

IASS STUDY

Institute for Advanced Sustainability Studies (IASS)
Potsdam, October 2022



Baseline Needs Assessment:

Water, sanitation, & hygiene, energy, and
food security evaluation in Bisagara and
Rugurama villages

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1. Acknowledgements

The study was possible within the Impact-Driven and Action-Based Research Project (IMPACT-R) hosted by the Institute for Advanced Sustainability Studies (IASS) in Potsdam. For the implementation of the study, the support of the African Center of Excellence in Energy for Sustainable Development at the University of Rwanda was fundamental. We thank Dr. Alice Ikuzwe, Dr. Charles Kabiri, Dr. Jean de Dieu Hakizimana, and James Ntaganda for their collaboration. Moreover, the authors thank the contribution of Dr. Grace Mbungu, senior fellow and head of the Climate Change Program at the Africa Policy Research Institute and former research associate at IASS, for the revision of the survey tools. The field research was possible with the participation of the independent consultant specialists, Alfons Uellenberg and Celestin Karamira, and the local team of researchers: Noelle Izere Ange, Princesse Uwasse, Octave Gashakambo, Kessy Jabukiro, and Valentine Mukakamana. We are grateful for their work and professionalism in completing the proposed activities.

And most importantly, we thank each of the households and local stakeholders for their participation in this study and interest in contributing to the long-term work of the Sustainable Villages Foundation.

Cover page photograph: TU Berlin/Pacifique Himbaza

Photos page 6: Sustainable Villages Foundation.

2. Executive Summary

In April 2021, under the “IMPACT R” project, IASS Potsdam and HEDERA Sustainable Solutions GmbH in Berlin, together with University of Rwanda and Sustainable Villages Foundation (SVF), conducted a household survey in two villages in Rwanda. SVF has started an integrated village development pilot project in those two villages and wanted to better understand the local populations’ needs and establish a baseline for impact measurement, in order to track the project’s progress over time. In parallel, focus group discussions and key stakeholder interviews were carried out. The main results are as follows:

- Over 80% of households get their main income from agriculture, largely on small plots. Two-thirds of the households have USD 45 or less to spend on a 5-person family, on average.
- There is no public electricity grid. Half of the households have access to very basic electricity through solar systems; the other half has none at all.
- Over 90% of households use wood and open fire pits or handmade clay stoves for cooking, mostly indoors, causing deforestation and health problems because of the smoke.
- There is no public or private drinking water supply. Villagers collect rainwater and/or surface water, which has to be carried over several kilometers by adults and children. The water is dirty and not treated before drinking in one-third of households, which triggers diseases.
- Only 26% of households are classified as food-secure, whereas 15.5% are above the severe food insecurity threshold. A significant percentage of the inhabitants does not eat a balanced diet due to lack of resources.

The local community especially emphasized the need for:

- Priority 1: Safe drinking water
- Priority 2: Electricity
- Priority 3: Clean cooking devices

Another severe challenge is poverty in general. There is a shortage of food in terms of quantity and quality for a significant portion of the population. This is caused by households’ limited financial capacity and insufficient agricultural yield due to the absence of water for irrigation and inefficient agricultural techniques.

Furthermore, teacher qualification in English and information technology (IT) is not satisfactory, and the primary school has no electricity in most of the classrooms and no computers. Professional training options are only offered far away from the villages and are very costly. New business development is hindered by the lack of electricity.

The target communities seek for support to address all the above challenges and are willing to contribute their part.



Sustainable Villages Foundation

Sustainable Villages Foundation is a Germany-based nonprofit organization (incorporated in November 2020) focused on designing and implementing a model to foster sustainable development in remote rural regions suffering from deficient infrastructure. By addressing a wide spectrum of issues, such as the lack of access to basic services (e.g. drinking water, electricity, and clean cooking solutions), limited business development, and poor education and training, SVF aims to create a holistic development model targeting the interplay of solutions for these areas in rural settlements in Sub-Saharan Africa, applying solutions based on science and technology.

Part 1 – Methodology



As part of the **Impact-Driven & Action-Based Research Project** (IMPACT-R), **Sustainable Villages Foundation** (SVF) was provided support to conduct a baseline assessment in a rural village in Rwanda focused on understanding the target population's needs, as the organization is planning to start implementing program activities there to improve the residents' quality of life.

This report presents the results of the needs assessment conducted by SVF in April 2021, in collaboration with the IMPACT-R project hosted at the Institute for Advanced Sustainability Studies (IASS) in Potsdam, the University of Rwanda African Center of Excellence in Energy for Sustainable Development (ACE-ESD), and HEDERA Sustainable Solutions GmbH¹ (HEDERA), which provided digital tools for the basic needs assessment.

For the household survey, a research permit was granted by the Rwandan National Council for Science and Technology.

For the pioneer study, SVF has selected a pilot community, the twin villages of Bisagara and Rugarama (collectively called Bisagara, a village of approximately 600 households with over 2,600 inhabitants), in the Bugesera District, Eastern Province, Rwanda, where a holistic development model proposed by SVF will be tested.

The goal of IMPACT-R, fostering research and action to improve access to energy, water, sanitation, & hygiene (WASH),

and food security, was aligned with the objectives of SVF's proposed study, resulting in a fruitful collaboration. The baseline study consisted of household data collection (245 households) and (7) in-depth focus group discussions (FGDs) with different stakeholder groups, carried out over a span of ten days. In order to identify the community's basic needs, the study entailed a survey on energy needs (electricity supply and access to clean cooking solutions), access to WASH, and food supply.

The survey tool incorporated international standards adopted at the policy level for tracking achievements towards the Sustainable Development Goals (SDGs) 2, 6, and 7. More specifically, the household survey consisted of about 250 questions based on the following assessment frameworks: the Multi-Tier Framework² (MTF) [1] (from the World Bank's Energy Sector Management Assistance Program (ESMAP)) for measuring access to electricity and clean cooking solutions; the service ladder introduced by the United Nations International Children's Emergency Fund (UNICEF) & World Health Organization's (WHO) Joint Monitoring Program (JMP)³ for evaluating WASH access [2]; and the Food and Agriculture Organization of the United Nations's (FAO) Food Insecurity Experience Scale⁴ (FIES), a methodology for measuring the severity of food insecurity [3], and Household Dietary Diversity Score survey⁵. Furthermore, a household roster was included with a detailed set of control variables for future analysis. Surveys were adapted, tested, and adapted again to fit the study's goals and context.

¹ See <https://hedera.online>

² See <https://mtfenergyaccess.esmap.org/>

³ See <https://washdata.org/>

⁴ See <https://www.fao.org/in-action/voices-of-the-hungry/>

⁵ See https://www.fao.org/fileadmin/user_upload/wa_workshop/docs/FAO-guidelines-dietary-diversity2011.pdf

2. Assessment Frameworks

2.1 Energy Access Assessment: The Multi-Tier Framework

To monitor progress towards SDG 7, energy access for all, ESMAP developed the Multi-Tier Framework (MTF) [1], a multidimensional methodology that evaluates access to electricity and modern cooking solutions at the household level. Energy access is measured across a spectrum of levels, from Tier 0 (without access) to Tier 5 (the highest level of access).

2.1.1 Measuring Access to Electricity Supply & Electricity Consumption

Access to household electricity supply is measured based on capacity, availability (duration), reliability, quality, affordability, formality, and health & safety. These attributes are defined as follows:

Capacity: the ability of the system to provide a certain amount of electricity to operate various appliances.

Availability: the amount of time during which electricity is available.

Reliability: the frequency and duration of unexpected power disruptions experienced in the household on a weekly basis.

Quality: the absence of severe voltage fluctuations that can damage household appliances – measured using incidents of appliance damage as a proxy.

Affordability: the proportion of total household expenditure spent on electricity – it should not exceed 5%.

Formality: payment for electricity usage.

Health & Safety: injuries to household members from using grid-based electricity services during the past 12 months.

Household electricity consumption is assessed based on annual and daily consumption levels.

For each attribute, households are placed in a tier depending on the level of service as defined by the attribute's different thresholds. A household's overall tier of access is determined by the lowest tier value the household obtains among the attributes. The different thresholds for each attribute and tier are summarized in Figure 1.

2.1.2 Measuring Access to Modern Cooking Solutions

The MTF assesses access to modern cooking solutions based on the characteristics of both the cooking stoves and fuels used. Access is measured based on cooking exposure, cookstove efficiency, convenience, safety of primary cookstove, affordability, and fuel availability. These attributes are defined as follows:

Cooking Exposure: personal exposure to pollutants from cooking activities, which depends on stove emissions and ventilation (including cooking location and kitchen volume).

Cookstove Efficiency: the amount of fuel required for cooking, which is determined by looking at both the combustion efficiency and heat-transfer efficiency.

Convenience: the amount of time a household spends collecting or purchasing fuel and preparing the fuel and cookstove for cooking.

Affordability: the household's ability to pay for the primary cooking solution (cookstove & fuel), proxied by the expenditure on cooking fuel in this report – it should not exceed 5% of total household expenditure.

Safety of Primary Cookstove: the degree of safety risk based on the type of cookstove and fuel used, measured through reported incidents of past injury and/or fire.

Fuel Availability: the availability of fuel when needed for a household's cooking purposes.

Households are placed in tiers for each attribute and an overall tier according to the same above mentioned process for electricity supply measurement. The different thresholds for each attribute and tier are summarized in Figure 2.

2.2 Water, Sanitation, & Hygiene Assessment (WASH): Joint Monitoring Program

To monitor progress towards SDG 6, availability and sustainable management of water and sanitation for all, UNICEF & WHO developed the JMP, which monitors WASH at the household level, as well as in schools and healthcare facilities.

Multi – Tier Matrix for Measuring Access to Household Electricity Supply

Attributes			Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	
	1. Capacity	Power capacity ratings (W or daily Wh)	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW	
			Less than 12 W	At least 12 W	At least 200 W	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh	
		Services		Lighting of 1,000 lmhr/day	Electrical lighting, air circulation, television and phone charging are possible				
	2. Availability	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours	
		Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours		
	3. Reliability		More than 14 disruptions per week				At most 14 disruptions per week or at most 3 disruptions per week with total duration of more than 2 hours	(> 3 to 14 disruptions/week) or ≤ 3 disruption/week with > 2 hours of outage	At most 3 disruptions per week with total duration of less than 2 hours
	4. Quality		Household experiences voltage problems that damage appliances					Voltage problems do not affect the use of desired appliance	
	5. Availability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income				Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
6. Formality		No bill payments made for the use of electricity					Bill is paid to the utility, prepaid card seller, or authorized representative.		
7. Health & Safety		Serious or fatal accidents due to electricity connection					Absence of past accidents		

Multi – Tier Matrix for Measuring Household Electricity Consumption

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Annual consumption levels, in kWhs		≥ 4.5	≥ 73	≥ 365	≥ 1,250	≥ 3,000
Daily consumption levels, in Whs		≥ 12	≥ 200	≥ 1,000	≥ 3,425	≥ 8,219

Figure 1: Multi-Tier Framework matrix for electricity supply and consumption

Multi – Tier Matrix for Measuring Access to Cooking Solutions

Attributes			Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
	1. Capacity	IO's voluntary performance targets (Default Ventilation) PM _{2.5} (mg/Mjd) CO (g/Mjd) gn	> 1030 > 18.3	≤ 1030 ≤ 18.3	≤ 481 ≥ 11.5	≤ 218 ≤ 7.2	≤ 62 ≤ 4.4	≤ 5 ≤ 3.0
		High Ventilation PM _{2.5} (mg/Mjd) CO (g/Mjd)	> 1489 > 26.9	≤ 1489 ≤ 26.9	≤ 733 ≤ 16.0	≤ 321 ≤ 10.3	≤ 92 ≤ 6.2	≤ 7 ≤ 4.4
		Low Ventilation PM _{2.5} (mg/Mjd) CO (g/Mjd)	> 550 > 9.9	≤ 550 ≤ 9.9	≤ 252 ≤ 5.5	≤ 115 ≤ 3.7	≤ 1030 ≤ 18.3	≤ 2 ≤ 1.4
	Cookstove	IO's voluntary	≤ 10 %	> 10 %	> 20 %	> 30 %	> 40 %	> 50 %
	Convenience	Fuels acquisition and	≥ 7		< 7	< 3	< 1.5	< 0.5
		Stove preparation time	≥ 15		< 15	< 10	< 5	< 2
	Safety		Serious Accidents over the past 12 months				No serious accidents over the past year	
	Affordability		Cost of Fuels ≥ 5 % of household expenditure (income)				Cost of fuels < 5 % of household expenditure (income)	
	Availability of Fuels		Primary fuels available less than 80 % of the year				Available 80 % of the year	Readily available throughout the year

Figure 2: Multi-Tier Framework for measuring access to cooking solutions

2.2.1 Water Service Ladder

The JMP service ladders are used to benchmark and compare service levels across countries [2].

Drinfiing water services refers to the accessibility, availability, and quality of the main water source used by households for drinking, cooking, personal hygiene, & other domestic uses.

Improved drinfiing water sources are those that, by nature of their design and construction, have the potential to deliver safe water. These include piped water, boreholes or tube wells, protected dug wells, protected springs, rainwater, and packaged or delivered water. The criteria for the different rungs of the drinking water service ladder, from surface water (lowest rung) to safely managed (highest rung), are summarized in Table 1.

Table 1: Service ladder for drinking water

Service ladder	Definition
SAFELY MANAGED	Drinking water from an improved water source that is accessible on the household premises, available when needed, and free from fecal and priority chemical contamination
BASIC	Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip journey, including queuing
LIMITED	Drinking water from an improved source for which the collection time exceeds 30 minutes for a roundtrip journey, including queuing
UNIMPROVED	Drinking water from an unprotected dug well or unprotected spring
SURFACE WATER	Drinking water obtained directly from a river, dam, lake, pond, stream, canal, or irrigation canal

2.2.2 Sanitation Service Ladder

Sanitation services refer to the management of excreta from sanitation facilities used by individuals, through the emptying and transport of excreta for treatment and eventual discharge or reuse. Improved sanitation facilities are those designed to hygienically separate excreta from human contact. The criteria for the different rungs of the sanitation service ladder, from open defecation (lowest rung) to safely managed (highest rung), are summarized in Table 2.

2.2.3 Hygiene Facility Service Ladder

Hygiene refers to the conditions and practices that help maintain health and prevent the spread of disease, including handwashing, food hygiene, and menstrual hygiene management.

The presence of a handwashing facility with soap and water on-premises has been identified as the priority indicator for global hygiene monitoring.

Handwashing facilities may be fixed or mobile and include a sink with tap water, buckets with taps, tippy-taps, and jugs or basins designated for handwashing. Soap includes bar soap, liquid soap, powder detergent, and soapy water, but does not include ash, soil, sand, or other handwashing agents. The criteria for the different rungs of the hygiene facility service ladder, from no handwashing (lowest rung) to basic (highest rung), are summarized in Table 3.

Table 2: Service ladder for sanitation services

Service ladder	Definition
SAFELY MANAGED	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated offsite
BASIC	Use of improved facilities that are not shared with other households
LIMITED	Use of improved facilities shared between two or more households
UNIMPROVED	Use of pit latrines without a slab or platform, hanging latrines, or bucket latrines
OPEN DEFECACTION	Disposal of human feces in fields, forests, bushes, open bodies of water, beaches, and other open spaces or with solid waste

Table 3: Service ladder for hygiene facilities

Service ladder	Definition
BASIC	Availability of a handwashing facility with soap and water at home
LIMITED	Availability of a handwashing facility lacking soap and/or water at home
NO HANDWASHING	No handwashing facility on premises

2.3 Food Insecurity Assessment

FAO's Food Insecurity Experience Scale (FIES) (see, e.g., [3]) is an experience-based measure of household or individual food security based on a short survey. The survey consists of eight questions regarding people's access to adequate food. The questions investigate the level of worry regarding food access, inability to eat healthy and nutritious food, access to only a few kinds of food, necessity to skip meals or eat less than needed, lack of food available at home, unsatisfied hunger, and not eating for an entire day over the last 12 months. The methodology assigns to each respondent and question the probability of being above a certain food insecurity threshold, e.g. the threshold of being moderately food inse-

cure versus severely food insecure. For example, most of the time, someone who is worried about not having enough food to eat will be less severely food insecure than someone who goes without eating for a whole day.

The Household Dietary Diversity Score (HDDS) survey aims to assess households' economic access to food by asking about the types of foods and beverages that have been recently consumed. Individual (household) scores, calculated as the number of food groups eaten, reflect the nutritional quality of the diet. The original HDDS survey contains 12 food groups. For the baseline assessment, some of the questions (e.g. concerning vegetable and fruits) were adapted to the local context.

3. Digital Tools for Household Data Collection

The digital version of the household questionnaire was prepared by HEDERA under the framework of the IMPACT-R project and made available to all participating organizations via the ODK Collect mobile app (Android). The official lighter versions of the MTF, JMP, and FIES surveys were integrated into the app and further optimized, taking into account the local context (lack of grid connection, additional techniques for water collection and storage, available appliances, etc.). Besides standard question types, the survey also included the collection of Global Positioning System (GPS) coordinates, as well as the possibility of taking photos.

In the preparatory stage of the pilot study, HEDERA provided the necessary technical support for the setup of the data server. Furthermore, a web interface to visualize and download the collected data was created for the SVF team.

The questions were displayed in English in ODK Collect. They were translated into the local language (Kinyarwanda) by enumerators on the spot during the interviews. Before the start of the survey, all questions were discussed with the local team; all enumerators had at least two household test interviews with “real villagers”.

Based on the finalized version of the questionnaire, HEDERA prepared a format for an automated digital report, to be generated upon finalization of the analysis. The digital report includes preconfigured graphs for the results evaluation based on the considered standard frameworks. It will be further customized according to SVF’s needs and findings. It also includes web-based interactive tools for exploring the relation between the variables included in the full dataset. The digital report and data analysis tools developed for this pilot study will be constantly improved in the context of follow-up assessments conducted by SVF.

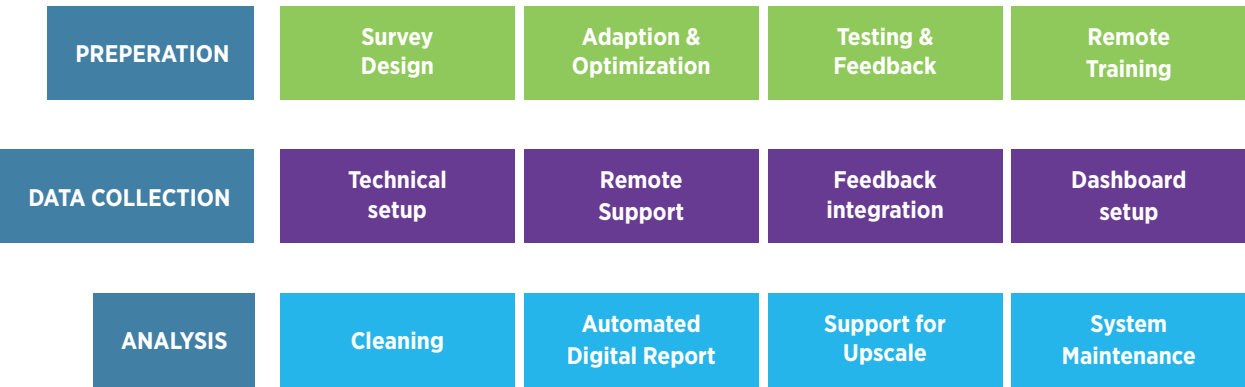


Figure 3: HEDERA’s technical support

The mobile surveys have been optimized in order to facilitate their implementation, avoiding skipping patterns and including in-app response validation. Prior to the data collection campaign, a train-the-trainers approach was applied to ensure know-how transfer and local ownership of the research methods. HEDERA provided multimedia training material and remotely trained SVF management and principal researchers, who, in turn, trained a team of local enumerators on site. The training entailed presentation of the tools, extensive testing, and feedback. The training material provided by HEDERA included a document with frequently asked questions and reported issues (e.g. detailed instructions on how to reset the application and enable/disable particular features). Once all tools were set up and the surveys were finalized, SVF conducted the training in Kigali with the team, with remote support provided by the HEDERA team from Berlin.

For remote support during the data collection campaign, the SVF and HEDERA teams established a joint Telegram chat where the field team could raise issues. Feedback on the survey questions and required modifications was integrated into the digital questionnaire by the HEDERA team on a daily basis, which was automatically updated in the mobile app.

From the planning to the execution, the entire installation, questionnaire review and adaptation, testing, and modification was done by HEDERA remotely in close coordination with SVF, IASS, and the local experts. The onsite enumerator training was complemented with access to the digital HEDERA Training platform. Furthermore, power banks were provided to the enumerators by SVF, so the smartphones were always at optimal functioning.

Part 2 – Results

4. Sample Description

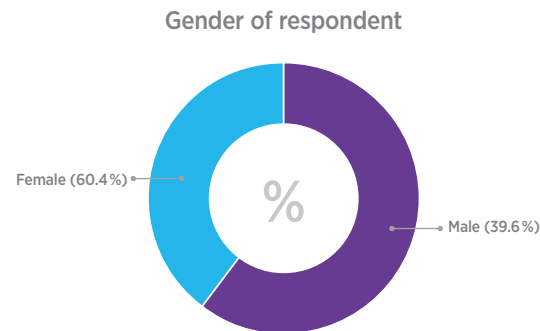
4.1 Demographic

Between April 20 and 28, 2021, 245 randomly selected households in the Rwandan villages of Bisagara and Rugarama (out of the total of 600 households) were interviewed by five enumerators, and seven focus groups discussions took place. The groups consisted of three farmer groups, savings and credit cooperative organization (SACCO) members, shopkeepers, primary school teachers, and secondary school students in their final year.

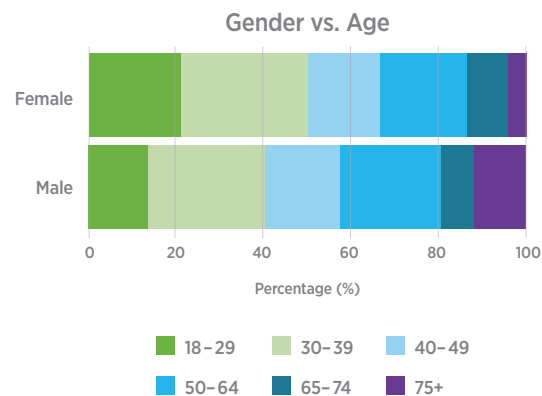
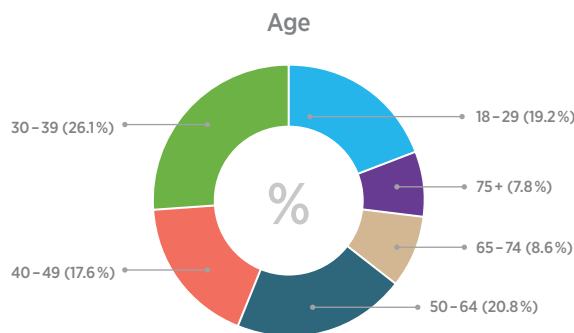
Several important village members or individuals having an impact on the village, such as the local nurse, the Catholic Church representative, the SACCO manager, and the headmaster of the primary school, were interviewed. Researchers got quite positive feedback from the community, who welcomed the study.



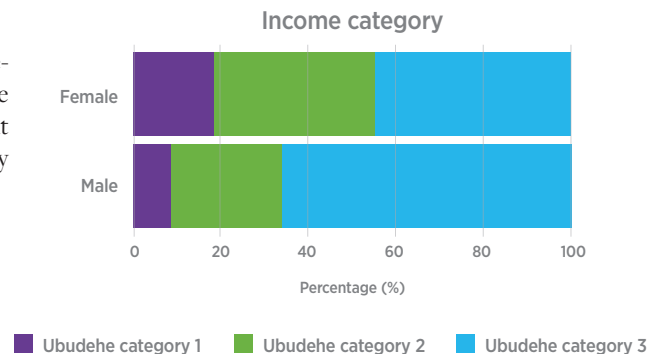
Participants in the different focus groups, as well as households and interviewees, were eager to share their views, comments, and visions. Based on the FGDs and in-depth conversations with the community, access to clean and safe drinking water were ranked as the main priority. About 60% (148) of the respondents were women, with similar gender distribution in both villages.



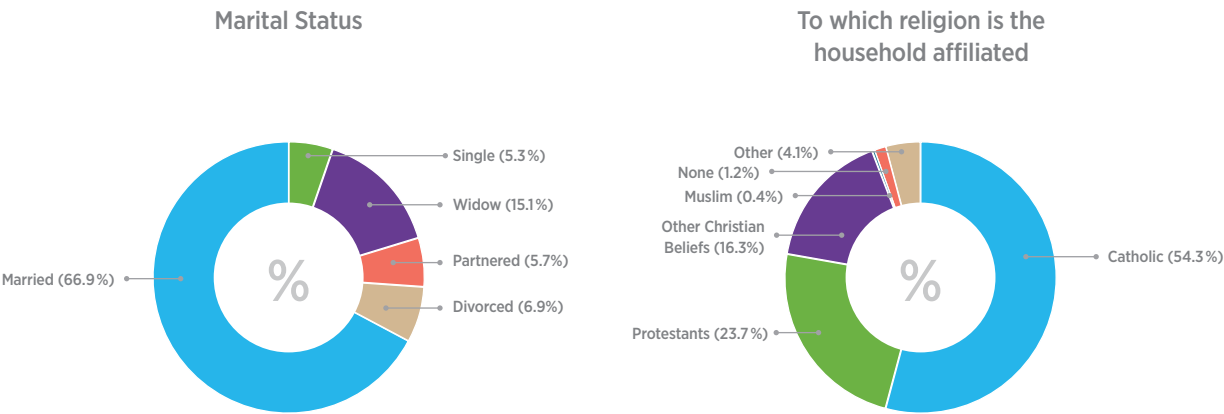
The sample's age is evenly distributed across the different age groups, with the exception of the oldest groups: 20% of the respondents were 18–29 years old, 24% were 30–39, 18% were 40–49, 20% were 50–64, and 16% were 65 or older.



Most of the households were classified in Ubudehe category (income category) 3 (51% of the total, 40% of female respondents, 65% of male respondents), while about 31% were in category 2, and 14% were in the lowest category (category 1) (19% of women, 8% of men).

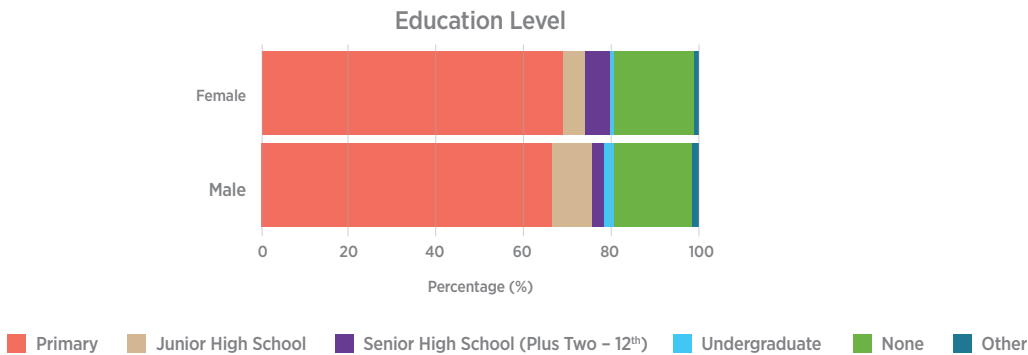


Two thirds (66.9%) of the respondents were married, 15% were widowed, and 5.7% were in partnerships. Only 6.9% were divorced and 5.7%, single. Over half (54.3%) of the population is Catholic, 23.7% are Protestant, and about 16% have other Christian beliefs.



Education

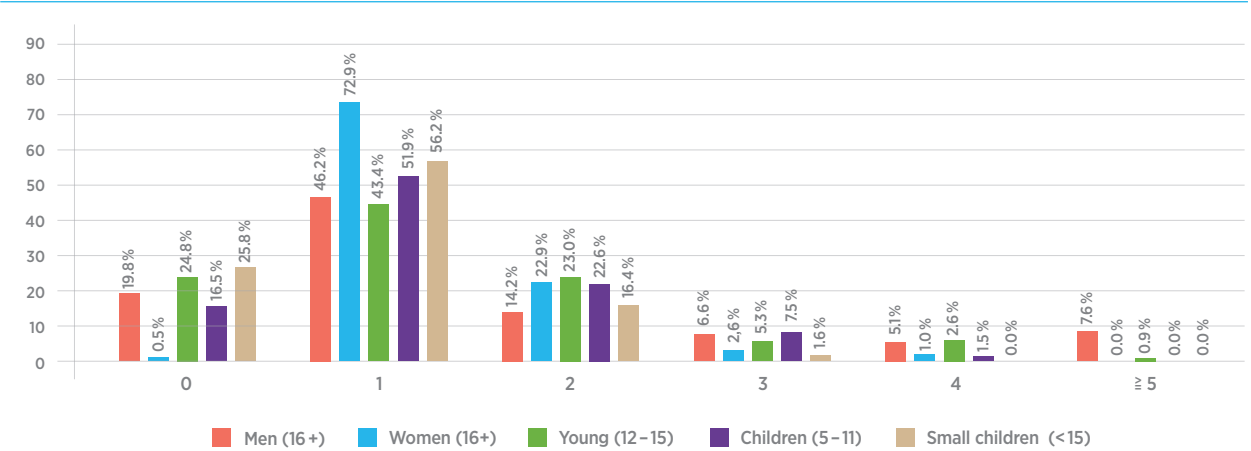
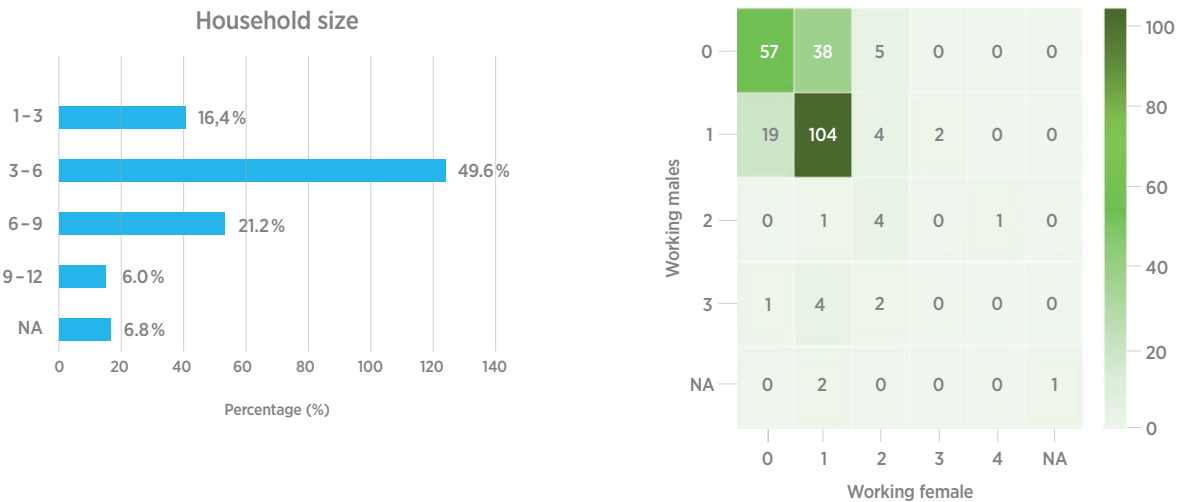
The level of education is very low in the studied area – 63.2% of the respondents said that they can read and write (with a similar distribution among women and men). Almost 20% of respondents did not complete any degree, and 68.6% had only completed primary school. Less than 5% of the interviewees had completed senior high school, and 1.2% had attended a university (for undergraduate studies).



When looking at education level by gender, the rate of respondents without any degree is slightly higher among men than among women. Women have a higher rate of primary school and senior high school degrees, whereas men have a higher rate of junior high school and undergraduate degrees. Among the respondents with primary or no education, 31.7% said that cannot read and write.

Household Members

Half of interviewed households (124) have 3–6 members, about 28% of the interviewed reported a household size of 7 or more, and only 16% had fewer than 3 members. About 42% of the households (104) had one woman and one man working. In 38 cases (15.5%), the household had only a working woman, and in 19 cases (7.8%), only a working man. Fifteen households (6%) had 2 working women. In 23.6% of cases (57 households), there was neither a working man nor a working woman.



The above graph shows the distribution of household member types for each class (adult men, adult women, youth, and children).

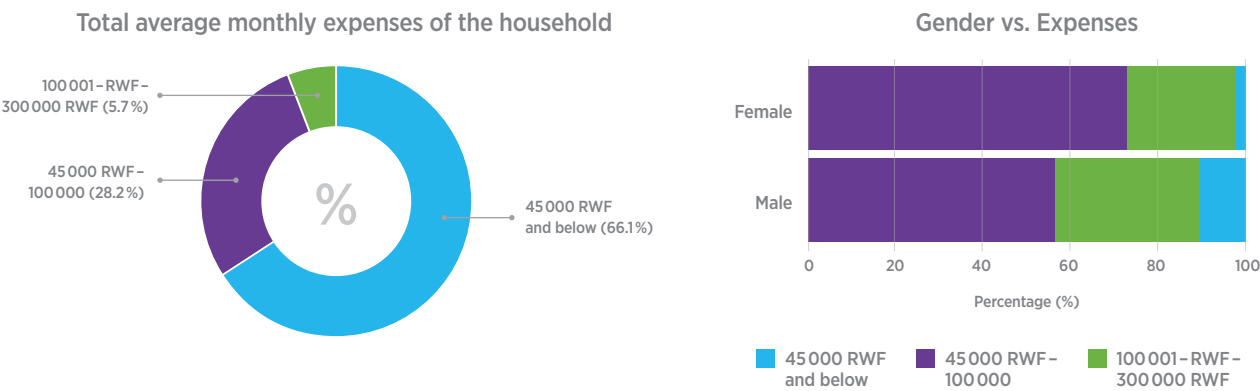
The first group of bars indicates that 19.8% of the households do not have adult men, whilst only 0.5% (2 respondents) have no adult women. The next group of bars shows that 46.2% of the households have only one adult man, and 72.9% of households have only one adult woman. Eighteen percent of households have three or more men, and 22.9% have two women.

Two-thirds of households have 1–2 youth (12–15 years), and two-thirds have 1–2 children between 5 and 11 years old. Over half of all households (56.2%) have a young child below 5, and 16.4% have two young children.

4.2 Economic Situation

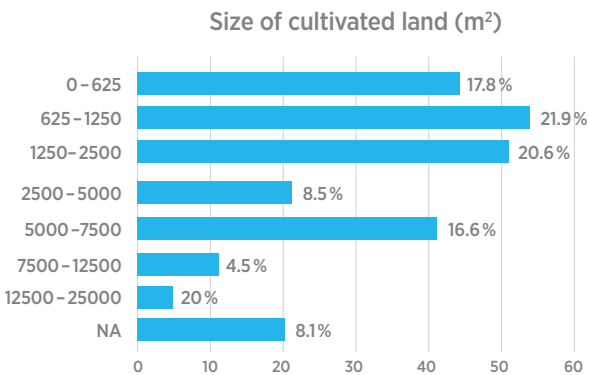
The main source of income is agriculture (over 80% of the sample and almost 80% of the interviewed men). Additional occupations such as trading businesses, services, or education have been reported among the younger (18–29) respondents (less than 5%).

Average monthly household expenditure is very low. Less than 6% only spent more than RWF 100,000 (USD 100) per month, while two-thirds had relatively low expenditures below RWF 45,000 (USD 45). Many female respondents reported much lower household spending than their male counterparts.



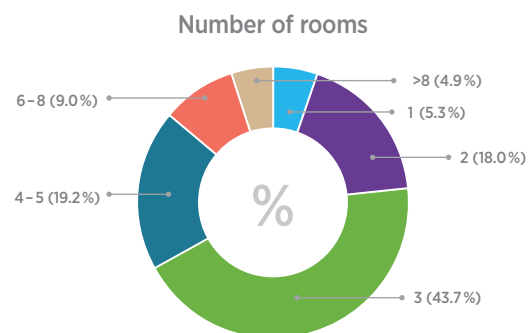
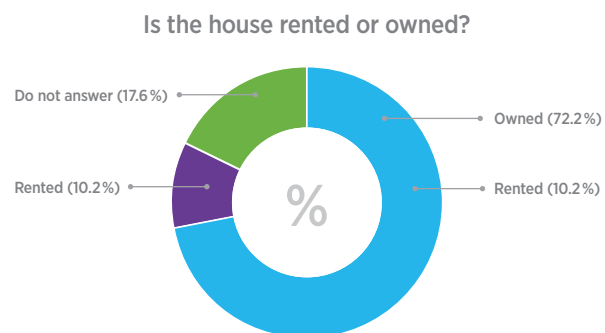
17.8% of the households cultivate very small plots of up to 625 square meters, whereas 21.9% cultivate 625–1,250 square meter plots. On the upper end, only 6.5% cultivate plots of more than 7,500 square meters. The largest plots encountered in the study were 25,000 square meters.

Almost 80% of respondents (193) own land, and, among these, 66% (129, 52% of the total) also own livestock. Slightly less than 10% only own livestock, whilst 14% do not own either land or livestock. Among the respondents owning livestock, 54% own sheep or goats, 31% own poultry, 31% own cows, and 18% own pigs.



72.2% of respondents said that the house they live in is owned by them, 10.2% said they rented the house, and 17.6% did not answer the question.

5.3% of houses have only one room, whereas 18% have two rooms, and 43.7% have three. 19.2% of houses have 4–5 rooms, and the remainder have 6 or more rooms. Data on the total area of the house in square meters was not collected, but as a general observation, most houses are extremely small, e.g. 30 square meters in total surface area.

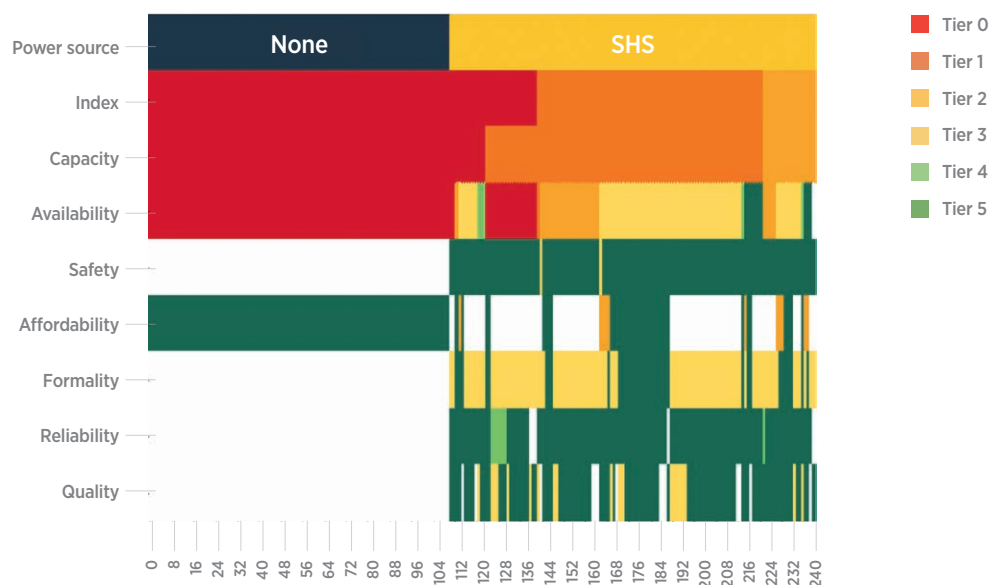


5. Access to Electricity

5.1 Multi-Tier Framework

The following figures show the ranking based on the ESMAP Multi-Tier Framework. It should be noted that, depending on the household conditions, some of the attributes are not relevant (e.g. electricity supply reliability or quality for house-

holds without a power source). In such cases, these attributes were excluded, and the graphs thus show a total number of responses below the sample size. The MTF Access Index (“Index” in the figure) is defined for each household as the minimum tier value achieved of all valid measured attributes.



The above graph shows, household by household, the values for the different tiers. For clarity, the sample is divided into two main categories, depending on the power source (none and solar home system (SHS), in the first row). The majority of the households has an Index 0, which is mainly due to the lack of power sources, and, for those owning a SHS, due to the lack of capacity and availability.

Affordability 60.4% of households spend less than 5% of their income on their power source, while 4.4% of households have electricity expenses that exceed 5% of their total household expenditure.

Availability Over half (53.4%) of the population gets less than four hours of electricity per day and less than one hour per night. 11.4% get at least 4 hours of electricity per day and at least 2 hours per night.

Capacity 50.6% of households have the lowest level of electricity supply, i.e. no power at all.

Formality 96 out of the 134 respondents using an SHS (71.6%) did not answer the question, whether they pay formally or informally for their electricity. 38 households pay to the company or manufacturer.

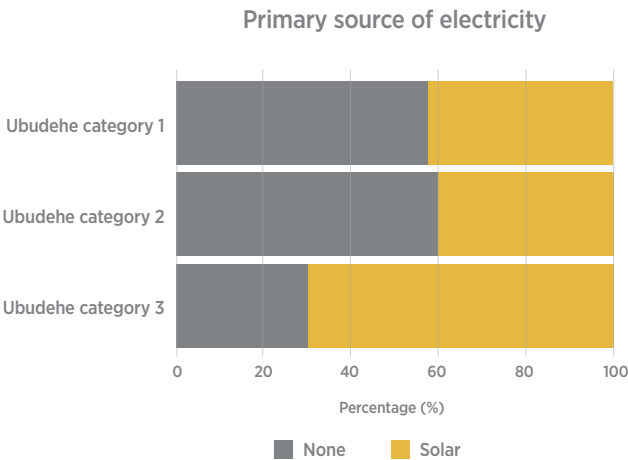
Quality Only a few households – 16% of those using SHS – indicated the presence of appliance damage due to voltage fluctuations.

Reliability The households do not have any issues with system outages.

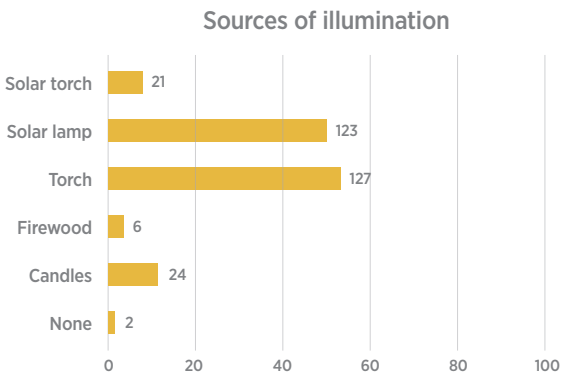
Safety In very few cases, households experienced safety issues with their power source (4.4%).

5.2 Power Sources

No households in the villages are connected to the electricity grid. Almost 54.7% of the households have electricity through an SHS, and 45.3% have no electricity at all. Looking at the Ubudehe category, 70% of those in category 3 have a solar system, whereas only roughly 40% in categories 1 and 2 have such a system.



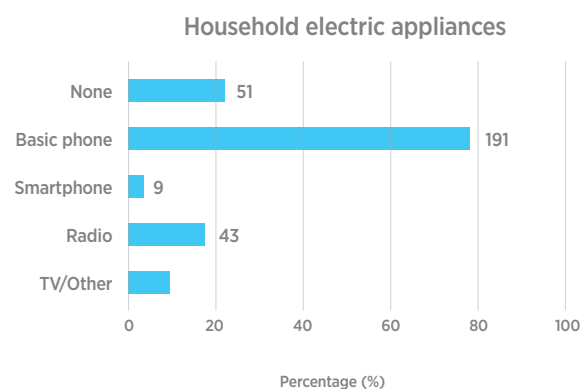
51.8% of respondents said they use a torch with a battery, which is a surprise, because solar lamps are readily available in Rwanda. 50.2% use a solar lamp, and approximately 8.6% use a solar torch. Around 10% use candles, and 2.4% use firewood. Interestingly, nobody uses a kerosene lamp. As multiple answers were allowed, and the total is far over 100%, households may use several lighting solutions in parallel. Only 0.8% have no lighting solutions at all.



Even though 45.3% of the respondents said they have no electricity at home, only 20.8% say they have no electrical appliances at home. That is because 78% of households have a basic mobile phone. It seems that a third of those with a basic mobile phone have no option to charge the phone at home because of lack of electricity.

About 15% of SHS owners said they cannot charge their mobile phone with their system. As the electricity consumption of mobile phones is very low, one can infer that many solar systems have serious technical problems – see the chapter on technical issues for more details.

2.4% of households have smartphones with internet access, and another 1.2% have smartphones without internet. Beyond phones, radios (17.6%) and TVs (7.3%) are the most used appliances. One household has a sound system, and one household has a DVD player. Nobody has a satellite dish or fan.



44.1% of SHS owners say they have no technical issues with the system. 36.8% report battery problems, and 11% say they have maintenance/service problems. 2.9% of the systems do not work anymore. Looking at the system age, 16.1% were installed before 2017, 24.2% in 2017/2018, and 32.3% in 2019. Over a quarter of the systems were put into operation in 2020/2021. 17.6% of SHS owners complained that the systems were unable to power large appliances. Looking at the brands and system sizes, only 10.5% are (bigger) Mobisol systems, and 38.8% are (medium-sized) BBOX systems. About 50% seem to be small systems from Sunking (17.2%) or other brands that cannot power TVs. Therefore, the perception of what systems can power might be in some cases overly optimistic compared to what people have bought.

Unsurprisingly, the systems installed in 2020 and 2021 have significantly fewer battery problems than those installed before those years.

5.3 Electricity Reliability & Safety

55.6% of households with electricity said they get 10–24 hours of electricity per day. 18.8% get 5–9 hours, and another 18.8% get 2–4 hours. 6.8% said they do not get any electricity, indicating that their systems are broken.

Looking at the critical nighttime hours between 6 pm and 10 pm, when it is dark outside and electricity is needed, the results are as follows: 66.9% have electricity during the entire 4 hours or even more, 26.6% have 3 hours of electricity, and only 6.5% have less than 3 hours.

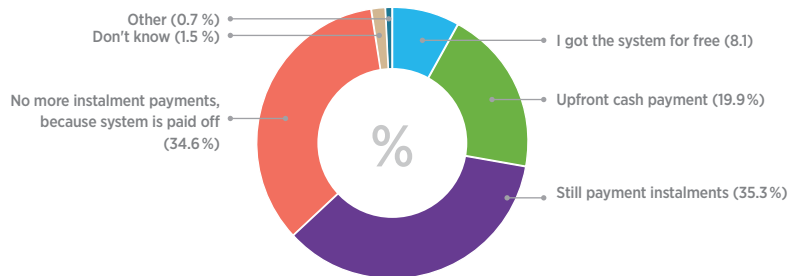
55.8% did not experience any blackouts in the past 30 days, whereas almost a quarter had 1–3 outages. 10% reported 4–6 outages, and 9.3%, more than 10 outages. 11.3% of the outages last less than an hour, whereas 58.1% are between 1 hour and 1 day. Another 11.3% of the outages last 1–3 days, whereas 19.4% extend beyond 3 days.

In terms of safety, 2 respondents (1.5%) reported burns or electrocution in the past 12 months, and 1 person, another minor injury. It should be noted that supposedly all solar systems in the village are low-voltage systems and are therefore unable to kill a person when they touch a naked wire or any part with an electric current.

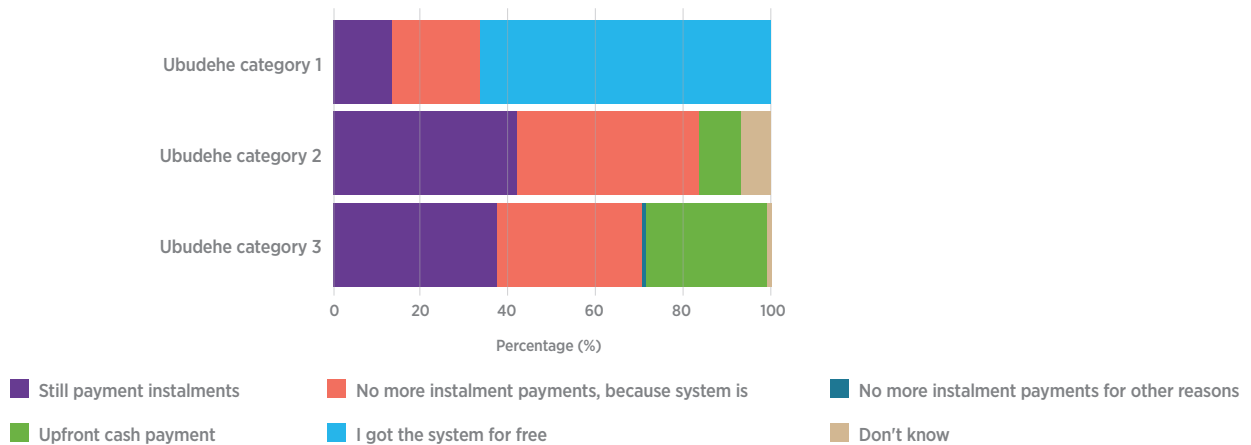
5.4 Payment for Electricity

34.6% of SHS owners have already paid all their installments, whereas 35.3% are still paying off the loan. In most cases, they are paying the company that sold them the system. Nobody pays a SACCO or bank. 19.9% paid for the system upfront, and 8.1% got the system for free.

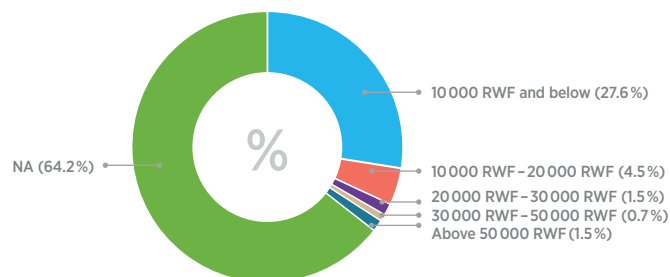
How did you/do you pay for the system



Primary source of electricity



Estimated monthly instalments for electricity supply and lighting devices

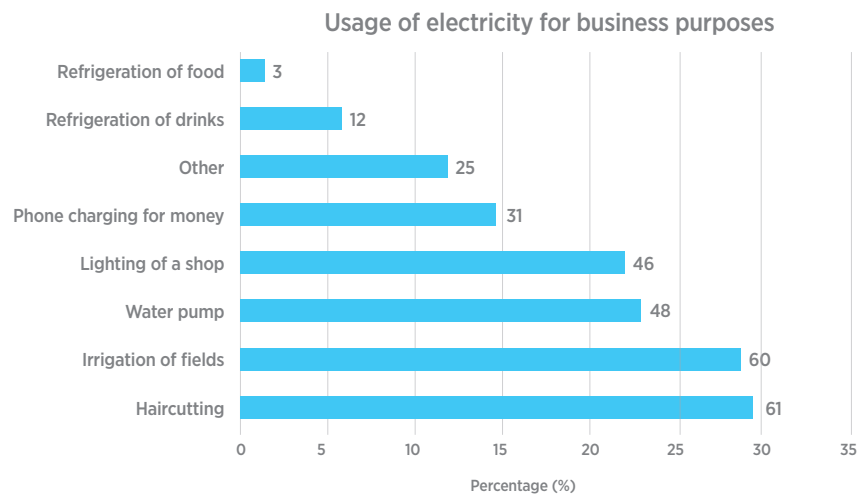


Among those who have a solar system, 27.6% pay RWF 10,000 or less per month, 3.7% pay more than RWF 10,000, and the rest are not paying anything, for the abovementioned reasons.

5.5 Productive Uses of Electricity

Only 6 households (2.4%) use electricity for their businesses. Four households use it to light up a shop, two to power hair

cutters, one to charge phones for a fee, one to run a water pump, and one for irrigation (multiple choices were possible).

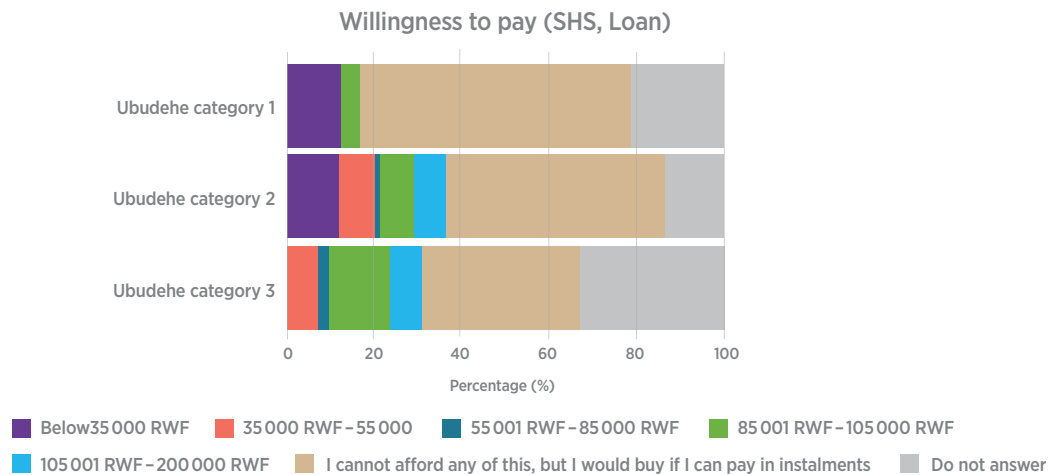


When respondents were asked whether they would use electricity for their business if they had enough of it, 53.9% said they would. Roughly a quarter of respondents would use electricity for haircutting. Another quarter (multiple answers were possible) would use it for crop irrigation. For other desired uses, see the graph above. 18.9% answered “other”. Commonly cited potential productive uses of electricity include welding, milling, and tailoring. Fishing, a cinema, and a cyber café were also mentioned.

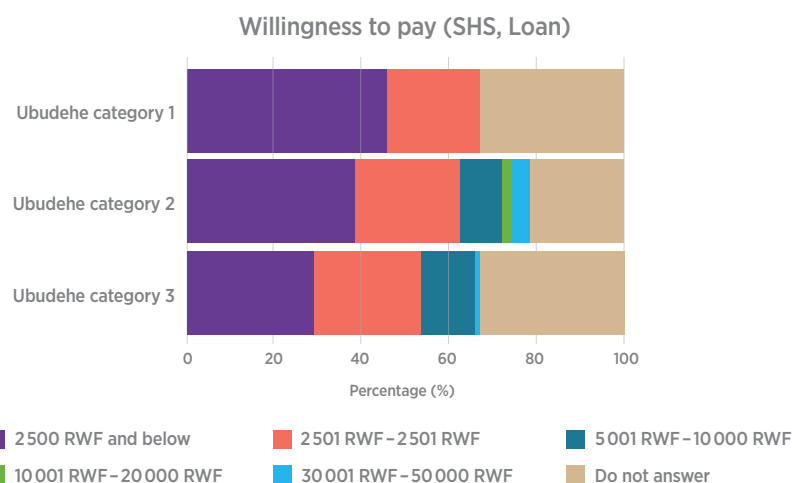
5.6 Willingness and Ability to Pay for Electricity

When asked how much they would be willing to pay for an SHS if they had to pay the entire amount upfront, 48.1% of

households said they could not afford to pay for the system upfront, but they would buy a system if they could pay in installments. The number of households who cannot afford to pay upfront is especially high in Ubudehe category 1 (about 60%).



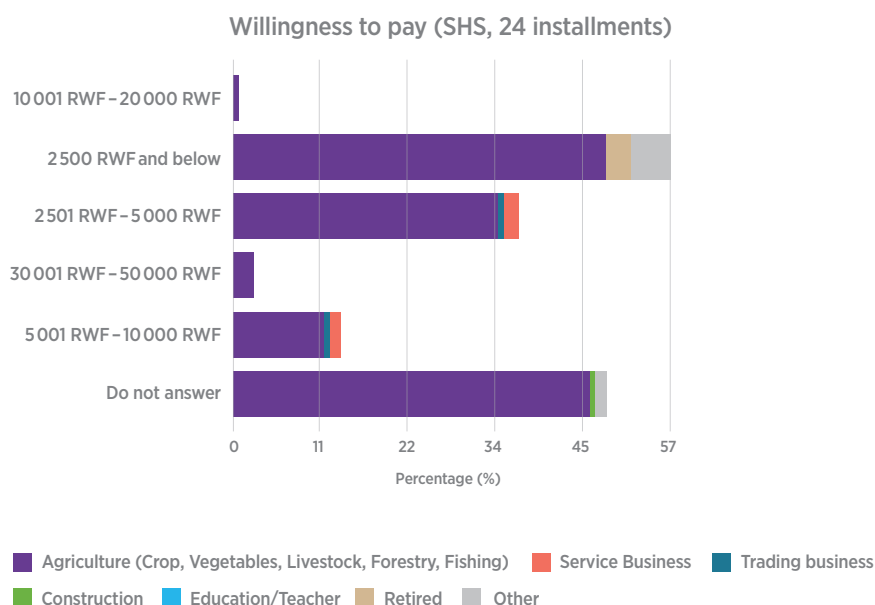
22.2% did not answer the question at all. 5.6% said they could pay upfront for a system below RWF 35,000, whereas almost a quarter could and would pay RWF 35,001–200,000.



When asked how much they would be willing to pay per month in a 24-month installment scheme, 35.2% of households said could pay RWF 2,500 RWF or less, whereas 23,5% said they could pay RWF 2,501 – 5,000. Only 11.1% are willing to pay over RWF 5,000 per month. 30.2% did not answer the question.

It should be noted that, overall, answers only slightly differ based on the gender of the respondent. However, on average, male respondents are willing to pay higher amounts than women, 40% of whom prefer to commit to the lowest monthly payment of RWF 2,500 or less for a loan.

Teachers and households in trading businesses have higher willingness to pay (all answers were between RWF 2,500 and 10,000) than households engaged in agriculture, the majority of which is willing to pay less than RWF 2,500 per installment.

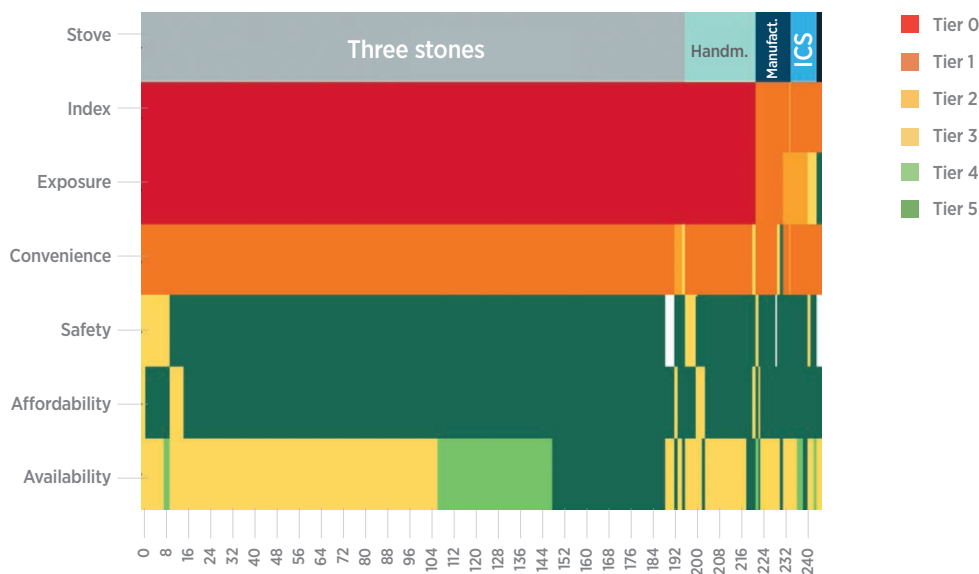


6. Access to Cooking Solutions

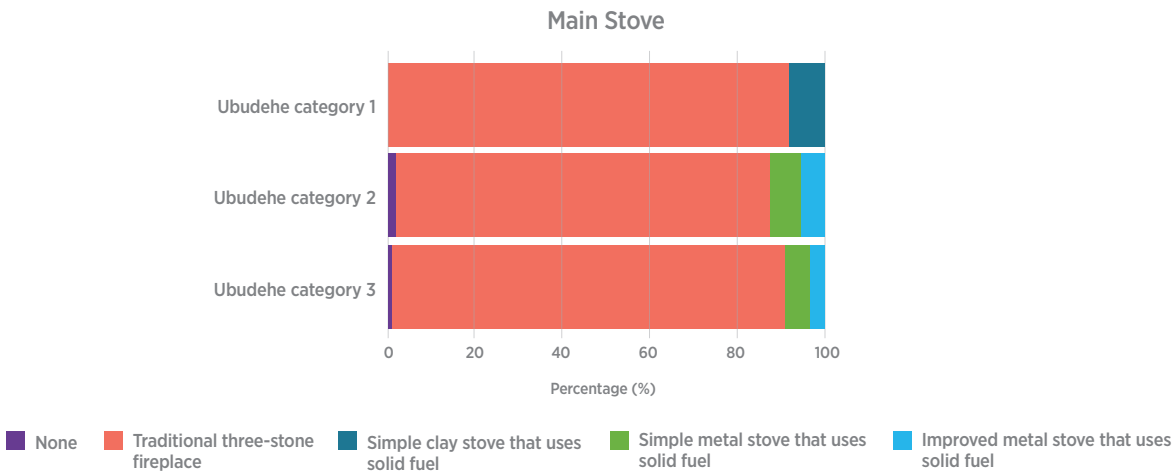
6.1 Multi-Tier Framework

80% of households (196) reported using traditional three-stone fires for cooking, 25 households have simple clay stoves, 13 have simple metal stoves, and 9 have improved metal stoves. Looking at the distribution between female and male respondents who own cookstoves, men have fewer simple clay stoves or simple metal stoves. For improved cook stoves (ICS) and three-stone fires, the distribution of women and men respondents is similar. Only 18% use a second stove.

The graphic below shows the tier ranking of the entire sample. The respondents are grouped by their primary stove. All households using three-stone fires or handmade stoves have an MTF Access Index of 0, due to exposure to smoke. The other households are mainly ranked in Tier 1, due to issues with the exposure and convenience of the cooking solution (time required to prepare the stove and collect fuel).



Only a few households reported safety issues or limited cooking solution affordability. On the other hand, fuel availability is an issue for 60% of households (fuel is only available a few months per year).

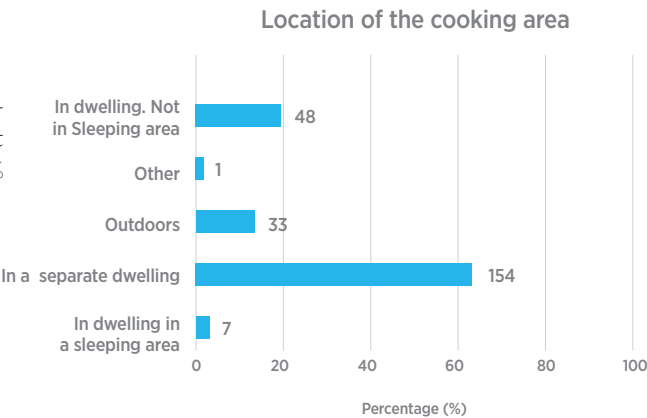


When looking at the Ubudehe categories, over 90% of households in category 1 (the poorest) use the traditional three-stone fire, whereas in categories 2 and 3, over 20% of households use more advanced stoves.

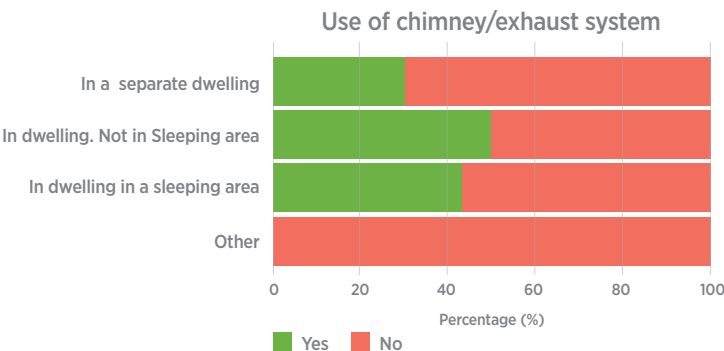
All households that use a three-stone fire or simple clay stove as their primary cooking solution use firewood as solid fuel. 0.9% say they also use garbage/plastic, and 1.4%, charcoal.

6.2 Exposure to Smoke

63.4% of respondents said that they cook in a separate building, 19.8% cook in the same building where they sleep, but not in the sleeping area, and 2.9% cook in the sleeping area. 13.6% cook outdoors.

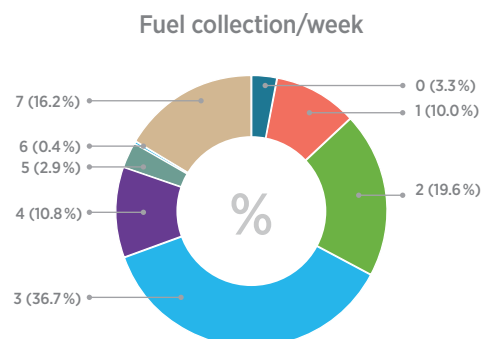


Among the 210 respondents that cook in- side, only 34.8% (73) have a chimney or exhaust system.



6.3 Fuel Availability and Collection

Only 3.3% of respondents do not collect firewood, whereas 10% collect firewood once per week. Over half of the respondents collect firewood 2–3 times per week. 16.2% of the interviewed households collect firewood every day.

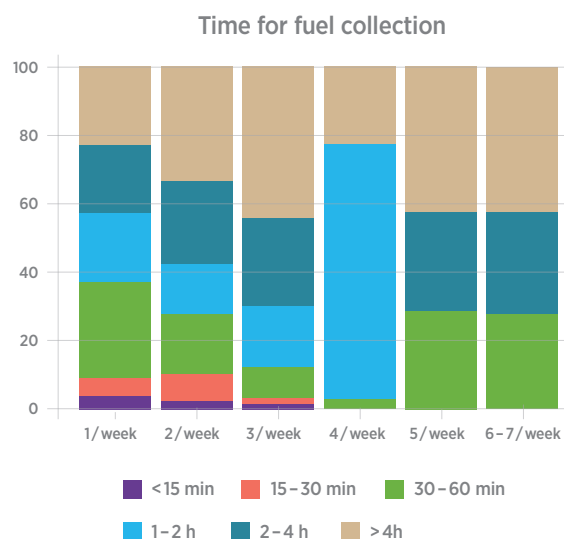


82% of respondents collect firewood outside the family farm/property, 10% collect it from their land, and 23.4% buy it from vendors (multiple answers were possible).

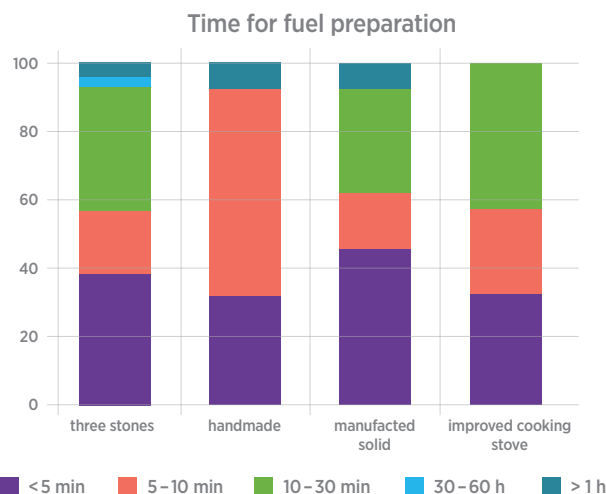
The best months to collect firewood are June through October, which corresponds to the dry season. The rest of the year, it is rather difficult to find firewood, with March, April, and May being the worst months.

The time required for fuel collection is substantial. Even of those who said they collect firewood 6–7 times per week, over 40% said that they spend more than 4 hours per collection, and nobody said they spend less than 30 minutes.

The time required for fuel collection does not depend on the type of stove, as most of the households cook with firewood.

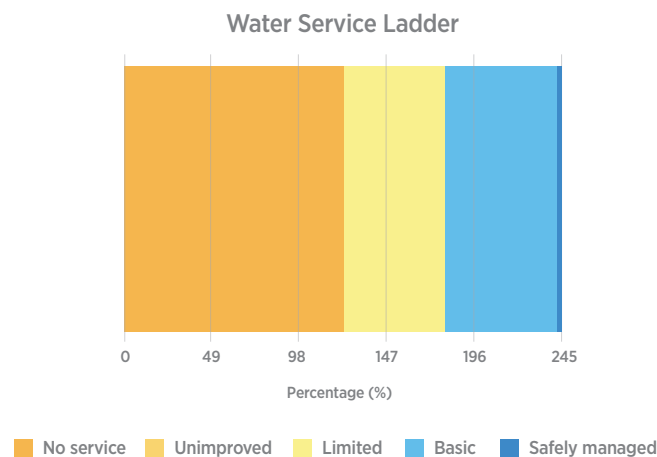


The time required for fuel preparation, which in the normal cases entails preparing the firewood, is much lower than that for firewood collection. Only a small fraction of households need more than 30 minutes for it; the majority needs 10 minutes or less. The cookstove-related differences do not seem significant, although households using ICS cited slightly shorter collection and preparation times (always less than 30 minutes).



7. Wash

7.1 Drinking water

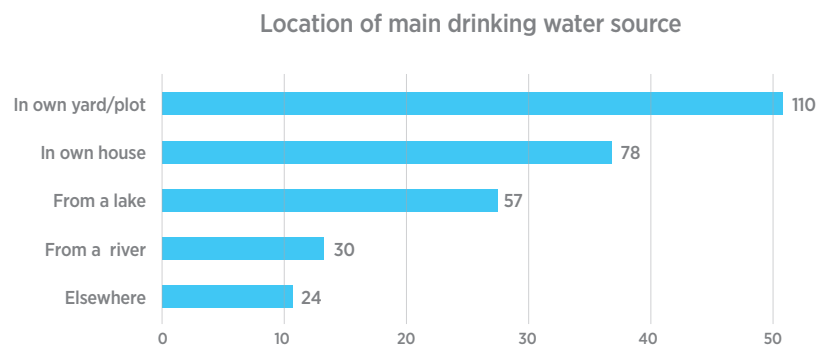


The water service ladder indicated that access to drinking water is one of the most pressing issues in the community. Only about 20% of households have access to basic services, and almost 50% have no service at all. As a reference, access to safely managed services at the country level was about 12% in Rwanda in 2020, and access to at least basic services is about 65% in Sub-Saharan Africa.

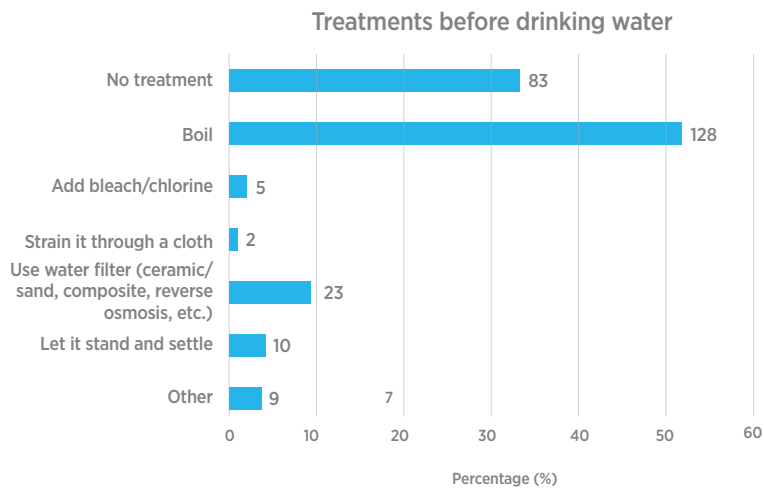
There is no public water supply in the two villages. 45.7% of households use surface water as their main drinking water source, whereas 46.7% use rainwater.

It seems that in the dry season, most of the households that usually collect rainwater have to switch to surface water from Lake Gashanga or Akagera River, both roughly 6 kilometers (km) away, depending on the exact location of the household. Less than five households said they use a public tap or receive the water from a tank truck.

The questionnaire did not take into account the seasonality of water sources. In the next survey, the questionnaire should be reviewed to better capture the ground reality.



When we asked more specifically about where households get water from, 35.9% said from their own house, and 50.7% said from their own yard/plot. 26.3% said from a lake, and 13.8% said from a river. 11.1% said that they get the water from elsewhere.

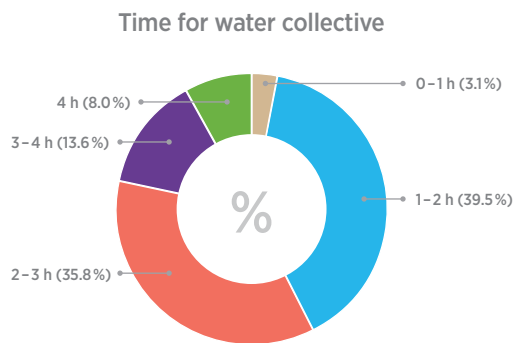


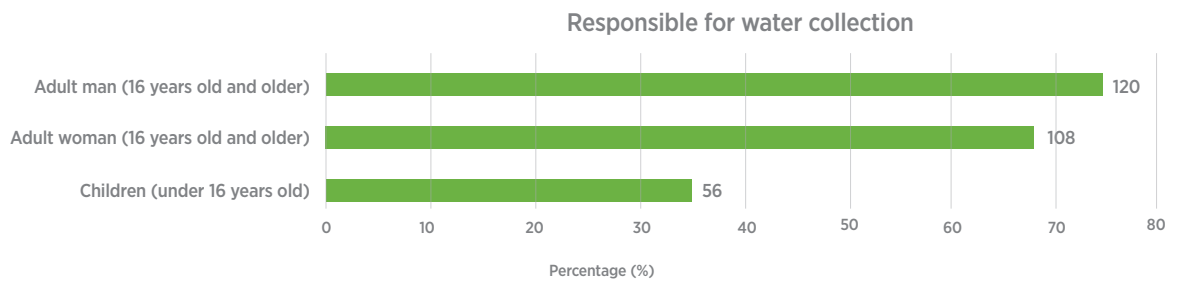
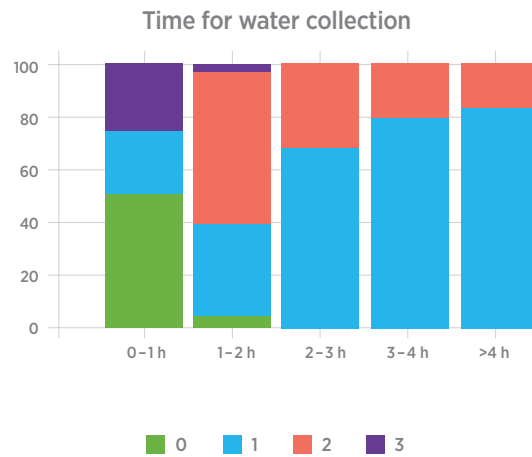
93.1% of households stated that the quality of the water is not acceptable due to contamination, including solid material in some cases. One-third of households do not treat the water at all before consuming it. Out of the two-thirds of households that do treat the water, most of them boil it. About 10% of households treat water using a filter (made of ceramic, sand, composite, reverse osmosis, or other material), and 4% let it stand and settle. Only two households add chlorine.

7.1.1 Water collection

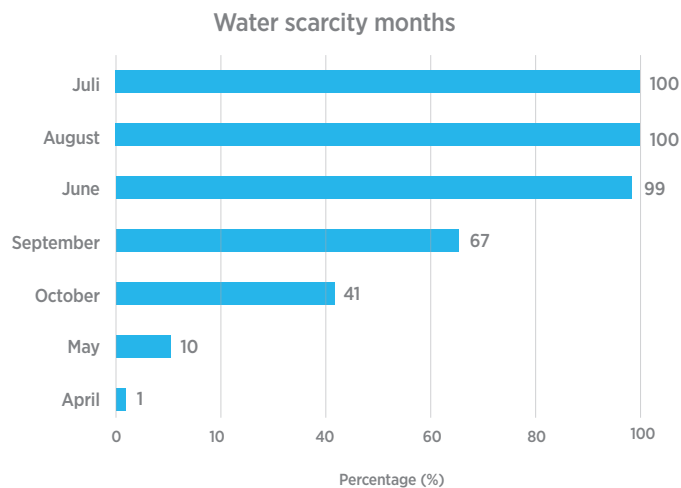
The time needed for water collection varies from 0 to 4 hours. Only 3.1% can collect drinking water in less than 1 hour (lefthand plot). However, over 20% of these households make up to 3 trips per week to the water source (righthand plot). 39.5% of respondents take 1–2 hours to reach the water source, and 60% of these make at least 2 trips per week. 35.8% take 2–3 hours, whereas 21.6% take 3 hours or more.

Among these, 80% can only make 1 trip per week.





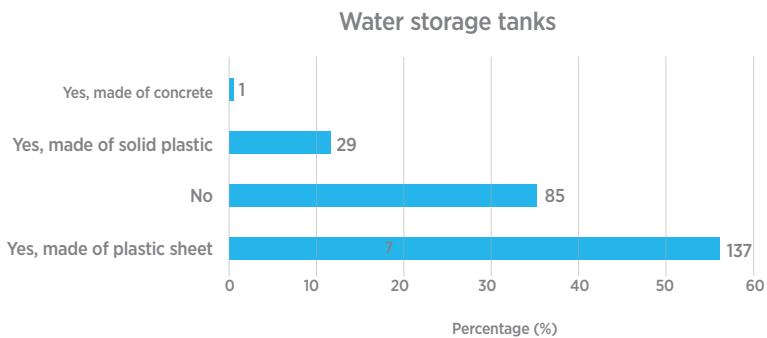
79% of households said that someone in the household is engaged in water transport. Of these, 67.1% said that adult women transport water; 74.5% said that adult men do it, and 34.8% said that children under 16 carry water.



Over 50% of households stated that there is water scarcity over the year. The months of June to August are the worst, but September and October can also be bad.

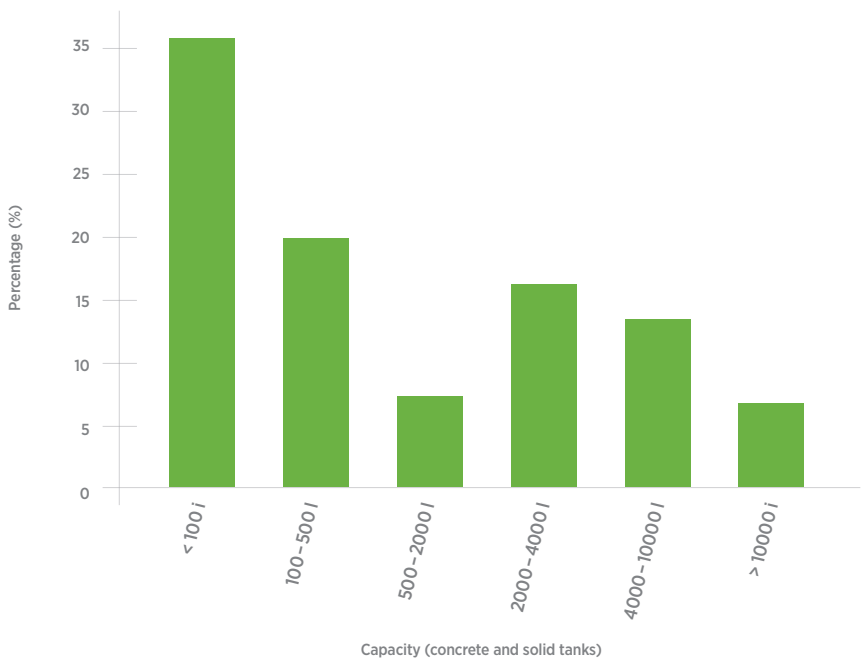
The household survey was conducted in April 2021, a month that was not classified as water scarce. Nevertheless, 77.1% of households said there was a time in the past 30 days without sufficient water in the household.

7.1.2 Water storage



34.5% of respondents do not have a storage tank above 50 liters' capacity, whereas 55.9% have a tank made of plastic sheets. 11.8% have a solid plastic tank, and only 1 household has a concrete tank. The photos of the tanks made of plastic sheets, tak-

en in the field, revealed that most of them were not covered, and the hygienic quality of the water seemed poor, with lots of insects and organic material inside. We were also informed that four small children drowned in those tanks.

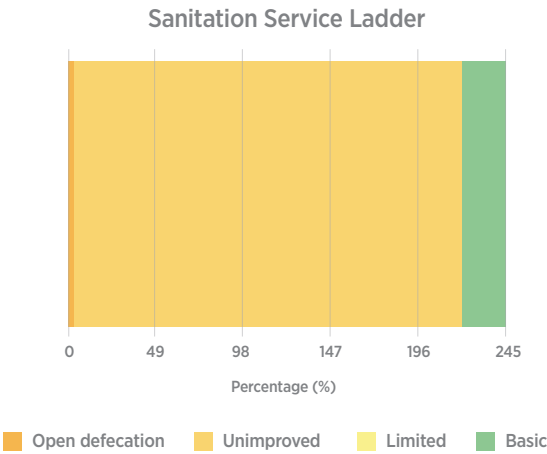


Looking only at the 30 respondents using solid tanks (concrete or solid plastic), over 35% use small tanks (less than 100 liter (L) capacity), while less than 10% have large storage facilities (over 10,000 L capacity).

Even though in April, the dry season had not started yet, 61% of those with a storage tank said there were times in the past month when they were not able to store enough water to meet their needs.

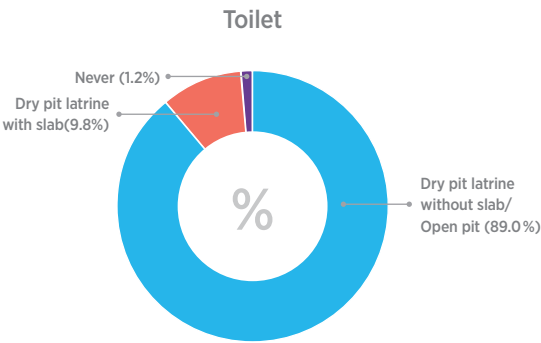
86.8% of households said that they store water in smaller containers of 50 L or less.

7.2 Sanitation



The majority of households only have access to limited sanitation facilities.

In particular, 89% said that they have a dry pit latrine without a slab or an open pit, whereas 9.8% have a dry pit latrine with a slab, and 1.2% have another solution. There are no flush toilets or compost toilets in the village.



In 96.3% of the cases, the toilet is in the household's own yard/plot. 2.4% of respondents said the toilet is inside their house, and 1.2%, elsewhere.

90.2% of respondents said that everyone in the household has access to the toilet day and night. 9.4% said the access is limited. Of those, 82.6% said that the toilet is not always safe for all household members, 8.7%, that the distance prevents some members from reaching the toilet, and 4.3%, that limited mobility prevents members from using the toilet.

98.4% of households do not share their toilets with other households. 1.2% share their toilet with another household they know, and only 0.4% use a community toilet.

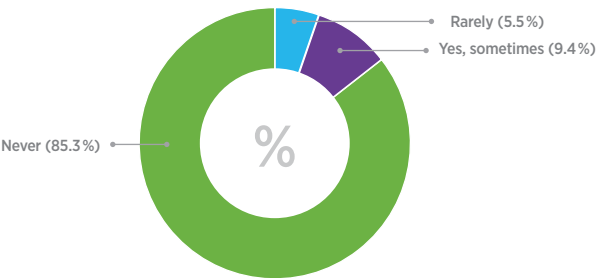
85.3% of respondents said their toilet never overflows. 5.3% said it overflows rarely, and 9.4% said it overflows sometimes.

78.1% said their toilet was never emptied, whereas 21.9% said it has been emptied. Of those, only 22.6% said it was emptied

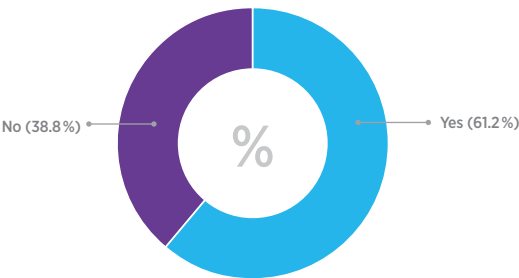
by a service provider. The villagers explained that a common method to solve the problem of a full toilet is to dig a new hole for the toilet, place the existing toilet hut over the new hole, and close the old one.

61.2% of households said that the toilet design prevents other people from seeing and hearing them when they use it, whereas 38.8% said that is not the case.

Does your toilet ever overflow?



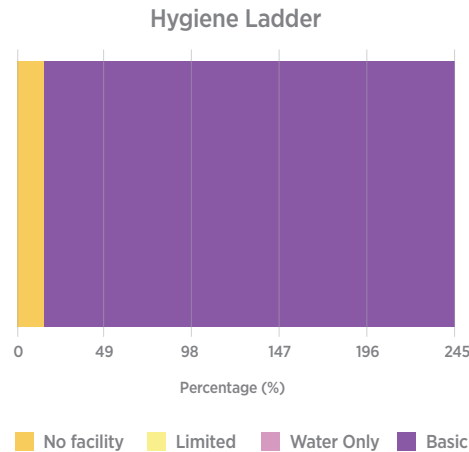
Does the design of your toilet prevent other people from seeing and hearing you when you use it?



When it comes to solid waste disposal (both organic and non-organic), 58.8% of households dispose of the waste within their own yard or plot. 52.7% bury or burn it, and 23.3% dispose of it elsewhere. Some of these households dispose of the waste in a communal landfill. Many respondents stated that they use the organic waste as manure for the fields and burn the non-organic waste. In a follow-up survey, there should be separate questions about the disposal of organic and non-organic waste. Having seen the very limited resources of most of the villagers, we believe that the amount of non-organic waste is rather small.

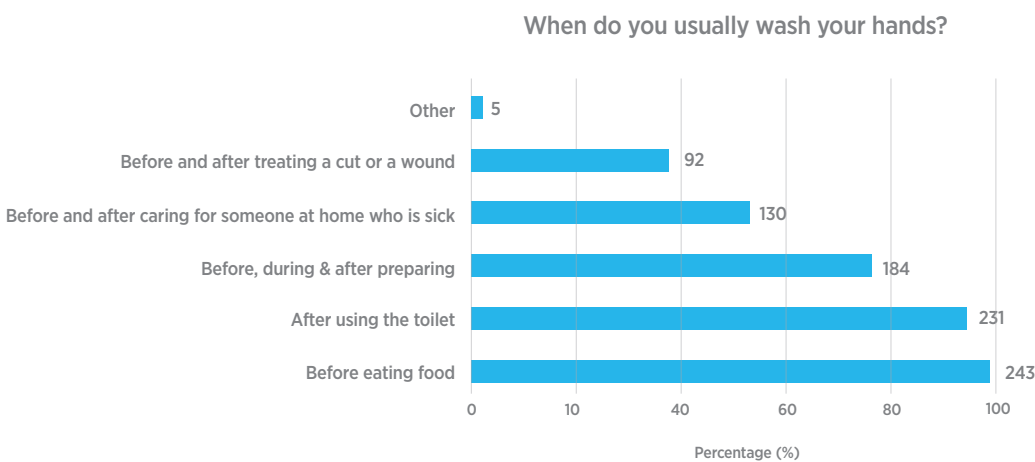
There is no sewerage system, so household water is disposed of in the open ground, either through a sink or directly. As there are no flush toilets, the household water should not contain feces. Children either defecate in the toilet, or the feces is carried to and put in the toilet afterwards. 21.7% see their toilet as a risk to health, and 18.9% see it as a safety risk. Nobody said there was a risk of harassment.

7.3 Hygiene



90.6% of households use a mobile bucket/jug/kettle to wash their hands. Only 1.2% have a fixed hand- washing facility in the house, and another 2%, in the yard. 0.4% said they use

hand sanitizer. 5.3% have no handwashing facility. The above graphic displays these results in terms of the hygiene service ladder.



The above graph shows answers to the question “When do you normally wash your hands?”

91.4% of respondents said there is water available for hand- washing when needed, whereas for 8.6%, there is not. In 71% of households, soap (liquid or bar) is available for handwashing.

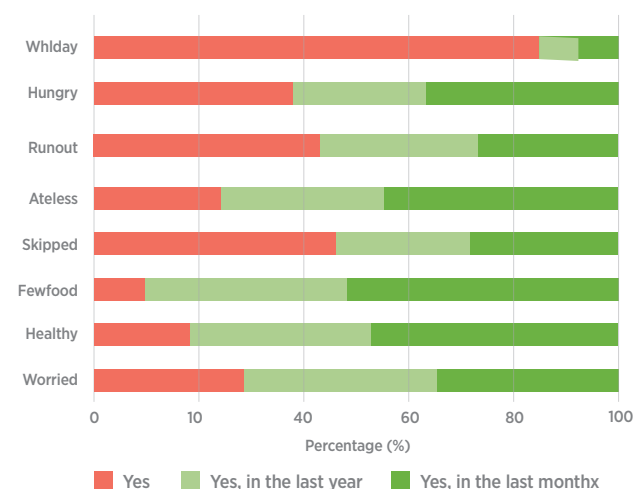
8. Food Security

8.1 Food Insecurity Experience Scale

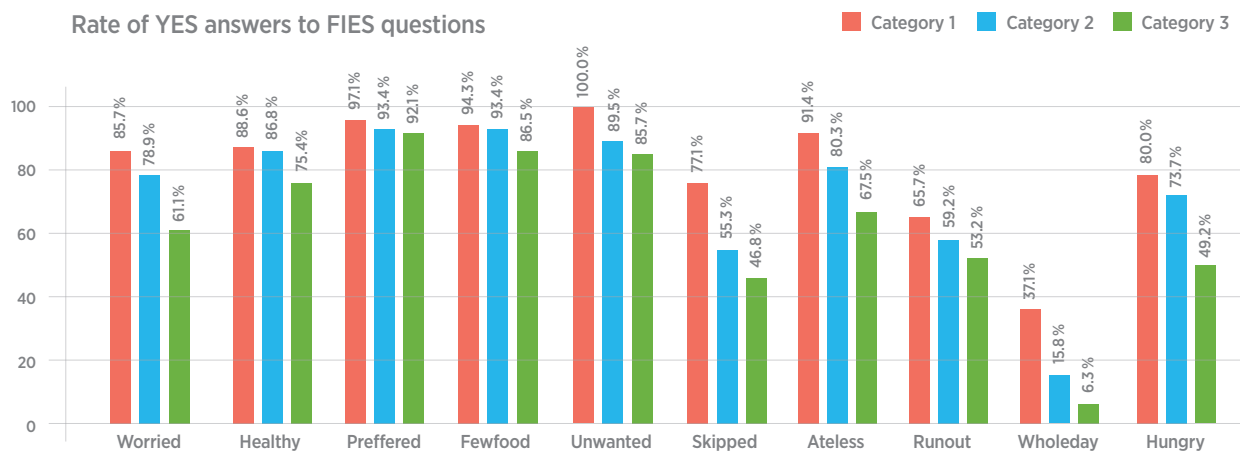
The FIES results indicate that only 26% of households can be classified as food secure. Of the remaining 74%, 15.5% of individuals can be classified as severely food insecure.

People experiencing moderate levels of food insecurity will typically have low-quality diets and might have been forced to reduce the quantity of food they eat at various times throughout the year, while those experiencing severe food insecurity levels will have gone for entire days without eating, due to lack of money or other resources to obtain food.

Food Insecurity Experience Scale (FIES) of the whole sample



Rate of YES answers to FIES questions

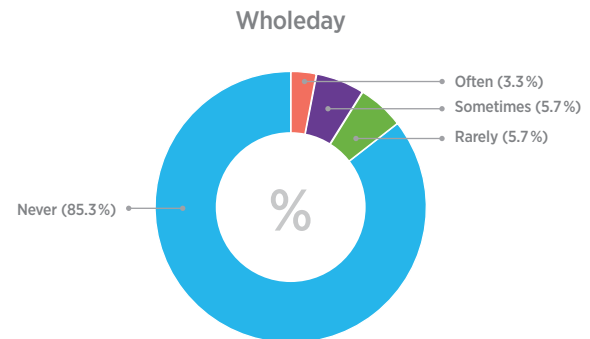


Only 4.5% of households responded "no" to all FIES questions. Although only 14.7% responded that they had a whole day without food in the past year, 89.8% said that they had to eat a limited variety of food, 89% said they sometimes have to eat food that they really do not want to eat, 81.2% said they were sometimes not able to eat healthy and nutritious food, 75.1% said they sometimes have to eat smaller meals, and 70.6% are sometimes worried about not having enough food.

An overview of responses (YES/NO) is shown in the graph above. The frequency of the different problems is shown in the following graphs. The definitions are as follows: Rarely: once or twice in a typical month Sometimes: three to ten times in a typical month Often: more than ten times per month.

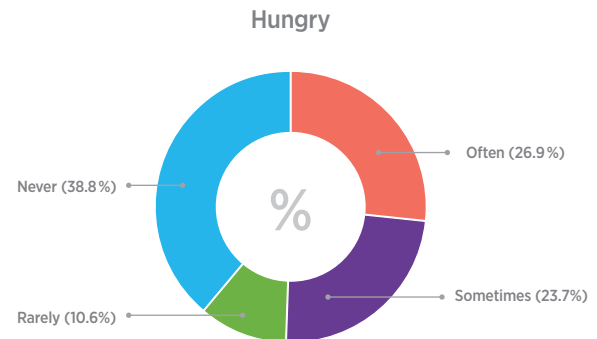
WHOLEDAY | In the past 12 months, was there a time when, due to lack of money or other resources, you went without eating for a whole day?

7.8% said that in the past month they did not eat for a whole day at least once. 6.9% said it happened at least once in the past year, whereas 85.3% said it did not happen to them in the past year.



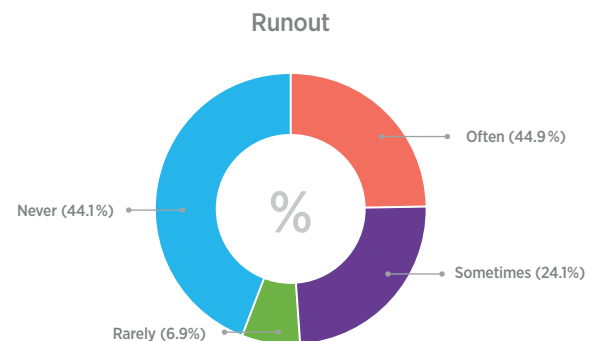
HUNGRY | In the past 12 months, was there a time when, due to lack of money or other resources, you were hungry but did not eat?

36.7% of respondents said they were hungry but could not eat at least once in the past month. 25.8% said it happened to them in the past year; whereas 38% said they did not have any issue. The frequency of the problem is depicted in the graph below.

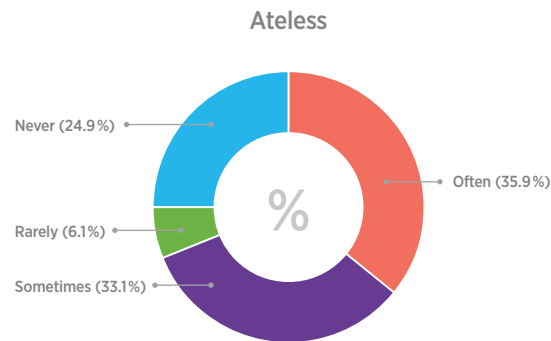


RUNOUT | In the past 12 months, was there a time when, due to lack of money or other resources, your household ran out of food?

27.3% said that they ran out of food at least once in the past month. 29% said it happened to them at least once in the past year, but not in the past month. 44.1% said they had no issues. The frequency of the problem is depicted in the graph below.

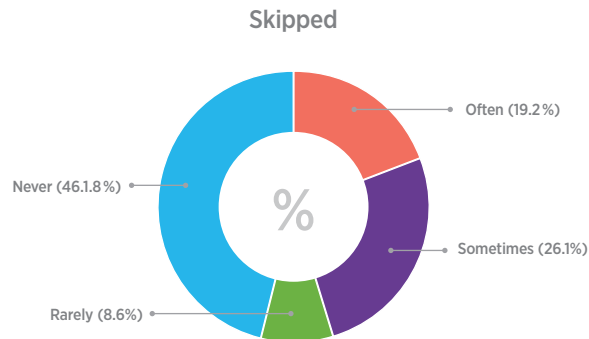


ATELESS | In the past 12 months, was there a time when, due to lack of money or other resources, you ate less than you thought you should? Most of the households had to eat at least one smaller meal than what they felt they needed due to the lack of food in the past month (44.9%); for 30.2%, it happened at least once in the past year, and only 24.9% of households did not experience this. The frequency of the problem is depicted in the graph below.



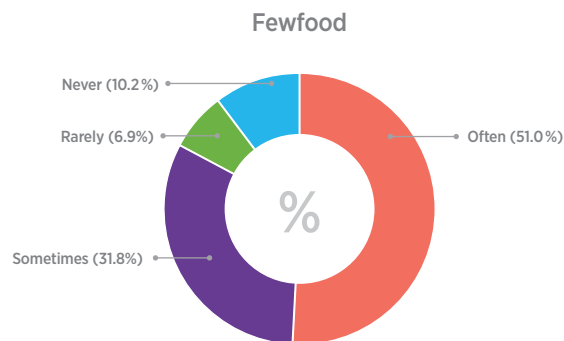
SKIPPED | In the past 12 months, was there a time when, due to lack of money or other resources, you had to skip a meal?

46.1% of households did not skip a meal, 28.6% skipped at least one meal in the past month, and 25.3%, in the past year. The frequency of the problem is depicted in the graph below.



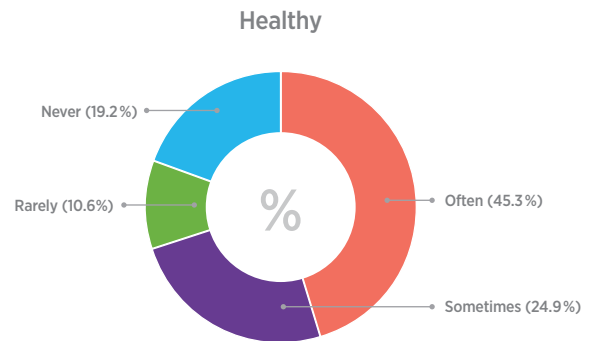
FEWFOOD | In the past 12 months, was there a time when, due to lack of money or other resources, you ate only a few kinds of foods?

51% of households had to eat a limited variety of foods due to a lack of resources in the past month, and 39%, in the past year. Only 10% had a rich variety of foods to eat. The frequency of the problem is depicted in the graph below.



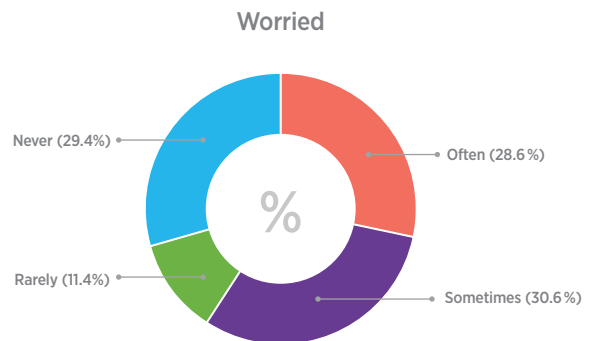
HEALTHY | In the past 12 months, was there a time when, due to lack of money or other resources, you were unable to eat healthy and nutritious food?

Around 46.5% was not able to eat healthy and nutritious food in the past month, and 34.7%, in the past year but not in the past month. Only 19.2% did not have this issue. The frequency of the problem is depicted in the graph below.



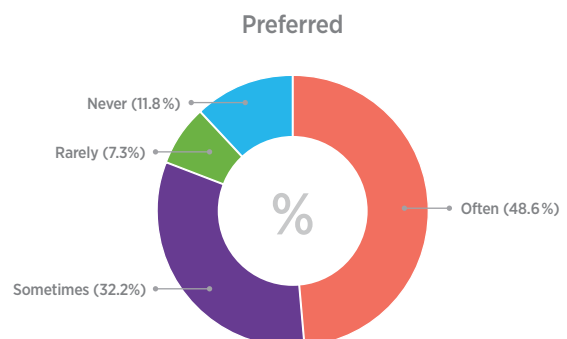
WORRIED | In the past 12 months, was there a time when, due to lack of money or other resources, you were worried you would not have enough food to eat?

35.5% of the population was worried in the past month that their household would not have enough food, and 35% were worried in the past year but not in the past month. Only 29.4% were not worried at all.

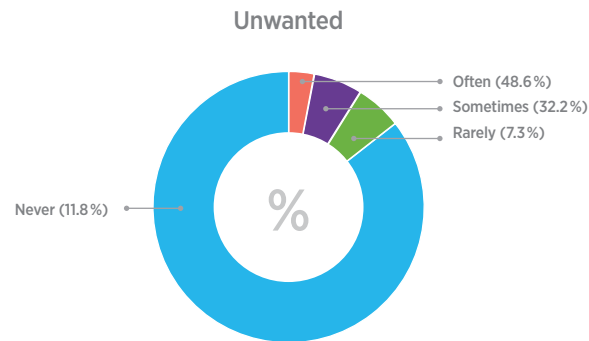


PREFERRED | (This question is not part of the FIES framework but is present in optional modules.) In the past 12 months, were you or any household member not able to eat the kind of food you would have preferred to eat due to lack of resources?

54.7% of households were not been able to eat the kind of food they would have preferred to eat due to a lack of resources in the past month, and 38.4%, in the past year. Only 6.9% did not have any issues.



UNWANTED | (This question is not part of the FIES framework but is present in optional modules.) In the past 12 months, did you or any household member have to eat some foods that you really did not want to eat due to lack of resources? 52.7% said they had to eat food that they did not want to eat in the past month at least once, whereas this happened to 36.7% in the past year. Only 11% said it never happened to them.

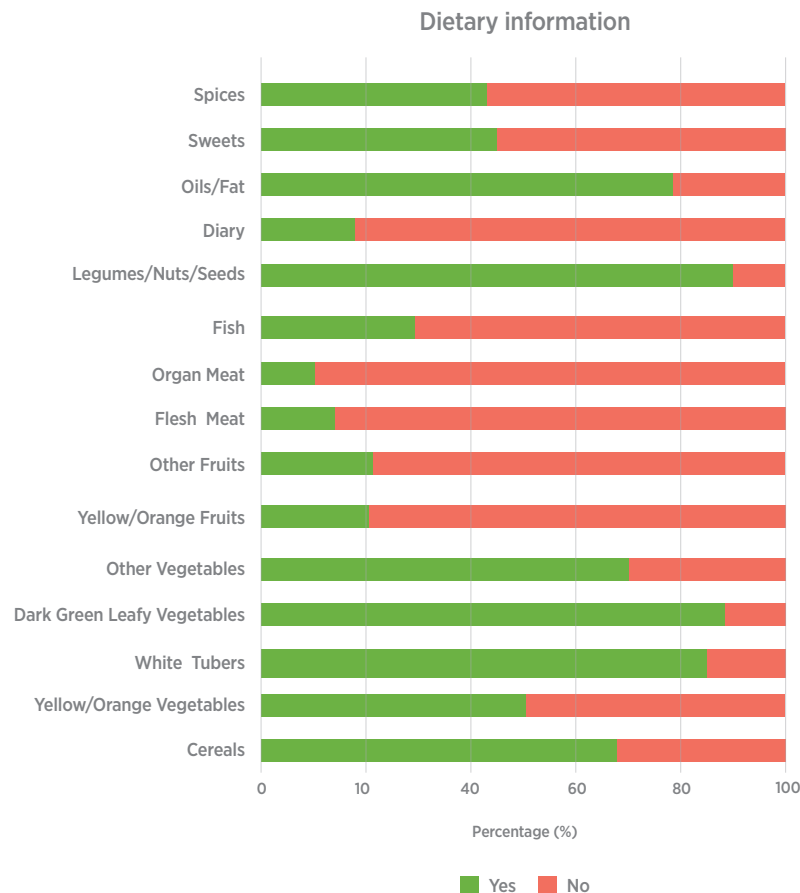


8.2 Household Dietary Diversity Score (HDDS)

Respondents were asked about the foods and drinks they or anyone else in the household ate or drank the day before during the day and at night. The answers were then organ-

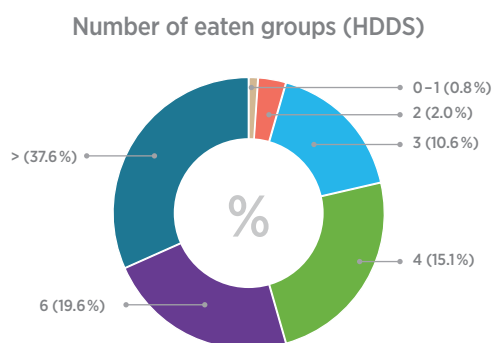
ized into the **following food groups**: cereals, white tubers & roots, vegetables, fruits, meat, eggs, fish/seafood, legumes/nuts/seed, milk/diary products, oils/fats, sweets, and spices.

Over 75% of the households eat white tubers, dark greens, and vegetables like tomatoes and onions, legumes such as beans and peas, and oils and fats.



When it comes to cereals such as rice, wheat, maize, and sorghum, the portion of households decreases to 66.9%. The vitamin A-rich yellow or orange vegetables are only eaten by 50.6% of households. Fish is eaten by 29.4%. Only 20.5% eat yellow or orange fruits, and only 21.2% eat other fruits. 18.9% eat dairy products, 13.5% eat meat, and 9.8% eat organ meat.

37.6% of households usually eat more than six food groups, another 19.6% eat six, and 14.3% eat five food groups. 15.1% of households eat four food groups, and 13.4% eat three food groups or less (see graph below). It should be noted that the survey did not include eggs, which should be a separate food group. Thus, for those households that eat eggs, this food group must be added, and the diet situation would be slightly better than that depicted above.



Part 3: Focus Group Discussions & Interviews

9. Focus Group Discussions

In April 2021, in parallel to the household survey, SVF conducted seven FGDs with homogeneous groups and several interviews with key stakeholders. The following groups were included in the FGDs: shop owners, SACCO members, three different farmer groups (mixed, women only, cooperative members), local primary school teachers, and final year secondary school students. The target number of participants was six to eight, which was mostly reached, but in one case, only two participants showed up. Key stakeholders interviewed included the SACCO manager, the chief nurse of the health post, the local Catholic Church secretary, and the local primary school headmaster.

The team conducting the FGDs and key stakeholder interviews consisted of Alfons Üllenberg, a Kigalibased consultant specialized in development cooperation and agriculture, Celestin Karamira, a consultant also specialized in development cooperation and agriculture, with an additional focus

on health, and Joachim Hauschopp, the founder and executive chairman of Sustainable Villages Foundation. Celestin Karamira also served as an English-Kinyarwanda interpreter.

9.1 FGD with Shop Owners

There are several shops in the two villages – mainly grocery shops that also sell soap and other non-food items. There is also a bar and a restaurant. The villages have at least two barber shops, but none of the owners were present at the FGD. Some of the shop owners run a farm in parallel. The group criticized the absence of basic services like electricity, water, and roads and limited healthcare provision. Market access is difficult, dirty water is a hygiene problem, and smoke from stoves inside houses is a health problem. The primary school is of poor quality, and vocational training options are too far away.



Key Quotes:

- We feel safe and at home in the village.
- Water is indispensable for survival. Electricity is important for advancement.
- The water problem is too big to be solved by village – outside support is needed. Priorities:

- 1 Clean (drinking) water in sufficient quantity
- 2 Electricity (affordable)
- 3 Training (skill development, nearby vocational training)
- 4 Enough affordable cooking fuel

9.2 FGD with SACCO Members

From the household survey, we know that more than half of village households are SACCO members. In the FGD, participants said that they have bank accounts with the SACCO, which costs a fee of RWF 1,500 (USD 1.5) per year. The government pushes SACCO membership, e.g. by requiring beneficiaries to have SACCO bank accounts to get government subsidies. Participants said that getting a loan from a SACCO (24% interest rate per year) is easier than from a bank (which might have slightly lower interest rates). For small loans with a shorter term, participants prefer to go to a local savings group, even though the interest rate is much higher. Thus, for a loan of USD 150, participants would rather go to the local savings group, whereas for USD 300, they would prefer to go to the SACCO. Participants can also use the SACCO account for savings; the interest rate is 6% per year. The closest SACCO office is in the market town of Kabukuba, approximately 6 km away.

Key Quotes:

- Larger amounts of money are kept at or borrowed from the SACCO, whereas smaller amounts are put into or borrowed from savings groups.
- A SACCO is a “bank belonging to the people”.
- It is easier for villagers to get a loan from a SACCO than from a bank.

Priorities:

- 1 Sufficient quantity of clean (drinking) water
- 2 Electricity (affordable)
- 3 Health insurance
- 4 More food to eat
- 5 Enough affordable cooking fuel

9.3 FGD with Farmers (Mixed Group)

The typical crops cultivated include bananas, coffee, beans, maize, sweet potatoes, cassava, Irish potatoes, and tomatoes. Some households have livestock, e.g. a cow, goats, sheep, chickens, and pigs. The land holdings of the respondents are between 300 square meters (sqm) and 1 hectare (ha). Participants regard their land as fertile and value the proximity of the school and the good leaders in the two villages. The main challenges are water for irrigation and lack of fertilizer (compost production not sufficient, and chemical fertilizer too ex-

pensive). Participants want training for farmers, but government training stopped when the 2019 coronavirus disease (COVID-19) pandemic started. A shortage of firewood and limited electricity supply are also problematic.

Farmers take loans from the SACCO but see the collateral and the high interest rate as a challenge. Savings groups are seen positively (even though the interest rate is higher). Farmers want better storage options, so that they do not have to sell the crops when the prices are lowest.

Key Quotes:

- We need more agricultural training.
- We also need more water for irrigation. In the dry season, one person full day of work is required for water transport.
- The amount of compost produced is not sufficient, so fertilizer has to be bought, but sometimes there is not enough money available for that.
- The cow (donated through the government's one cow per poor family program), after having had the first calf, was not inseminated again and does not give milk, but continues consuming food (and our resources).

Priorities:

- 1 More water, also for irrigation
- 2 Electricity
- 3 Efficient cookstoves that consume less or no firewood
- 4 Better conditions for agriculture: cheaper and more accessible inputs, equitable markets, higher food production overall

9.4 FGD with Farmers (Cooperative Members)

Only two participants showed up for this FGD – both were members of the same “cow” cooperative. The precondition for membership is to have a cow, or the cooperative gives a loan to a new member to buy a cow. The cooperative has wetland, which is the strongest incentive to become a member, but the government dictates what can be grown in the wetlands, e.g. beans, soy, maize, and tomatoes, and no intercropping is allowed. The land is cultivated and crops are sold by the individual members, but the cooperative helps with sales. Members get health insurance and a pension contribution through the cooperative. Loans are more easily accessible, with interest rates comparable to those of savings groups (5% per month). The participants are very happy with their cooperative.

Key Quotes:

- We joined the cooperative because we get attractive land in the wetlands that can be cultivated, including in the dry season.
- We can easily get a loan of up to RWF 300,000 from the cooperative without any collateral.
- If we have enough water and electricity, given that the new airport will be so close, the rest will come by itself.

Priorities:

- 1 More water, also for irrigation
- 2 Electricity

9.5 FGD with Farmers (Women Only)

Our general impression is that the women farmers are poorer than many of their male counterparts. Participants see dependence on rain as the main challenge for agriculture. They see health getting better through government programs and knowledge about agriculture improving through grassroots training, but knowledge on how to fight insects and crop diseases is missing. The poverty issue was mentioned several times.

As all of the participants are members of saving groups, there was an intense discussion about it. They have all already taken out loans up to a maximum of USD 150, e.g. for livestock, house renovations, or school fees. The typical loan term is 9–12 months, and the interest rate is 5% per month, to be paid each month. The principal is paid back in one shot at the end of the term. Sometimes, there is competition among members for the available funds. Even though the interest rate is so high, all the members see their savings groups in a very positive light, because the interest earned is ultimately given



back to the members. To get a loan, they just approach their committee. However, savings groups often ask for collateral, as well. There is no loan default problem anymore.

Most savings groups have 20–25 members, some up to 60. They are limited to the cell. The groups have statutes and a formal structure but are not registered.

Note from SVF: we see great potential to involve the savings groups in the management of payments in installments, e.g. for SHS, ICS, & water storage tanks.

Key Quotes:

- Poverty is a big problem.

- There is not enough water.
- There is neither enough money nor enough knowledge to fight diseases or insects attacking the crops.
- We would rather go to our savings group to get a small loan than to the SACCO, although the interest rate in the saving group is higher. The application process is easier. You just write a letter to your group, and they make a decision quickly.

Priorities:

- 1 More water
- 2 Electricity

9.6 FGD with Primary School Teachers

Juru Primary School is operated by the Catholic Church. The school was built in 1963 with roughly 900 students in grades 1–6. The school has a big rainwater harvesting system for drinking water, which was broken when we had the FGD (but then later fixed with our support). There are two solar systems to power lighting in the headmaster's office and a few of the classrooms. The headmaster has a laptop, but it is broken. Teachers often have no specific training, as most of them become teachers immediately after they finish secondary school.

Teachers are meant to teach in English, but none of the teachers speaks good English – most of them, hardly any. There is also very little IT knowledge and no opportunity to maintain and develop it further, because there are no computers. Teachers are not happy with their own level of education and welcome further training. Poverty among families in the villages is seen as a big problem.

Key Quotes:

- Water problem: some kids have to fetch water for their family before school or cannot come to school at all because of this – dropout is highest in the dry season because of water transport.
- Teachers have knowledge about science and technology, but they need computer training.
- Teachers could teach villagers how to use tools and technologies and explain that there is a need for their contribution.

Priorities:

- 1 Clean water
- 2 Electricity

9.7 FGD with Secondary Students, Final Class

Katarara Secondary School (grade 7–12) is about 5 km away from the two villages and serves the entire region. However, all students participating in the FGD are from the villages of Rugarama and Bisagara. Students said the soil is fertile, people like agriculture, livestock is good, and food trade is profitable. On the other hand, they stated that the lack of electricity is hindering development, lack of water is limiting agricultural productivity, the roads are bad, skills get lost, agricultural inputs are difficult to get, and people are very poor.

The participants had much stronger visions than those encountered in all the other FGDs. The nearby airport construction site is seen as a big opportunity; for example, a hotel could be built, and the import/export of crops (e.g. coffee or rice) and other goods could become much easier. They want a water tap in every house and the streets to be paved (no other group ever proposed this). Electricity is seen as equally important as water and is primarily considered as a business enabler. It would open up the possibility to start workshops, e.g. for carpentry or welding. They see a need for agricultural training, as well as also computer training. All students want to go to university but come back to their villages later on.

Only one student seemed to be capable of speaking English, so we had to conduct this session in Kinyarwanda, as well. They do not do self-study in English, because they do not have smartphones, and access to the smart classroom for individual activities is limited. All students are aware of their deficiencies in English. Students rate their IT capabilities much higher. The participants said one IT teacher is very good.

Note from SVF: we later contacted this IT teacher, and he will support the introduction of a smart classroom and teacher training in IT at Juru Primary School.

Key Quotes:

- In ten years, we want the village to have grid access, a water tap in every household, and the main road paved.
- We made it to secondary school because we were lucky, we wanted it, and we have better skills.
- The new airport will trigger the development of additional infrastructure and create jobs; there could even be a hotel in the village.
- We all want to go to university, but later we want to live in the village again.



10. Interviews with Key Stakeholders

10.1 Interview with the Juru Umurenge SACCO Manager

Each of Rwanda's more than 400 sectors has an Umurenge SACCO. This interview took place in the Juru Umurenga SACCO in Kabukuba, which is the main town in Juru Sector, about 5 km away from the two pilot villages. A SACCO serves like a bank, so each member has a proper bank account. Members can be individuals, but also cooperatives and even savings groups have bank accounts at the SACCO.

SACCO loans have a 24% interest rate per year, which is higher than a bank's interest rate (there is at least one bank in Kabukuba, not very far away from the SACCO building), but lower than that of savings groups and cooperatives (5% per month). Deposits earn an interest rate of 6% per year.

The SACCO currently has USD 80,000 in outstanding loans; the yearly turnover is around USD 200,000. The loan default rate is 3–7%. The demand for loans is higher than the offer. The SACCO finances agricultural loans with rather short terms, as well as water tanks. So far, they have not financed SHS.

10.2 Interview with the Chief Nurse of Juru Cell Health Post

Each cell has a health post; the one in Bisagara is near the Cell Office. The health post in Bisagara is in a proper building. It has an SHS for lighting and a rainwater harvesting system with a plastic tank.

The health post has two nurses. They provide basic health services and have an average of twenty cases per day (the cell has roughly 7,000 inhabitants). More severe cases are sent to the sector health center, which is around 5–6 km away, or to the hospital in Nyamata (a one-hour car drive on bumpy roads). For example, mothers giving birth are sent to the health center or hospital.

The chief nurse sees the biggest problem in the water quantity (in the dry season) and quality (all year round). People get diarrhea from dirty water. A roundtrip journey to the lake to get water takes 2 hours by bicycle (for those who have access to a bicycle). Piped water or big storage tanks with proper disinfection are needed to solve the problem. She sees the open sheet tanks built by the NGO Acord Rwanda rather positively, even though they have some hygiene issues. She says that kids should wear shoes in order to avoid worms. Electricity should be available everywhere.



She says that there is no malnutrition problem in the village.

Note from SVF: from what we have seen and heard in the FGDs and household interviews, we believe that there is a certain level of malnutrition, which might be below the official threshold, but still worth investigating further.

10.3 Interview with the Catholic Church Secretary

The secretary of the Catholic Church is also a primary school teacher and therefore participated in the FGD with the primary school teachers, as well.

The church has a big building in the village, but it lacks water, electricity, and sanitation. The church has the role of transmitting education and culture, liveliness, and religious beliefs. There is a church choir. Twice a week, the congregation gathers without the priest; every Sunday, the priest, who lives near Kabukuba, comes. The church has 3,000 members in the cell. Other religious groups in the community include Protestants, Presbyterians, and Adventists. There are no Muslims in the villages.

She sees water as problem number 1 – safe drinking water is 20 km away, and not even Kabukuba has piped water. However, electricity is needed as well. She says everybody wants an ICS, but people cannot pay the price (USD 26–28) in one shot; the option to pay in installments is needed.

She sees the nearby airport construction site as a positive development. Some work is already underway there. There was land expropriated for a military camp to protect the airport. People are afraid that more people will be relocated, but those who got expropriated were happy with the compensation.

10.4 Interview with the Juru Primary School Headmaster

The school (grades 1–6) was built in 1963 and has roughly 900 students in 18 classrooms. It was much bigger a few months ago, but a second primary school was opened in the cell, and many students moved to that new school. The school has no electricity except for two SHS for the headmaster's office and a few classrooms. The main rainwater harvesting system tank was broken (and recently repaired with the support of SVF).

They run a two-shift system. About 20–30 pupils have permanently dropped out. On top of this, there are temporary dropouts. Reasons for dropout include ignorance of the importance of education, poverty, and the work children have to do for the family, e.g. fetching water from the lake in the dry season and work in rice fields.

He talked a lot about poverty and the miserable condition of the family homes; most of them have no or very bad flooring, and houses are built with adobe and are not plastered. Villagers do not have enough to eat and not enough water. In the past, there was piped water from Lake Mugesera, but the service was suspended. Villagers can contribute to the water supply cost, but the state must help build and finance the infrastructure. SVF should also support irrigation projects and help create employment.

We did not talk about the quality of education and teachers' training status, as those topics were reserved for the discussion with the teachers.



Part 4: Conclusions & Outlook

11. Conclusions

The FGDs and key stakeholder interviews match the results of the household survey in almost all aspects. Nevertheless, they provided more detailed insights into some important topics, as summarized below:

Priority 1 in the two villages is safe drinking water. Again and again, it has been mentioned that villagers are willing to pay for water, but setting up the basic infrastructure requires organization and funds from outside. Safe drinking water in the vicinity of the houses will make people healthier and free up time for productive activities, e.g. income generation by adults or school attendance by children and youth.

Priority 2 is electrification. It is important to support education, light individual homes, and support businesses, including agriculture.

Priority 3 for many in the local community is clean cooking. Cooking on open fires in closed rooms is bad for one's health and consumes too much firewood, which is time-consuming to collect and results in deforestation. Clean cooking devices are needed.

In addition, there are some other key challenges:

- Poverty in general: Most inhabitants of the two villages are poor. Measures taken by SVF should focus on improvements in health, livelihoods, and income.
- Not enough food: Higher yields are needed to have enough food and enough income to buy the food needed for a proper diet that is not cultivated on one's own land.
- Irrigation: People need more income. In order to generate that, they need higher yields, e.g. through irrigation. Furthermore, irrigation will make smallholder farmers more resilient against drought.
- Agricultural training: Smallholder farmers expressed their desire to acquire more knowledge about agricultural techniques through training, another element to increase the yield.
- Access to agricultural inputs and markets: Access to inputs like seeds and fertilizers, as well as to equitable markets, is limited and should be improved. Crop storage can enable farmers to sell their produce when prices are higher.
- Teacher qualification & school infrastructure: Teachers feel that their qualification is not sufficient, especially in English and IT, and the school lacks electricity and computers. Electricity, IT equipment, and training is therefore needed.
- Employment: Professional training options, also outside agriculture, are not within geographical reach, even though they would increase villagers' chances of finding employment, e.g. at the nearby airport under development, or even creating their own businesses. Solutions must be found.
- Proper housing: Existing housing standards are poor; these standards should be raised in order to improve hygiene and health.

12. Outlook 2022 – 2023

In spring 2022, a Memorandum of Understanding (MoU) was signed with the Ministry for Local Government (MINALOC). On the basis of this MoU, the Rwanda Governance Board (RGB) recognised the organisation as an "International Non-Governmental Organisation".

In accordance with the statutes, the founder has appointed a seven-member board of trustees. The board has elected Francine Munyaneza as chairperson and Olivier Kraft as deputy chairperson. More information can be found at <https://www.s-v-f.org/the-foundation/board-of-trustees.html>. The first two meetings have already taken place.

In the village of Rugarama, an electrification rate of 100% has been achieved in spring 2022, while the village of Bisagara is still at 95%.

Preparations for the electrification of the primary school are well advanced. Laptops are also to be purchased and teacher training supported. The construction will be started in July and finalized by October 2022.

The construction of a model house, that will host a small nursery school, was started in July and will be finalized by October 2022. The house will showcase the use of adobe bricks in conjunction with hygienic flax oil treatment of the floors, a compost toilet, solar electrification, rainwater harvesting and clean cooking.

The start of agricultural training for smallholder farmers is in preparation.

The construction of a drinking water supply for the two villages is on the plan for 2022, as the current water supply is very poor. However, two hydrological surveys have shown no water or water at a very great depth. The solution for this extremely important project has not yet been found.

Fundraising with professional donors in development cooperation has begun. The aim is to find funding for an extension of the pilot project to four neighboring villages, to be started in late 2022, and to build up a team with employees in Rwanda.

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IASS Study/October 2022

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DOI: 10.48481/iass.2022.045



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