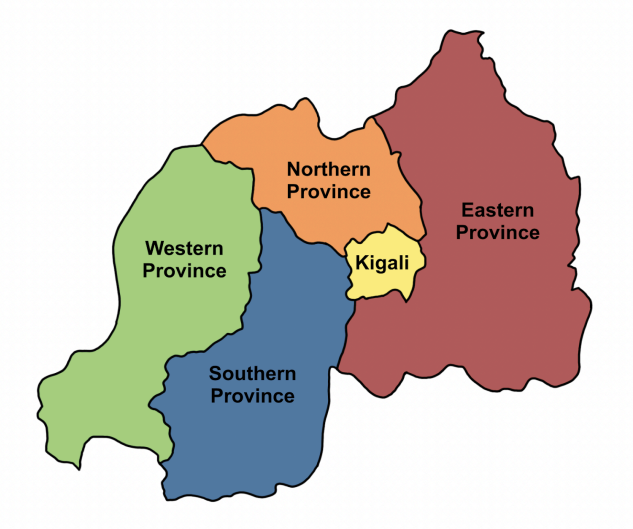

Figure 0

As shown in Figure 1.0, most of the respondents (47%) reside in the Kigali province of Rwanda. This is likely because Kigali has the most franchise locations. The second most common province where respondents live is the Southern province of Rwanda.

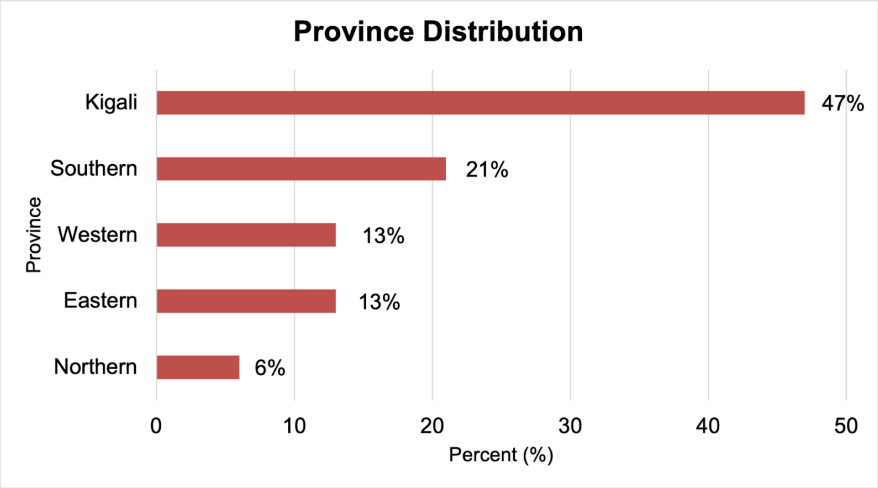

Figure 1.0

Within the Kigali province, most respondents (60%) live within the district of Gasabo as shown in the graph below. The next most common district is Kicukiro, where 31% of respondents live. The smallest number of respondents (9%) live within the district of Nyarugenge.

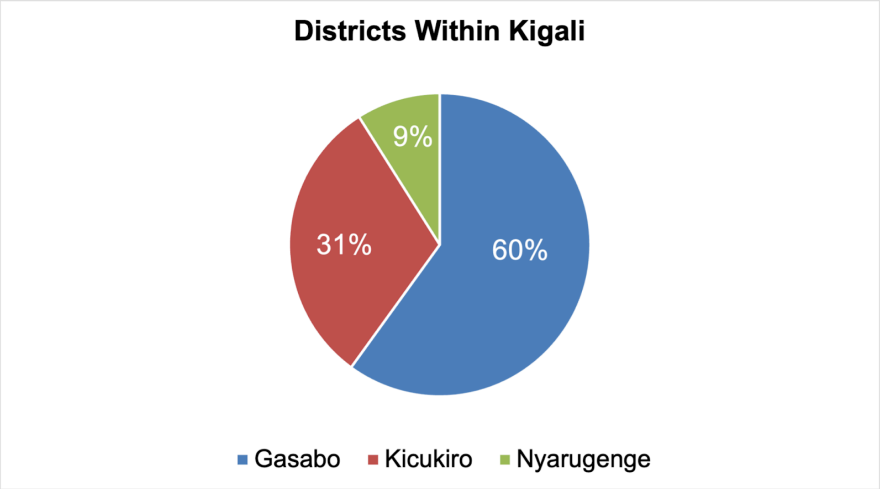

Figure 1.1

According to Figure 1.2, 48% of respondents identified as female. Fifty-two percent (52%) of respondents identified as male. The gender of respondents are distributed very evenly amongst men and women.

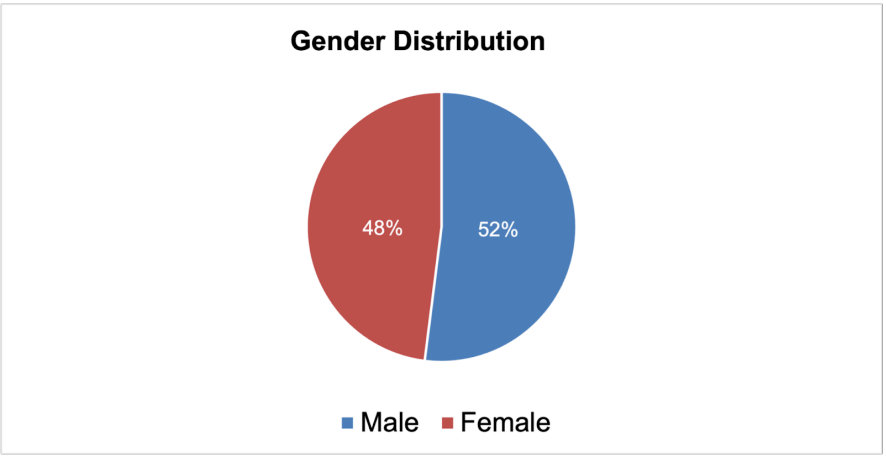

Figure 1.2

The graph in Figure 1.3 illustrates that 43% of the respondents were between the ages of 18-29 years old, representing the largest age group of respondents. Twenty-three percent (23%) of respondents were above the age of 40 years old. People drinking Jibu water are relatively young, and potentially at the childbearing stage of life.

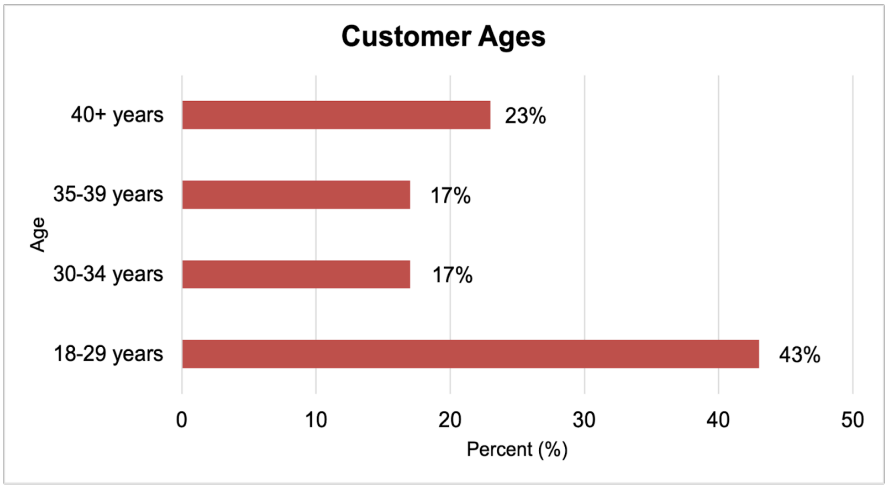

Figure 1.3

Figure 1.4 reflects the total household size of Jibu customers. Most households had one or two members. Specifically, the highest number of households surveyed were occupied by 2 people (30%). Ten percent (10%) of households surveyed were occupied by 1 person. After 2 people per household, responses dropped significantly and are therefore grouped into ranges in Figure 1.4. From this data, we calculated that the average household size is 5 people.

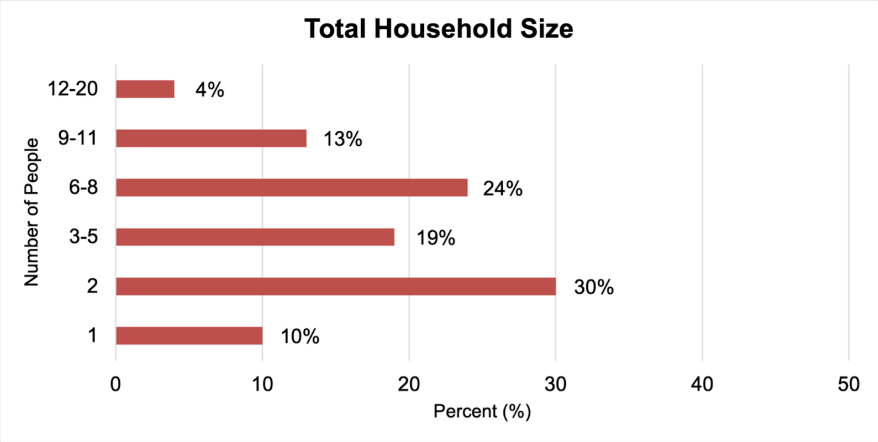

Figure 1.4

To understand the age composition of households, we asked respondents how many children under age 18 live in their household. As displayed in Figure 1.5, the largest number of households (41%) had one child living in their household. Further, 23% of the households had 2 children living in their household. As the amount of children increases, the portion of households decreases. Overall, Jibu provides water for many children amongst households surveyed.

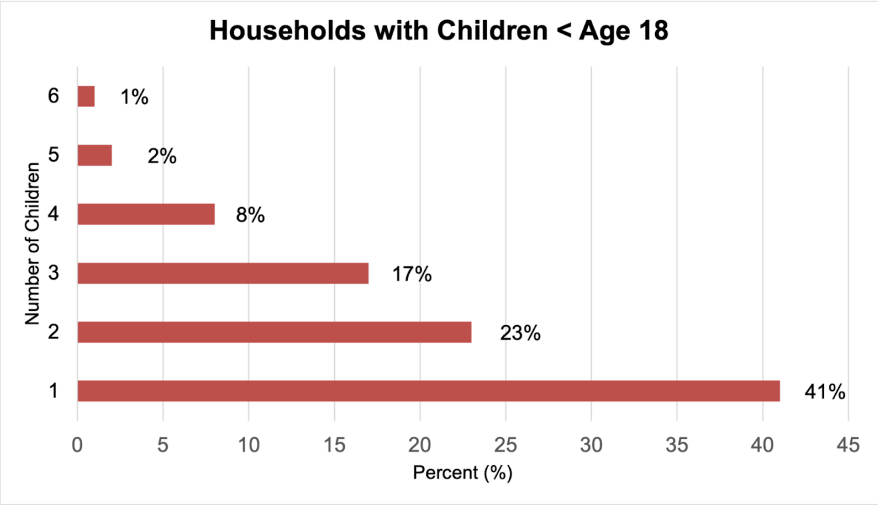

Figure 1.5

Figure 1.6 shows that within the demographic of adult household members the most respondents (35%) reported having 2 members above the age of 18. The least common number of adult members was 6, at only 2%. For more specific childhood age distributions, see Appendix A, Figure 3.6 and 3.7.

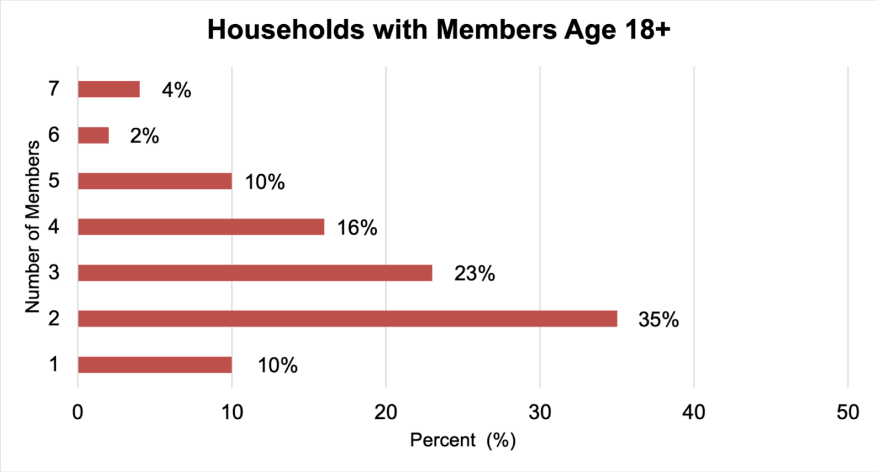

Figure 1.6

Rwandan household members hold different roles within the household. As shown in Figure 1.7, we asked respondents which role they occupy in their household. The majority of individuals (64%) surveyed were head of household. Twenty-six percent (26%) of the individuals surveyed were family members. Ten percent (10%) of the individuals surveyed were househelp.

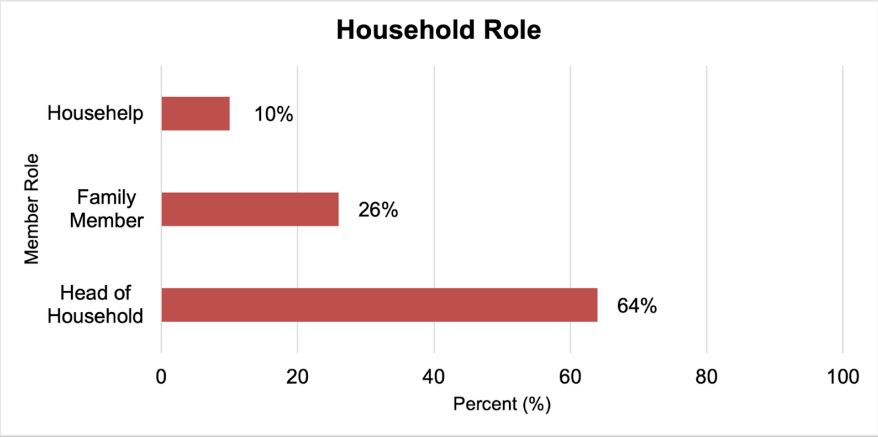

Figure 1.7

We found that over half (62%) of respondents are employed as shown in Figure 1.8. Twenty-two percent (22%) of respondents reported being self-employed. Only 11% of respondents were not employed, and merely 4% were students. No respondents were retired. This finding indicates that most respondents are employed, which may factor into how they can afford Jibu water.

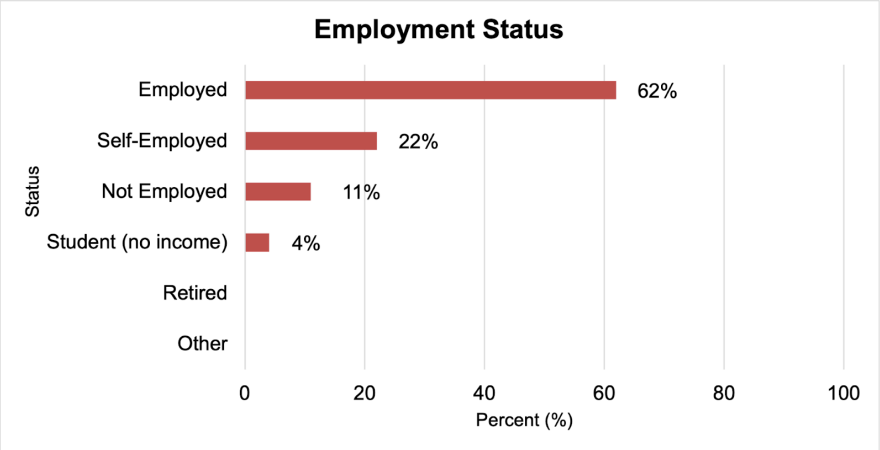

Figure 1.8

Figure 1.9 illustrates customer employment. The highest number of respondents (25%) reported they worked as storeowners. The second highest occupation (14%) was a business person, followed by positions as househelp and drivers. The "other" category includes less popular occupations in education, government, and art. Overall, respondents are generally working professionals.

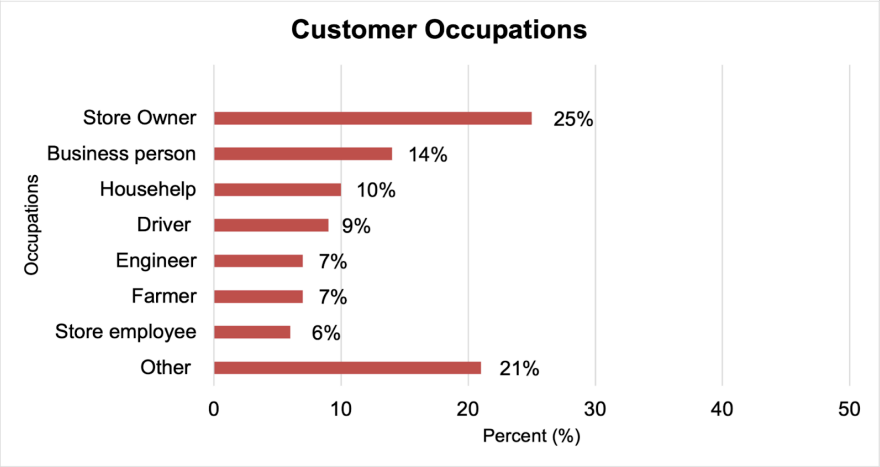

Figure 1.9

To assess customers' socioeconomic status in Rwanda, we asked respondents which monthly salary range they fell into. The highest number of respondents (27%) receive a monthly salary of less than 100,000 RWF (equivalent to less than approximately 80 USD), as illustrated in Figure 2.0. The next highest number of respondents receive a monthly salary between 100,000 RWF and 200,000 RWF (equivalent to between approximately 80 USD and 160 USD). This finding indicates that the majority of respondents earn less than 200,000 RWF per month, and this income group significantly makes up Jibu's customer base. It is important to note that 25% of respondents preferred not to answer this question.

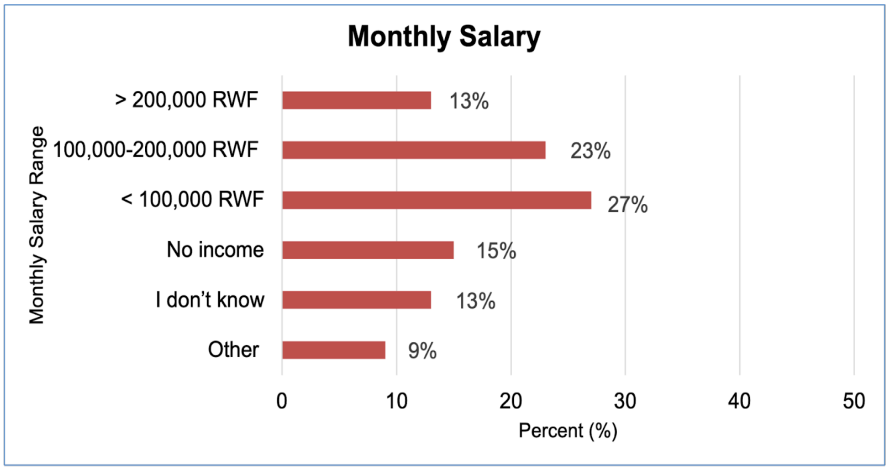

Figure 2.0

Purchasing Behaviors

Regarding purchasing specifics, Figure 2.1 shows that 62% of respondents reported that they have been Jibu customers for more than 2 years. The next largest group of respondents have been customers for 1-2 years. Very few respondents have been customers for less than 6 months. This data indicates that Jibu has established a loyal customer base throughout Rwanda.

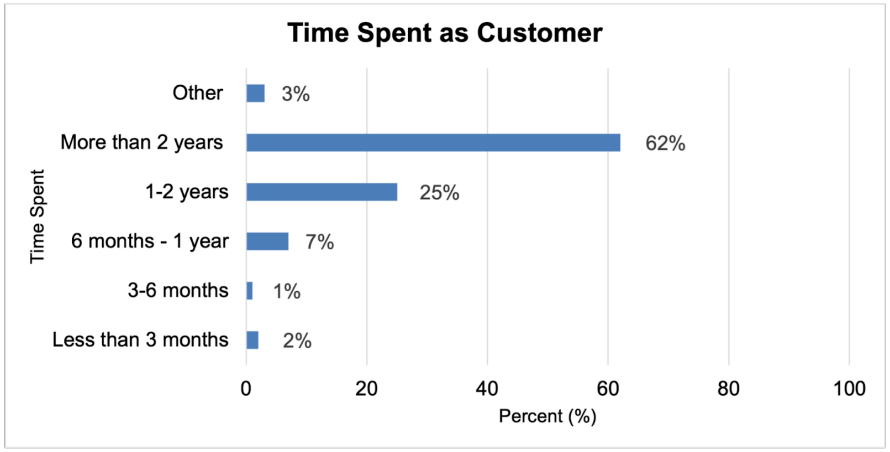

Figure 2.1

Figure 2.2 illustrates the size of Jibu water bottles that respondents are purchasing. Ninety-five (95%) of respondents indicated that they purchase water in 11-20L quantities. In the field, respondents indicated verbally that they most often purchase the 20L bottle with tap, and favor this size bottle rather than the 18.9L bottle.

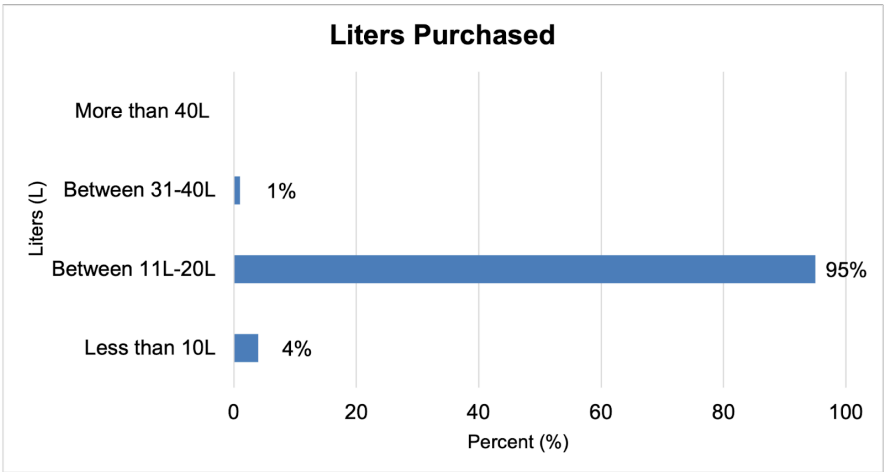

Figure 2.2

Figure 2.3 illustrates the purchasing location where respondents obtain Jibu water bottles. The highest number of respondents (41%) are obtaining Jibu water from a boutique or shop that is re-selling Jibu water bottles. The next highest number of respondents (35%) purchase Jibu water from Jibu franchises directly.

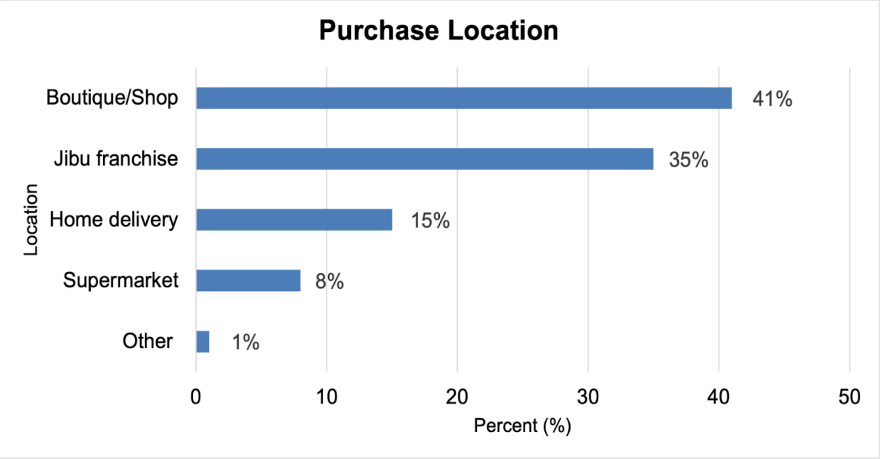

Figure 2.3

Figure 2.4 depicts how often respondents purchase Jibu water. More than half of respondents (64%) reported purchasing Jibu water 1-2 times per week. The next most common response was once every 2-3 weeks. Very few people purchase Jibu water 3 or more times per week.

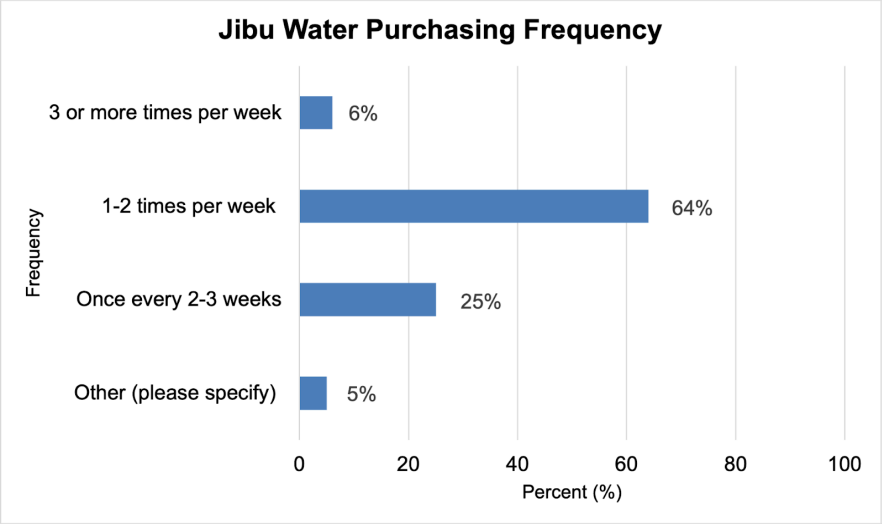

Figure 2.4

We found that in the majority of households (56%), the male head of household made the decision to purchase Jibu products. As shown in Figure 2.5, the next most common member who makes purchasing decisions is the female head of household (28%). This finding indicates that the head of household, male or female, holds the power in deciding to buy Jibu products over other family members.

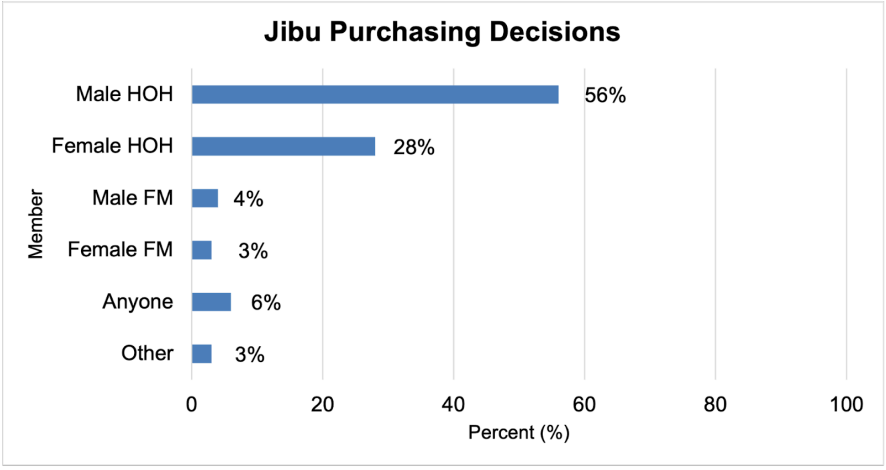

Figure 2.5
HOH = Head of Household; FM = family member

We asked respondents who in the household collects Jibu water. As displayed in Figure 2.6, we found that in 24% of households, anyone in the house collects the water rather than a specific member. Another common response was that nobody in the household collects the water, as they get it delivered by a third party. The least common person to collect water was a female family member. This data implies that water collection has to do with convenience rather than power structures in a given household.

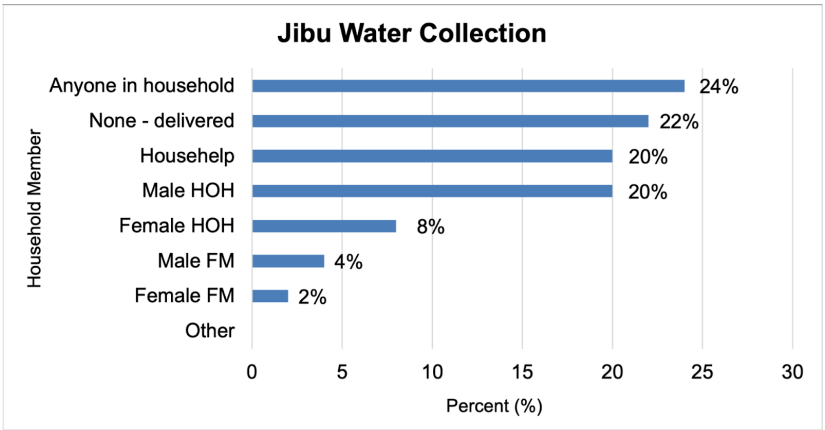

Figure 2.6

In addition to purified water sold in a variety of different sizes, Jibu sells liquid petroleum gas (LPG) and porridge. Figure 2.7 illustrates that an overwhelming majority of respondents (90%) indicated they do not purchase these two other products, and many of these respondents shared they did not know these products existed.

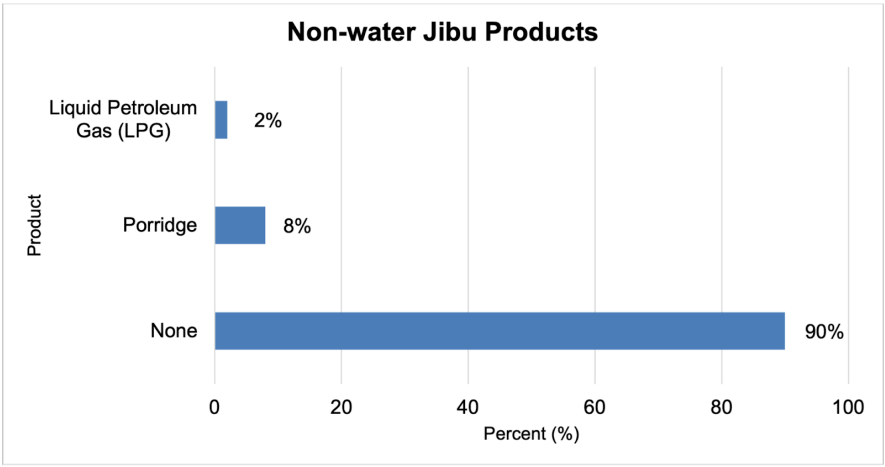

Figure 2.7

Analysis and Key Findings

Customer Carbon Savings

In this section, we will discuss findings related to customer carbon savings that are relevant to the carbon credit certification process. We asked questions concerning water sourcing and treatment practices *before* customers started purchasing Jibu water. Data derived from these questions indicates levels of carbon emissions that Jibu customers used to produce. Since Jibu water is treated with close to carbon-neutral practices, substantial carbon emissions are avoided. In the following sections, Jibu customers that we surveyed are referred to as respondents.

Figure 3.0 shows that the majority of respondents (72%) retrieved their water through a piped source before becoming Jibu customers. Piped water is often connected directly to a given household, and is usually not safe for drinking. Before customers began purchasing Jibu water, Jibu customers faced a public health issue: a reliance on piped water that was non-potable.

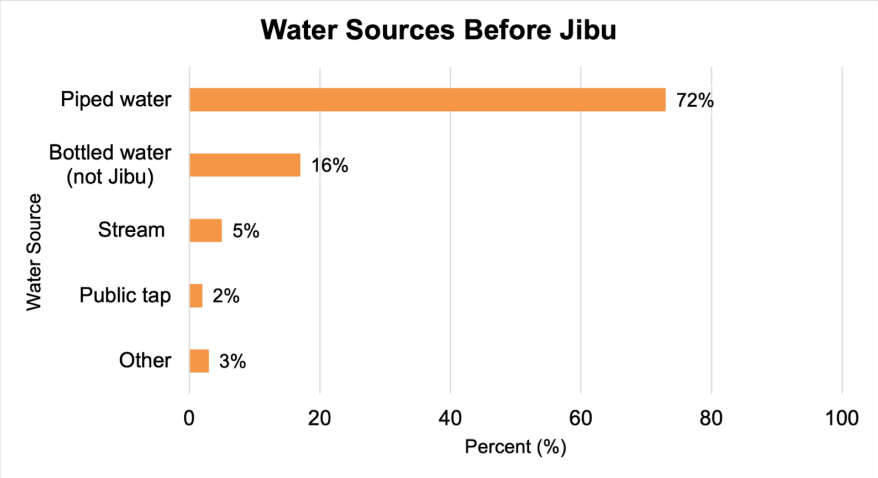

Figure 3.0

As shown in Figure 3.1, we asked customers how they used to treat their water before becoming Jibu customers. Most respondents (72%) reported boiling their water. Boiling is the most carbon-emitting water treatment practice. This finding is significant as it indicates that Jibu customers used to release carbon into the atmosphere. It also sets the stage for how customers save on carbon when switching to Jibu water instead of boiling.

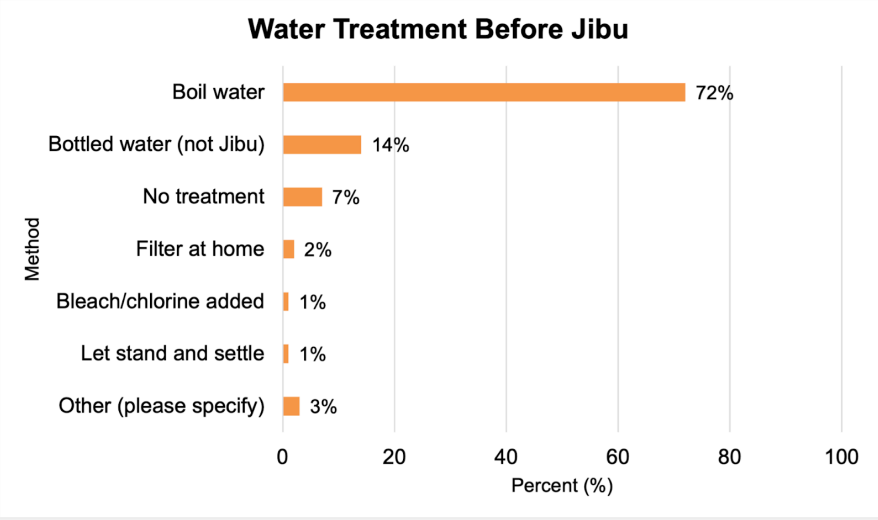

Figure 3.1

We also asked customers if they are still treating water since purchasing Jibu products.

Most customers (84%) indicated that they no longer treat other water sources and strictly drink Jibu water. However, 16% of respondents indicated they still treat their water, and of that group, 94% reported that they boil water (see Appendix A, Figure 3.8). Most often, customers indicated they still boil water only when they cannot afford Jibu water bottles, so these customers reverted to their previous treatment method of boiling piped water. With that said, this group of respondents is boiling water less frequently and have reduced their carbon footprint since becoming Jibu customers.

Figure 3.2 illustrates what materials respondents used to power the fire for boiling before becoming Jibu customers. The highest number of respondents (60%) used charcoal to power the fire. Charcoal is the burning material that emits the most CO2. This illustrates how Jibu is preventing charcoal from being purchased and burned by their current customers. The second highest number of customers were using gas or biogas to power the fire for boiling. Gas and biogas also emit carbon into the air. Since customers are no longer using charcoal or gas to power the fire for boiling water, Jibu customers are cutting down on CO2 emissions. At the same time, it is important to acknowledge that Jibu technologies are not 100 percent carbon neutral.

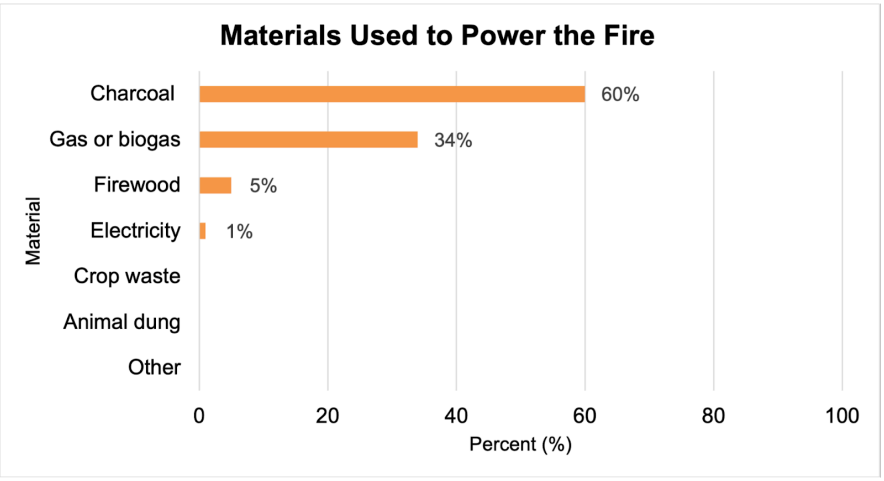

Figure 3.2

As shown in Figure 3.3, we found that the majority of respondents (65%) boiled water 2-3 days per week, which indicates that customers were boiling water often.

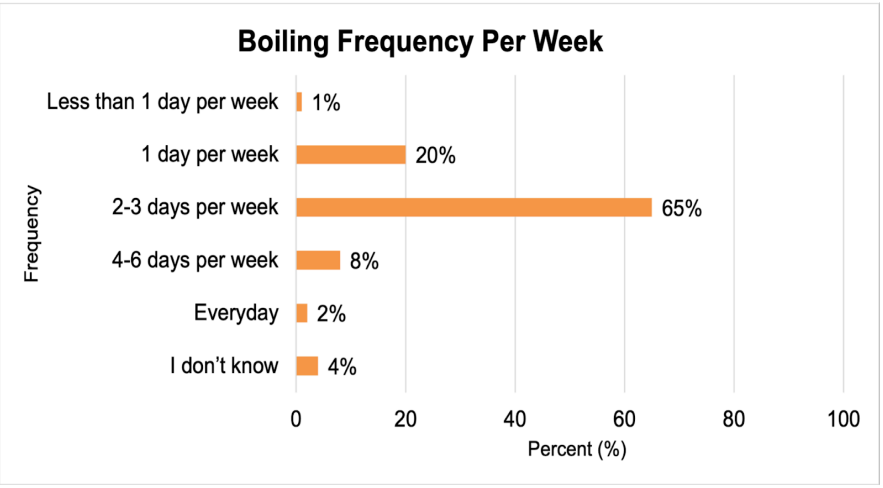

Figure 3.3

Figure 3.4 shows the most common amount of water that Jibu customers used to boil was 5-7 liters (69%), which is a considerable amount of water. This amount is significantly higher than the rest, as the next highest amount of water was 8-10 liters at only 14%. This finding, when further broken down to the individual consumer level, will be significant in calculating how Jibu provides enough water for the population's needs.

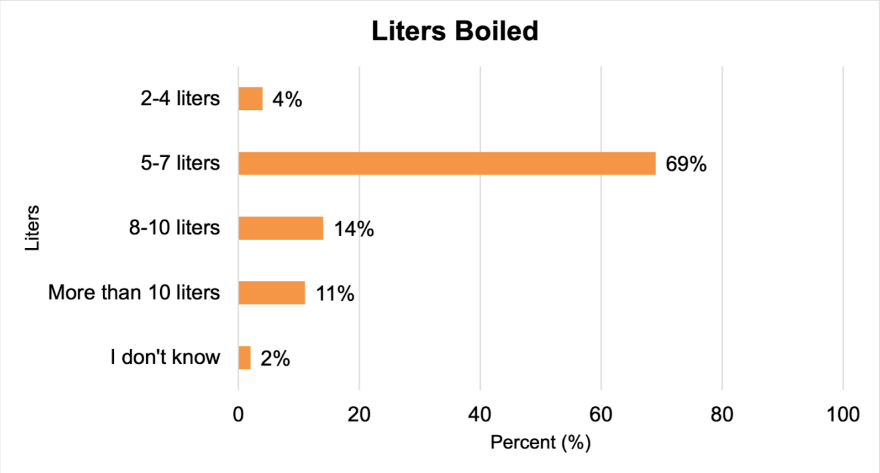

Figure 3.4

In addition to the amount of water boiled, we found that most respondents used to boil water often for 21-30 minutes (32%). Figure 3.5 illustrates that many respondents (30%) also used to boil water for 5-15 minutes. The least amount of Jibu customers used to boil water was for less than 5 minutes. This finding, along with boiling material, boiling frequency, and liters boiled indicates that Jibu customers used to emit notable quantities of CO2 into the atmosphere. Jibu services have prevented further carbon emissions through boiling.

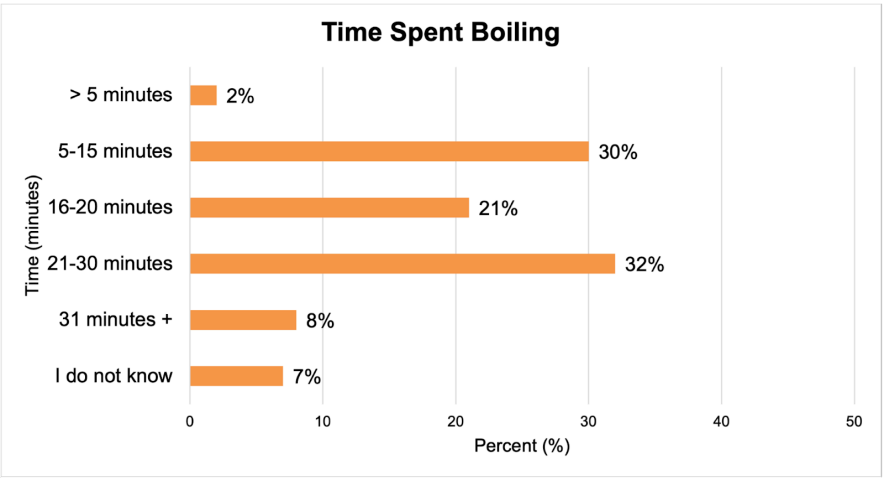

Figure 3.5

Finally, we asked three survey questions about transportation methods used to obtain water before becoming Jibu customers (see Appendix A, Figure 3.9, Figure 4.0, Figure 4.1). Specifically, the survey questions entailed modes of transportation, in addition to distance and time spent traveling. Our data revealed that since most people sourced their water through a pipe into the home, little to no transportation was needed to obtain water for drinking. More than half of Jibu customers reported that they did not travel to obtain water (62%). If they did travel, most Jibu customers used to walk (22%), for less than 1km (25%) and for only 5-10 minutes. The most common practices, not traveling or walking, do not emit any carbon into the atmosphere. Therefore, the transportation section of our survey did not produce findings that would be crucial to investigate for the Gold Standard Carbon Credit Certification.

Customer Feedback

Figure 2.8 and Figure 2.9 refer to customer feedback. Looking at customers' favorite aspects of Jibu, we divided these responses into categories as shown in Figure 2.8: great quality water, improved access, improved health, saves time, affordable price, great service, bottle design, saves money. Based on these responses, we see that more respondents (33%) believe the water quality is great, compared to the group that indicated to improve the water quality in Figure 2.9. Additionally, respondents indicated that Jibu has improved their access to clean drinking water, has improved their households' health, and saves time not treating water. These survey responses indicate that Jibu customers are generally satisfied with the products and services that Jibu provides in Rwanda.

The areas for improvement, shown in Figure 2.9, was divided into nine categories: decrease price, improve water quality, improve bottle quality and durability, add more resellers/franchisee locations, increasing marketing on porridge and LPG products, provide home delivery, add a single use 1 liter water bottle, oversee the re-seller locations more diligently, and none. From this feedback, we see that the majority of respondents (39%) do not see an area where Jibu needs to improve. However, some customers

suggested decreasing the price of Jibu water bottles, improving the water quality at franchisees, and improving the quality of bottles.

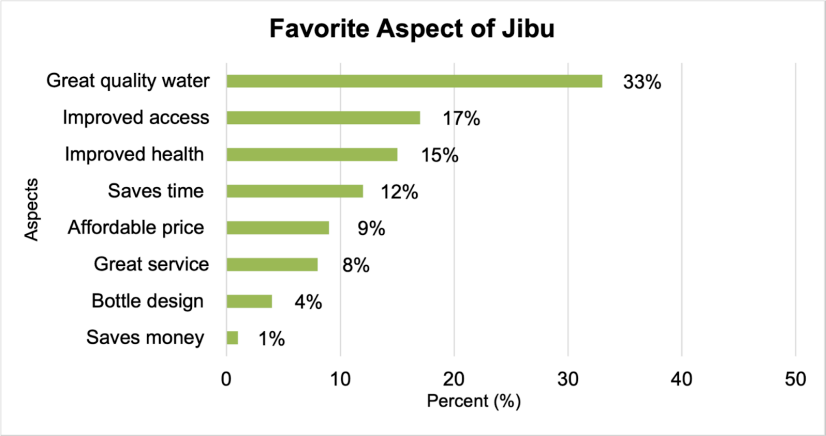

Figure 2.8

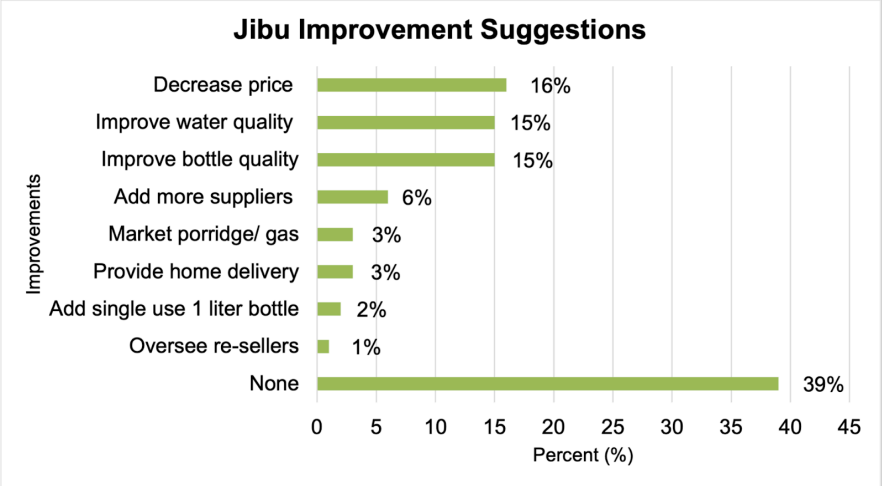

Figure 2.9

We summarize our key findings as follows:

1) Jibu has provided an affordable and accessible water source for customers across Rwanda
2) Jibu customers are saving on carbon emissions by purchasing Jibu water, because the majority of customers are no longer boiling water
3) Based on customers saving on carbon emissions, it is worthwhile for Jibu to pursue the carbon credit certification process further

Conclusions

Our quantitative survey, implemented in July of 2023, asked 320 Jibu customers in Rwanda about customer profiles and carbon savings. The majority of responses came from people

living in the Kigali province. From the survey data, we derived quantifiable information about Jibu customers regarding demographic information and customer behavior. In terms of customer demographics, we concluded that Jibu maintains a relatively young customer base. The average household size of Jibu respondents is five people. Moreover, most Jibu customers are employed and are generally working professionals.

Furthermore, data collected on customer behavior indicates that the head of household, whether male or female, most often decides to purchase Jibu products, but that a majority of the households have a male head. At the same time, the vast majority of households purchase Jibu water alone rather than porridge or gas. With customer feedback, we found that Jibu customers are generally satisfied with Jibu products and services in Rwanda, although there are certainly areas for improvement.

The data also provided information on Jibu customer's carbon savings. Seventy two percent of survey respondents treated water by boiling before purchasing Jibu water, and most often, the water was from a piped water source. Moreover, charcoal was the material most commonly used by customers to power the fire for boiling. Most respondents boiled 5-7 liters of water and boiled as often as 2-3 days per week. Time spent boiling varied amongst customers, most often from 5-15 minutes (30%), 16-20 minutes (21%), or 21-30 minutes (32%). Overall, these quantitative findings will directly inform the carbon savings of customers in the certification process.

Recommendations

Based on our research, we recommend reviewing Jibu's customer feedback to understand the needs of Jibu's customer base. Customers suggested decreasing the price and improving both water and bottle quality. In terms of water quality, several customers reported a bad taste in the water, where there was a taste of chemicals or unclean water sources. Regarding bottle quality, several customers said the bottles were damaged in transport and suggested making the bottles more durable. Customers also indicated that the tap on the 20L bottle broke easily, suggesting this function be improved. Upon review of these suggestions, Jibu can better understand its Rwanda customer base and their needs. These steps will likely lead to higher customer satisfaction and the retention of Jibu customers in Rwanda.

Furthermore, Jibu's customer carbon savings indicate the potential for earning a carbon credit certification. We recommend that Jibu continue the carbon credit certification process, which includes collecting preliminary data in other Jibu markets. We encourage Jibu to implement a similar, culturally appropriate survey in different markets and continue to build on partnerships such as the Miller Center for Social Entrepreneurship for further preliminary research opportunities. To meet standards in the certification process, we suggest that Jibu continue to work with skilled translators and researchers to implement the survey in other markets. In Appendix B, we have provided the entire survey implemented in Rwanda.

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Appendix A: Supplemental Data Analysis

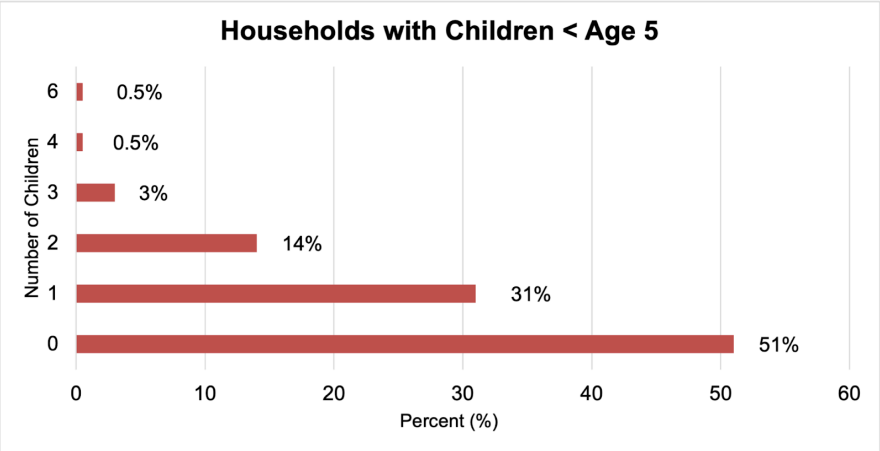

Figure 3.6

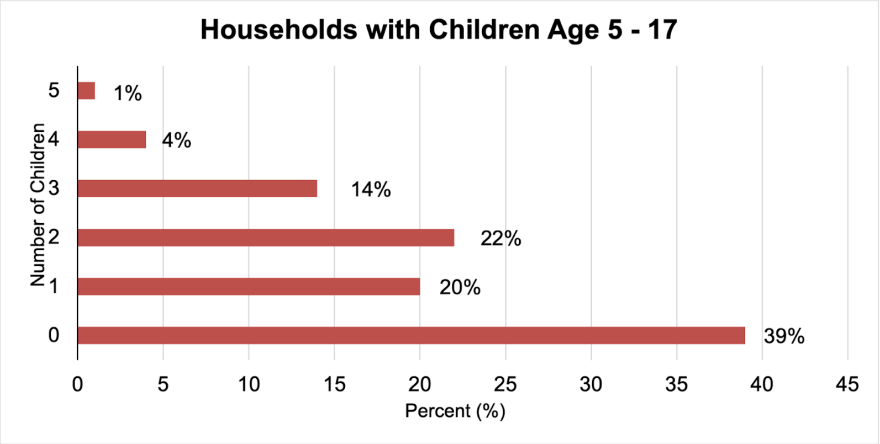

Figure 3.7

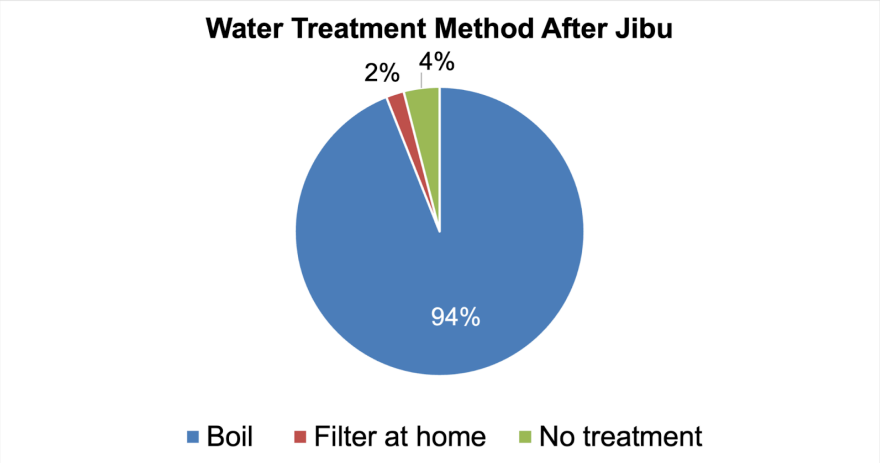

Figure 3.8

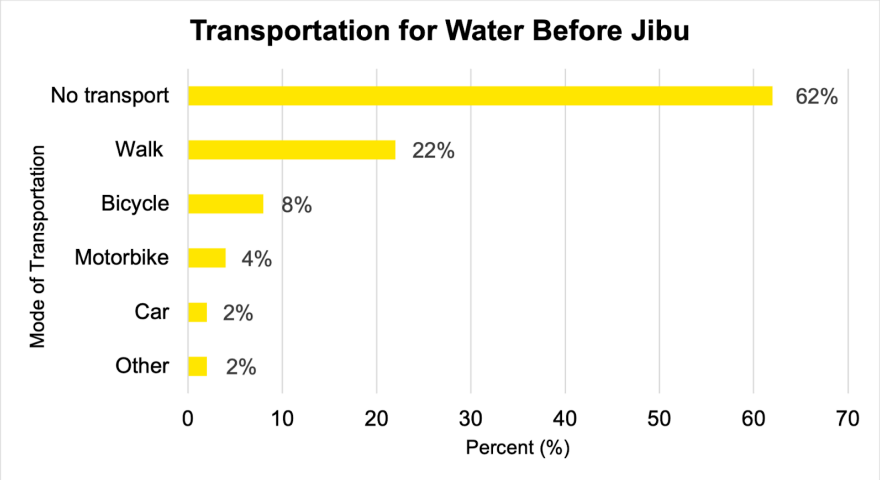

Figure 3.9

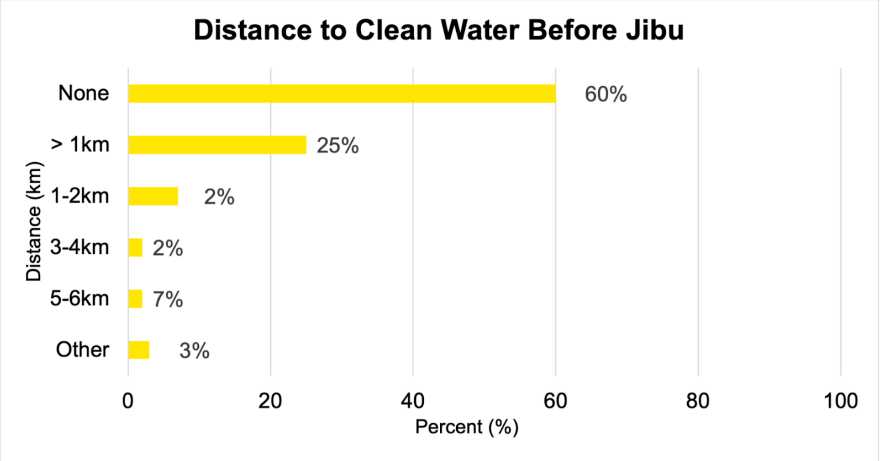

Figure 4.0

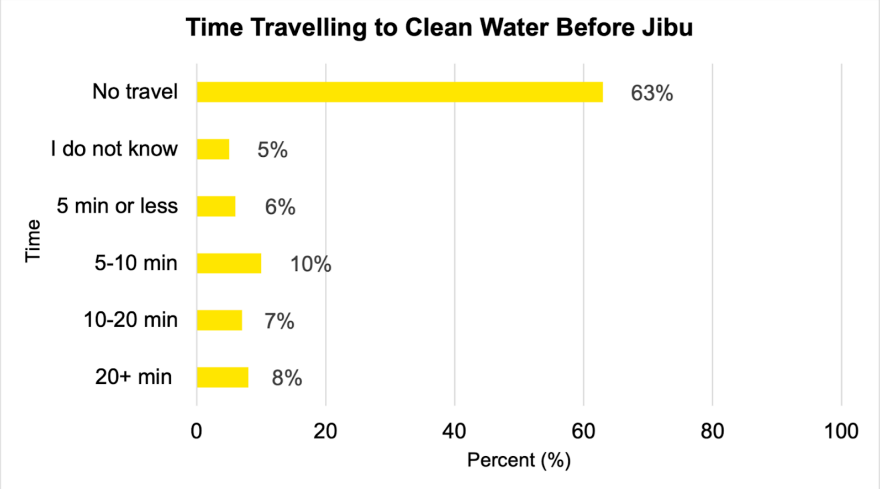

Figure 4.1

Appendix B: Survey

Informed Consent

Hello, we are working with Jibu to find out how well they are serving their customers and the environment. We are independent researchers from Santa Clara University in the USA. We would like to ask you some questions about how you obtain drinking water for your family. It will help Jibu expand their clean water efforts throughout Rwanda and better serve your community. Your participation in this survey is optional. If you take the survey, and you do not wish to answer some or all of the questions, you do not need to answer. All of your answers will remain anonymous, meaning that your name and personal information will not be shared outside of Jibu. This survey will take about 10 minutes to complete.

Are you willing to participate in this survey? We will not be interviewing minors, meaning anyone under the age of 18. If you are under the age of 18, please let us know.

Background Information

1. Does your household purchase Jibu bottled water?
    a. Yes
    b. No
    c. Other (Please specify)
2. What is your gender?
    a. Male
    b. Female
3. How old are you?
    a. 18-29 years
    b. 30-34 years
    c. 35-39 years
    d. 40+ years
4. What province do you live in?
    a. Kigali
    b. Northern
    c. Southern
    d. Western
    e. Eastern
5. What district do you live in?
6. What sector do you live in?
7. Household Members

    a. How many children in your household are under age 5?
    b. How many children in your household are between the ages of 5 and 17?
    c. How many people in your household are age 18 and older? (including yourself)
8. What role do you play in your household? -- (Read choices verbally)
    a. Head of Household
    b. Family member
    c. House help
9. Who makes the decisions in your household to buy Jibu water?
    a. Anyone
    b. Male head of household
    c. Female head of household
    d. Male family member
    e. Female family member
    f. Other (please specify)
10. Who collects your household's Jibu water? Check all that apply.
    a. House help
    b. None - my household gets water delivered
    c. Anyone in the household
    d. Male head of household
    e. Female head of household
    f. Male family member
    g. Female family member
    h. Other (please specify)
11. What is your employment status?
    a. Employed
    b. Self-Employed
    c. Not employed
    d. Student (with income)
    e. Student (no income)
    f. Retired
    g. Other (please specify)
12. What is your job?
13. The next question is about your income. I would like to remind you that all questions in this survey are optional. If you do not feel comfortable with answering this next question, I can skip it. If you are comfortable, can you let us know what range your monthly income falls into?
    a. No income
    b. Less than 100,000 RWF per month

c. Between 100,000 and 200,000 RWF per month
d. More than 200,000 RWF per month
e. I don't know
f. Other (please specify)

Drinking Water

1. How long has your household been a customer of Jibu?
    a. Less than 3 months
    b. 3-6 months
    c. 6 months - 1 year
    d. 1-2 years
    e. More than 2 years
    f. Other (please specify)
2. Where does your household purchase Jibu water? Check all that apply:
    a. Home delivery
    b. Boutique/shop
    c. Supermarket
    d. Jibu franchise
    e. Other (please specify)
3. Does your household drink any water other than Jibu water?
    a. Yes
    b. No
4. Before becoming a Jibu customer, what were your water sources? Check all that apply
    a. Bottled water not from Jibu
    b. Piped water
    c. Public tap
    d. Well
    e. Stream
    f. Other (please specify)
5. Before you started purchasing Jibu water, how did your household treat water for drinking? Let us know if before you used multiple treatment options. Check all that apply:
    a. Boil water
    b. Bleach/chlorine added
    c. Strain through cloth
    d. Filter at home
    e. Solar disinfection

f. Let stand and settle
g. No treatment
h. Purchased bottled water that was not from Jibu
i. Other (please specify)

6. Since becoming a Jibu customer, are you still treating other water for drinking?
    a. Yes
    b. No
    c. Other (please specify)
7. Since becoming a Jibu customer, how does your household treat water for drinking today?
    a. Yes
        i. Boil
        ii. Purchase Jibu water
        iii. Bleach/chlorine added
        iv. Strain through cloth
        v. Ceramic/sand, or other filter
        vi. Solar disinfection
        vii. Let stand and settle
        viii. No treatment
        ix. Other (please specify)
    b. No
    c. Other (please specify)

If the household used to boil water:

1. How did your household power the fire?
    a. Check all that apply:
    b. Charcoal
    c. Firewood
    d. Crop Waste
    e. Animal dung
    f. Gas or biogas
    g. Electricity
    h. Other (please specify)
2. On average, how often did your household boil water?
    a. Every day
    b. 4-6 days per week
    c. 2-3 days per week
    d. 1 day per week
    e. Less than 1 day per week

    f. I don't know
3. On average, how much water did your household boil per session?
    a. 500ml - 1 liter
    b. 2-4 liters
    c. 5-7 liters
    d. 8-10 liters
    e. More than 10 liters
    f. I don't know
4. How long did it take your household to boil the water?
    a. Less than 5 minutes
    b. 5-15 minutes
    c. 16-20 minutes
    d. 21-30 minutes
    e. 31 minutes or longer
    f. I don't know

Jibu

1. How often does your household purchase Jibu water?
    a. Once every 2-3 weeks
    b. 1-2 times per week
    c. 3 or more times per week
    d. Other (please specify)
2. How many liters of Jibu water does your household purchase per session?
    a. Less than 10L
    b. Between 11L-20L
    c. Between 21L-30L
    d. Between 31L-40L
    e. More than 40L
3. Have you ever purchased either liquid petroleum gas (LPG) or porridge from a Jibu franchise? Check all that apply:
    a. Liquid Petroleum Gas (LPG)
    b. Porridge
    c. None

Transportation

1. Before you became a Jibu customer, what methods of transportation did you use to obtain water for drinking? Check all that apply:
    a. No transport
    b. Walk

    c. Bicycle
    d. Motorcycle
    e. Car
    f. Bus
    g. Other (please specify)
2. Before purchasing Jibu water, what distance did you travel to obtain drinking water?
    a. No travel
    b. Less than 1 km
    c. 1-2 km
    d. 3-4 km
    e. 5-6 km
    f. More than 6 km
    g. Other (please specify)
3. Before purchasing Jibu water, how long did you spend traveling to obtain water? (there and back)
    a. No travel
    b. 5 minutes or less
    c. Between 5-10 minutes
    d. Between 10-20 minutes
    e. More than 20 minutes
    f. I don't know

Feedback and Thank You

1. What is your favorite aspect of Jibu?
2. How can Jibu improve?

Thank you for completing this survey.