Rural Water Supply Network

Field Note 2022-1

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History and current status of the rope pump in Nicaragua

A success story of rural community water supply and self-supply

Executive Summary

The rope pump was introduced in Nicaragua starting in the early 1980s as an alternative technology for improving water supply in rural communities. Forty years later, the rope pump continues to play a significant role in affordably providing access to water in rural and peri-urban areas, particularly for dispersed settlements and farming families where the rapid expansion of rural electrification has yet to reach.

The history of the introduction, development and scaling-up of the rope pump in Nicaragua is an example of effective uptake of a locally-adapted technology. The success of this simple, efficient and affordable technology was enabled by various factors including government support, long-term donor support focused on both technical and non-technical aspects, and local private sector involvement. This led to lasting capacity development and enabling conditions in both the private and public sectors. In the Nicaraguan case, subsidizing rope pumps for some families did not distort the market, but stimulated the sales to families who knew they would not get a subsidized pump.

This technical note highlights the key features of the rope pump, delves into the historical background of its introduction in Nicaragua and briefly highlights the current situation by providing estimates of number of rope pumps in use and their functionality and impact. It is based on the study conducted by Briemberg (2022).

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Introduction

In 2020, 55.5% of the population in Nicaragua had access to safely managed drinking water services and 26.2% had access to basic services. This means that over 1 million people were relying on unimproved sources or surface water. In rural areas the situation is even more critical: only 38.5% and 20.6% of the population had access to safely managed and basic services, respectively. Whereas in urban areas a combined 97,4% had access to safely managed and basic drinking water services (WHO/UNICEF JMP, 2022).

In rural areas of Nicaragua, there are approximately 7,200 rural communities and it is not uncommon to find water and sanitation facilities that are no longer functional. In some cases, these systems have simply reached their end of life, but most systems fail prematurely due to inadequate maintenance, insufficient replacement materials, low tariff payment and collection, insufficient funding to cover the cost of keeping systems or facilities fully operational, or limited administrative and technical skills among service providers and users (Borja-Vega et al., 2017).

A simple and low-cost technology overcame the constraints dictated by the enabling environment of rural water supply services and gained ground in Nicaragua: the rope pump. The popularity of rope pumps in Nicaragua contributed to increasing access to drinking water for rural populations. Between 1987 and 1995, rural water coverage increased from 27.5% to 54.8%. Rope pumps accounted for 85% of the total increase (Alberts and van der Zee, 2003), an improvement rate three times greater than in other Latin American countries over the same period.

What's a rope pump?

The rope pump is a hand pump that uses a loop of rope with small plastic pistons (or washers) spaced approximately 1 meter (Figure 1).

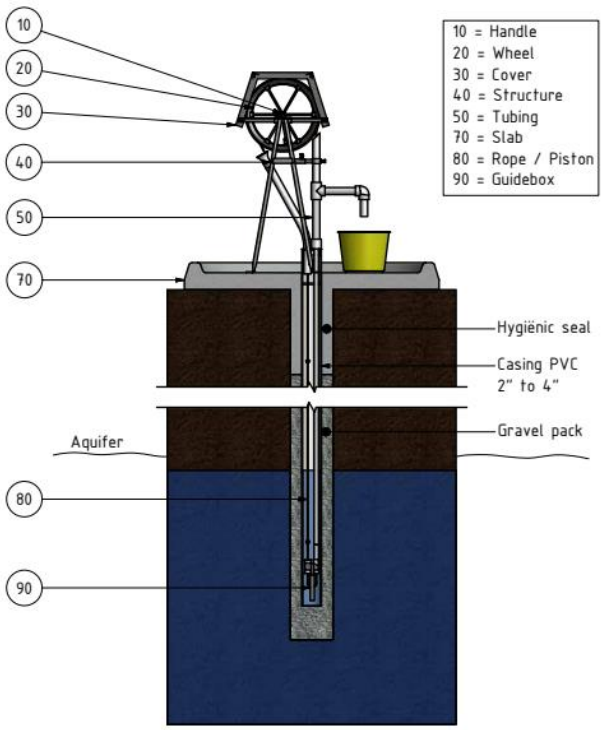

Figure 1: Model of rope pump for boreholes. Source: Meta Meta, 2014[1].

A crank-operated drive wheel pulls the rope through a PVC rising pipe; the drive wheel is generally made of used car tires. A concrete or steel guide box at the well ground leads the rope with the pistons into the rising pipe. The upward movement of the rope at a certain constant speed forces the water to flow upwards towards the outlet. When the pumping stops, the water in the rising pipe will drain slowly. Rope pumps with 1 or 2 handles can pump from depths of 35 or 60 meters, respectively. All rope pumps in Nicaragua are made with locally available materials like galvanized steel and PVC pipes and fittings, used car tires, plastic pistons and ropes.

[1] http://www.ropepumps.org/uploads/2/9/9/2/29929105/shipo_rope_pump_model_1.pdf

This type of pump is usually placed on a dug well and it's mostly used as family pump (self-supply). However, there are different models existing that are suitable for larger communities and that may be installed on boreholes up to 50 meters deep.

Why is the rope pump a SMART technology?

S Simple – Compared to other hand pumps, the system is of light weight, easy to build and operate. It is made of steel and PVC pipes and fittings, plastic washers or pistons and used car tires. A rope pump has a simple pumping principle and can be built by metal workers and maintained by its users with relatively little technical training.

M Market-based – Produced by local manufacturers, reducing the need to import conventional piston pumps or spare parts. The pump's success in Nicaragua was determined by the demand from farmers, the marketing from manufacturers as well as the receptive attitude of the Nicaraguan government. The rope pump reached its independence from aid agencies' support and became a product acquired by end users without subsidies or free distribution.

A Affordable – The cost of a rope pump in Nicaragua is approximately US$150 over 3 years; this includes US$120 for the initial capital investment (lowest price) and $10 in yearly maintenance. Compared to other hand pumps that can pump from a depth of 35 meters (e.g., India Mark II, Afridev), the rope pump is 5 to 8 times cheaper. An electrical pump can cost US$230 over 3 years, including initial investment and the cost of electricity. The difference is even greater when considering the life span of a rope pump (5-15 years). The average cost of installation (excluding transport) is approximately US$25 for both rope pumps and electrical pumps.

R Repairable – Because of its simplicity, users can be trained to perform weekly or monthly maintenance. It generally consists of oiling the turning parts. Spare parts, like pistons and rope, can be found locally in Nicaragua. The most frequent repair is replacing the rope. The pump pipes are very light, so no lifting equipment is needed when doing repairs. Local blacksmiths can perform repairs that require welding.

T Transferable – Given the low cost and simplicity of the rope pump, numerous aid agencies and organisations have been supporting technology transfer to countries such as Ghana, Ethiopia, Tanzania, Malawi and Zambia. Between 40,000 and 60,000 rope pumps were installed in Central America and Sub-Saharan Africa. Although the rope pump is simple, the hard lesson learned is that "simple is not easy", which is true for both the technical aspects as well as for the scaling-up in a certain context. A successful transfer requires a locally-suitable marketing strategy and long-term follow-up on quality control (Haanen, 2016).

Historical Background

Stakeholders in the rural water sector in Nicaragua

During the early development and scaling-up of the rope pump, the Rural Water Division (*Dirección de Acueductos Rurales* (DAR)) played a critical role at the national level. DAR formed part of the Nicaraguan Institution of Water Supply and Sewerage (*Instituto Nicaragüense de Acueductos y Alcantarillados* (INAA)) which was then transformed into a regulatory body during the WASH sector reform in 1998, and in 2021, it was merged with the National Water Authority (*Autoridad Nacional del Agua* (ANA)).

Currently, the Emergency Social Investment Fund (*Fondo de Inversión Social de Emergencia* (FISE)) is the governmental institution responsible at the national level for investments and the overall management of water and sanitation service provision in rural areas. In particular, FISE provides sector policy guidance, finances infrastructure and supports local communities in the selection and management of infrastructure. Another task of FISE is to collect data on development and performance of rural water supply and sanitation to be stored in the Rural Water and Sanitation Information System (SIASAR)[2], an innovative platform designed by the World Bank in 2010.

At the local level, the municipal technical WASH units (*Unidades Municipales de Agua, Saneamiento e Higiene* (UMASH)) are in charge of providing technical assistance to the community water boards (CAPS) that, in turn, are responsible for operating and maintaining the water supply systems. There are about 3,300 CAPS and they work to provide basic services in locations that are not reached by other government institutions.

Besides governmental institutions, a wide range of international and bilateral aid agencies and non-governmental organizations (NGOs) have been active in the rural WASH sector in Nicaragua at varying times over the last four decades. The most prominent bilateral aid agency during the development and scaling-up of the rope pump in Nicaragua was the Swiss Agency for Development and Cooperation (SDC) and the most prominent NGOs were SNV Netherlands Development Organization and Dienst Over Grenzen (DOG)[3]. In general, the presence of international aid agencies and NGOs has been on the decline in Nicaragua since 2010.

Most government institutions, aid agencies, international NGOs, civil society organizations, and universities active in the WASH sector have been members of the Nicaragua WASH Network (RASNIC) and have shared their experiences and learnings in the annual NicaraguaSAN forum.

Last but not least, the rope pump manufacturers. There are three larger producers, all currently active: Bombas de Mecate, S.A. (BOMESA), Taller Electromecanico and Aerobombas de Mecate (AMEC). As many as 19 smaller local manufacturers have produced rope pumps over the years, and at least 10 are still active.

[2] https://globalsiasar.org/en

[3] DOG have merged in 2000 with ICCO (now part of Cordaid)

History of rope pump in Nicaragua

The rope pump technology dates back several millennia. It was revived in the 70s by Demotech (Netherlands) with the use of new materials like PVC pipes and car tires, and subsequently introduced in Nicaragua in 1983 as an alternative technology for improving water supply in rural communities. It was initially tested under the auspices of the Centre for Appropriate Technology Research of the government-led Agrarian Reform Institute (CITA-INRA), and then, starting in 1988, it was improved by SNV and the government's Rural Water Division (DAR).

During the period 1988-1998 various donors (e.g., SDC) and NGOs such as SNV and DOG provided substantial funding for technical improvements, training local artisans, and promotion of the rope pump. It is estimated that about US$2 million were invested in technical and marketing assistance, and long-term follow-up. When several "off the shelf" models were ready, rope pump manufacturing started to scale-up and became a full-fledged commercial activity. In 1990, the first local manufacturer, BOMESA, started manufacturing rope pumps and selling them to farmers and rural families. At around the same time two other manufacturers of rope pumps were established in the capital city, Managua: Taller Electromecanico and AMEC. Besides a galvanized version of the hand powered rope pump, AMEC also developed and produced rope pumps powered by pedals, engines, horses and wind. By 1991, more than 1,500 pumps had been installed.

In 1995, the rope pump was included by the government in the list of standard hand pumps for rural water supply. Because of the success that the rope pump was having in Nicaragua, BOMESA received funding from SDC and the World Bank to transfer the technology to other local artisans in Nicaragua and in other countries (e.g., Ghana). In the late 1990s and early 2000s, the Nicaraguan rope pump was evaluated (IRC, 1995), and received a shared first prize at the World Water Forum in Japan, respectively.

It is estimated that nearly 88,000 rope pumps have been produced and installed in Nicaragua over nearly four decades (1983 – 2022). The largest manufacturers, BOMESA, AMEC and Taller Electromecanico, have collectively produced almost 74,000 pumps. As many as 19 smaller local artisans produced nearly 14,000 additional rope pumps.

Current status

Estimated numbers and functionality

The national standards for the design of potable water supply systems (NTON 09 007 – 19), revised in 2021, continue to include manual rope pumps as a suitable technology for water supply, including for boreholes with a depth of up to 50 meters and a productivity greater than 0.30 litres per second. Upon reviewing the SIASAR database, the 2011 agricultural census, and consulting with municipal WASH units (UMASH), an estimate of 50,000 rope pumps currently in use in Nicaragua was developed (Briemberg, 2022). This number can be broken down in three categories:

- Communal wells - 3,119 rope pumps are installed on hand dug wells and boreholes for rural communal water supply. In general, these communal pumps are subsidized either by the government or NGOs. Being community water supply systems, they are registered in the SIASAR database. The functionality rate of communal wells and boreholes is reported to be 85%. Of these, 50% of the pumps have been assessed to be in good condition and 35% in regular condition. Functionality of boreholes (90%) is higher than the functionality of hand-dug wells (74%).
- Private wells - as many as 48,000 rope pumps are currently used on private wells. There is no official registry of private wells, thus this number was calculated based on estimates provided by UMASH from 124 out of the total 152 municipalities: 70% reported the presence of rope pumps, while the remaining 30% reported that there are no rope pumps in their municipalities. Considering that, according to SIASAR database, 1,783,275 is the rural population without access to communal water supplies, rope pumps are providing access to as much as 14% of the rural population. The estimate was compared with the agricultural census conducted in 2011 which registered 60,810 hand dug wells and 9,158 artesian boreholes on farming plots nationally. In terms of subsidies, only a small fraction of these pumps was subsidized in the event that a family invested in constructing the well (supported self-supply), but most pumps were paid for by families themselves (full self-supply). An additional 3,000 rope pumps are in use in nine peri-urban townships of the Caribbean coast autonomous regions, where municipal water supply systems have been highly deficient. This estimate assumes that at least 1 in 20 households obtains water from hand dug household wells equipped with locally obtained rope pumps.

Manufacturing sales

AMEC reported selling a total of 212 rope pumps in 2021, of which 108 were sold to NGOs, 80 to local distributors (hardware stores) and 14 directly to the general public; the remaining 10 were sold to a client in Honduras. None of the other rope pump manufacturers shared actual sales data, either because they do not keep well documented records or because they were unwilling to share such information.

Ten local artisans are currently active making and selling rope pumps directly to end user or local sales points in 7 of Nicaragua's 17 departments and autonomous regions. They have collectively produced and sold as many as 4,850 pumps over the last 20 years.

The prices for rope pumps range from US$120 to US$230. Installation costs range from US$25 to US$40, excluding transport. An up-to-date price list from selected manufacturers can be found in Table 1.

Table 1 : Rope pump prices (January 2022). Source: Briemberg (2022).

Manufacturer (location)	Price in US$
AMEC (Managua)	120-190
Taller Electromecánico (Managua)	120
BOMESA (Los Cedros, Mateare)	140
Fábrica de Artículos Mecánicos (Ocotal)	190-230
Taller Bernardo Polema (Siuna)	140

Considering sales trends over the last 30 years, a decline can be observed from the height of the rope pump promotion in the 1990s (Figure 2). On the one hand, this may be caused by the market saturation; in fact, current sales levels are more consistent with a stable market with potential for minimal growth. On the other hand, the increased access to electrical energy services in rural areas and, to a lesser extent, the option of solar-powered pumping, contributed to a decline in rope pump sales. According to SIASAR, the coverage of rural electrification rose from 47% in 2001 to 96.7% in 2019. And, for example, of 50 manually-drilled shallow boreholes constructed in one rural municipality in 2009, about 80% of the rope pumps had been replaced by small electric centrifugal pumps by 2022 (for more information, see the case study text box). Rural electrification and convenience were identified as the motivations for switching to electric pumps. A third factor that may have affected sales is the decline in external support for the promotion and commercialization of rope pumps by NGOs and aid agencies. This is because NGOs prioritize communal boreholes and small distribution system, rather than focusing on services at the household level.

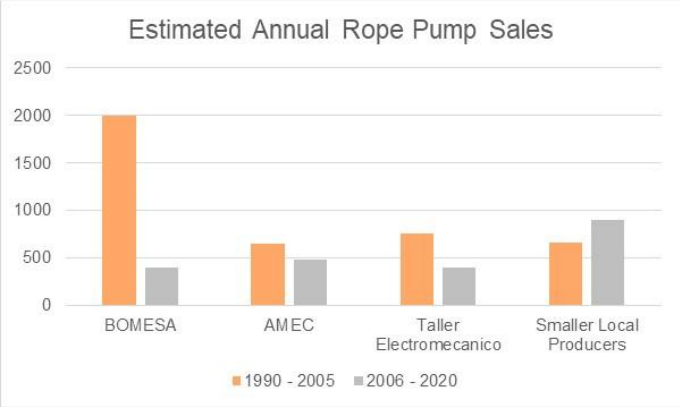

Figure 2: Trend in estimated annual sales of the 3 main producers and a variable group of smaller producers between two 15-year periods. Source: Briemberg (2022).

Economic impact

Replacing the traditional rope and bucket with a rope pump has an economic impact. A survey of over 4,000 families indicated that on average it increased their yearly income by US$220 (C$3,124) (van der Zee et al., 2002). Therefore, the cumulative income increase over the past 20 years for all the 50,000 rural families who had or have wells equipped with rope pumps could range between US$87 million[4] and US$220 million.

In general terms, the positive economic impact of a pump on a well can be attributed to: (1) a reduction in the recontamination of water in open hand dug wells, and thus reduced healthcare cost of waterborne diseases; (2) time saving due to the ease of extraction of water, and (3) more water readily available for both personal hygiene and productive uses given the ease of lifting water, assuming sufficient water availability. The calculation made by van der Zee et al. (2002) is based predominantly on the availability of water for livestock and small-scale irrigation (factor 3) and tangentially on factor 2. Regarding the first criteria, 48% of the population that lives in rural areas of Nicaragua is considered to be drinking unsafe (contaminated) water (WHO/UNICEF JMP, 2022). An early study by Gorter et al. (1995) found a 62% reduction in faecal coliforms in dug wells where ropes and buckets had been replaced by a rope pump, but there is a need of further studies that link drinking water safety to long-term usage of wells equipped with rope pumps.

Case study – from rope pumps to electric pumps

In 2009, 50 family wells were drilled in three communities of the municipality of Villanueva (Chinandega) in the framework of a project funded by the Dutch Rotary Club Haaksbergen and a Rotary Club in Leon. Forty of these wells were fully funded by the project and 10 were paid for by the users. Approximately 250 people were reached with this intervention. The direct cost of each water supply system was in the order of USD$850 including the well, rope pump and ceramic pot filter (branded "Filtrón" in Nicaragua). Households contributed with unskilled manual labour during the drilling process and local materials for the borehole filter pack.

In 2022, 39 of the 50 wells were surveyed (Briemberg, 2022). Four were no longer in use because of the house was no longer inhabited, the well casing collapsed or the household was now connected to the neighbour's electrical pump. Among the other 35 functioning wells, the original rope pumps were found to be in use in 20% of the wells, while the original rope pumps had been replaced by small electric centrifugal pumps in the remaining 80%. In most cases, the original structures of the rope pump were still found near the well (Figure 3).

Figure 3: Left: A functioning original rope pump on a family well (shared by two households) used for human consumption, washing, bathing and irrigation of patio garden; Matapalo village, Villanueva. Right: An original rope pump no longer in use, replaced by an electric centrifugal pump; Aquespalapa village, Villanueva. Source: Briemberg (2022).

[4] Calculated using the exchange rate for Nicaraguan Córdoba to USD of 28 July 2022 (C$3,124 → US$87)

Two of the 7 functioning rope pumps are located in a small sector (La Huerta), which remains without electricity. The rest of the functioning rope pumps (5) were found in the communities of Aquespalapa and Matapalo, which were reached by a rural electrification project in 2011.

The purchase and installation of the 28 electrically-powered centrifugal pumps was entirely driven and financed by the households; they travelled 50 km to the city of Chinandega for purchasing the pumps.

The ceramic pot filters, donated as part of the 2009 initiative, were no longer in use, except in 1 of the 39 households visited. In general, there was limited recollection of the filters that had been donated, nor why they were no longer in use. None of those interviewed knew where filters could be purchased. Only one of the families went one step further to purchase an ultrafiltration membrane filter.

Most of the households use the water for drinking, cooking, and personal hygiene; in addition, 30% of the households reported using it for small livestock (chickens), 27% to water the patio, and 15% for irrigation of feed crops for cattle. Twelve of the 39 households were willing to disclose information on their annual income, which ranged from US$667 to US$4,167, with an average of US$2,083 per household.

Conclusions and recommendations

About 48,000 family wells equipped with rope pumps are estimated to be present and functioning in Nicaragua. This represents 6.3% of the total rural population and 14% of the households currently considered to be without access to water supply according to the SIASAR rural water and sanitation information system. With respect to communal wells, 3,119 are equipped with rope pumps and 85% of those are considered to be functional.

The success of the rope pump in Nicaragua was favoured by various enabling factors, namely:

- the endorsement by a key government agency, that in 1995 included the rope pump in the list of standard technologies for rural water supply;
- the support of international aid agencies that invested not only in infrastructure development, but also on long-term technical assistance for manufacturers and communities;
- the creation of a pool of local manufacturers and artisans, who could readily supply rope pumps at competitive prices;
- the high pump efficiency and the simplicity of the technology in terms of construction, operation and maintenance;
- the affordability of the technology, with a cost of investment and operation over a three years' time, 35% cheaper than an electric centrifugal pump, and significantly cheaper than imported hand pumps;
- the willingness of families to pay for the pump (over 70% of all pumps were paid by families, so are examples of self-supply);

In addition, Briemberg (2022) highlighted that the support that some families received from NGOs - donation of rope pumps if families invested in constructing a well - did not distort the market and may have helped to create demand for rope pumps.

The cumulative income increase over the past 20 years for all the 50,000 rural families that had or still have a rope pump could range between US$87 million and US$220 million. With around US$2 million aid investment, the Nicaraguan rope pump is an outstanding example of high return on investment.

Nevertheless, some challenges still persist. These include:

- the development of a marketing strategy that takes into account changing contexts (e.g., increased electrification coverage in rural areas, combination with other solutions such as water filters or solar powered pumps);
- the establishment of formal after-sales servicing;
- the creation of a stable supply chain for spare parts;
- the formation of new skilled labourers at decentralized level;
- the design and deployment of financing options for acquiring rope pumps and other SMART products.

From this study, some recommendations aimed at sustaining and expanding the positive impact achieved by introducing the rope pump in Nicaragua emerged. These are practical actions that may be implemented by a wide array of national and international players.

- To include private household water points in the SIASAR information system. This should be coordinated at the national level by FISE, and implemented in collaboration with the UMASH at the local level.
- To conduct a market assessment to determine the current and future demand for household water technologies fit for self-supply. The study should aim at elucidating which products are already present on the Nicaraguan market and their potential.
- To disseminate the experience of the Nicaraguan rope pump in other regions, especially Sub-Saharan Africa where it can help reach Sustainable Development Goal 6.1, particularly in rural areas. The introduction of the rope pump or other locally-produced and low-cost water technologies can contribute to reducing rural poverty and increasing food security.

References

Alberts, J.H., van der Zee, J.J., 2003. A multi sectoral approach to sustainable rural water supply: the role of the rope handpump in Nicaragua. International Symposium on Water, Poverty and Productive uses of Water at the Household Level, 21-23 January 2003, Muldersdrift, South Africa. https://www.musgroup.net/sites/default/files/phpLPMx9N.pdf Accessed on 28 July 2022.

Borja-Vega, C., Pena, L., Stip, C., 2017. Sustainability of rural water systems: quantitative analysis of Nicaragua's monitoring data. Waterlines 36 (1), 40-70. https://www.jstor.org/stable/26600782 Accessed on 18 July 2022.

Briemberg, J., 2022. Rapid assessment of the long-term impact of the SMART approach. The case of the rope pump in Nicaragua. Project report. https://www.rural-water-supply.net/en/resources/details/1070 Accessed on 3 August 2022.

Gorter A.C., Alberts, J.H., Gago, J.F., Sandiford, P., 1995. A randomized trial of the impact of rope-pumps on water quality. Journal of Tropical Medicine and Hygiene 98(4), 247-55. https://www.ircwash.org/sites/default/files/232.2-95RA-18924.pdf Accessed on 28 July 2022.

Haanen, R. (2016).130,000 rope pumps worldwide. Many lessons learned. Poster presented at the 7th RWSN forum. https://rwsn-forum7.files.wordpress.com/2016/12/177-rik-hannen-poster-130000ropepumps-version20160821-a1.pdf Accessed on 3 August 2022.

IRC, 1995. Evaluation report Nicaraguan experiences with rope pump: final report. https://www.ircwash.org/sites/default/files/irc-1995-evaluation.pdf Accessed on 22 July 2022.

NTON 09 007 – 19 Diseño de sistemas de abastecimiento. Agua potable. 2021. http://legislacion.asamblea.gob.ni/normaweb.nsf/9e314815a08d4a6206257265005d21f9/0baccc4bfecb704006258789006aef8a?OpenDocument Accessed on 19 July 2022.

Van der Zee, J.J., Fajardo Reina, A., Holtslag, H., 2002. The impact of farm water supply on smallholder income and poverty alleviation along the Pacific Coast of Nicaragua: a case for low cost technology solutions. Centro de Estudios y Acción para el Desarrollo. Managua, Nicaragua. https://www.ircwash.org/sites/default/files/Zee-2002-Impact.pdf Accessed on 22 July 2022.

WHO and UNICEF Joint Monitoring Programme (JMP), 2022. Households database. https://washdata.org/data/household#!/table?geo0=country&geo1=NIC Accessed on 18 July 2022.

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About RWSN and this Publication

The Rural Water Supply Network (RWSN) is the only global practitioner-focused network dedicated to rural water supply. Since 1992, we lead collective action to accelerate progress towards universal and sustainable water services, with a focus on people in rural areas. Over the past three decades, we have evolved to become a diverse and vibrant network of over 13,000 individual members and 100 Member Organisations working on a wide range of topics, including self-supply, among others.

RWSN field notes are a loose series of publication, each dedicated to a specific practical experience or initiative. Further field notes can be found on the RWSN library.

This study summarizes the results of a literature review and a data collection effort, including a series of interviews with key stakeholders involved in the historic development and diffusion of the rope pump in Nicaragua. It has been made possible thanks to funding by the SMART Centre Group and Skat Foundation.

This field note can be found in the RWSN library: https://www.rural-water-supply.net/en/resources/details/1071

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Acknowledgements

Cover photos:

Top left: Stock of recently manufactured rope pumps at the AMEC factory, Managua, Nicaragua. Credit: Joshua Briemberg.

Top right: a functioning rope pump on a hand dug family well in the Municipality of Rosita, Nicaragua. Credit: Joshua Briemberg.

Bottom left: A local pump mechanic installing a wind wheel to power a rope pump and lift water to an overhead tank. Credit: Joshua Briemberg.

Bottom right: A rope pump on a family well near Chinandega in the eastern part of Nicaragua. Credit: Henk Holtslag.

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