SECURING WATER FOR FOOD

aQysta Performance Evaluation

Hydro-Powered Pumps in Nepal

AUGUST 2019

SECURING WATER FOR FOOD: A GRAND CHALLENGE FOR DEVELOPMENT

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TABLE OF CONTENTS

ABSTRACT

Founded in 2013 at Delft University of Technology, Netherlands, aQysta has since expanded to Colombia, India, Indonesia, Malawi and Nepal, and has provided a potential solution to the issues surrounding current and future access to water.

This study was undertaken to evaluate whether aQysta's Barsha pump has been successful in improving water access for farmers in Nepal. The evaluation involved fieldwork from July 16, 2019 to August 30, 2019, during which time data was collected on the Barsha pump's impact on end-users' farming activities, income, experiences with and thoughts on the innovation, and suggestions for improvements.

The study found that approximately 80 percent of the end-users interviewed felt that the Barsha pump has been beneficial to them. They noted the main benefit was the lower costs of inputs due to the pump using zero energy. More than half the interviewees experienced a positive change in the survival rates, yields, and diversification of their crops. Ninety-four percent said that they would recommend the pump, and plan to continue using it in the future.

In addition to concerns over climate variability and its influence on precipitation in Nepal, interviewees also highlighted the potential use of the pump for climate mitigation purposes. However, to maximize the benefits of the Barsha pump, interviewees also highlighted the need for further support in the form of education and extra farming equipment.

INTRODUCTION

Research location

Nepal, located in South Asia, is a landlocked country bordering China in the north and India in the south, east and west. The country lies within the Ganga River basin and includes three main geographic regions: the Himal mountain region, the Hilly region, and the Terai lowlands. Due to its geographic location, climate varies considerably and a range of groundwater (shallow and deep aquifers) and surface waters (glaciers, permafrost, lakes, springs, streams and rivers) are available, dependent on location (FAO, 2019).

Nepal benefits from high agro-biodiversity. Approximately 28 percent (40,138 km^2) of the country's total land area is used for agriculture. Its main crops include rice, maize, wheat, millet, and potatoes. Depending on their location, farmers also grow a variety of fruits and vegetables, as well as sugar cane, jute, cotton, barley, legumes, and tea (World Bank, 2016; FAO, 2019).

Of Nepal's approximate population of 28 million, 66 percent are directly engaged with farming. In total, Nepal's agricultural sector accounts for 25 percent of its Gross Domestic Product (GDP), which as of 2018 was valued at USD 28.812 billion. As such, the country is highly vulnerable to any negative changes within the agricultural sector (World Bank, 2018; FAO, 2019).

Climate variability and its potential impacts on Nepal have become a huge concern. A large majority of the country's 6,000 rivers are either fed by snow-melt discharge from the freshwater stored within the Himalayas and Mahabharat ranges or through summer monsoon rains. Predicted increases in temperature, along with changes in precipitation patterns within high altitude and latitude regions, pose a huge risk to the water resources on which Nepal is highly dependent.

Poor and marginalized communities, whose livelihoods are highly reliant on agriculture, are the most vulnerable to the variability of climatic conditions. For small and medium-sized farmers in Nepal, efficiently accessing a sufficient amount of water for their crops can be challenging. Simple and affordable solutions are needed to support farmers with their day-to-day activities and to provide them with tools to help mitigate the impacts of climate change (SWFF, 2019).

aQysta

aQysta, a high-tech start-up founded in 2013 at Delft University of Technology, Netherlands, and since expanded to Colombia, India, Indonesia, Malawi, and Nepal, has provided a potential solution to the issues surrounding current and future water access in Nepal. The for-profit organization has created a range of sustainable hydro-powered pumps that operate using energy from flowing water sources without the need for any external fuel or electricity (SWFF, 2019).

The Barsha pump was the first type of hydro-powered pump developed by aQysta. Depending on the soil, climatic conditions, and irrigation techniques, one pump can irrigate up to two hectares of land. The technology involves a propulsion mechanism to convert energy from flowing sources, such as rivers, into rotary motion, coupled with a suitable type of pumping mechanism to utilize the energy to lift the water to a field or storage container (aQysta, 2019).

aQysta says their pumps have been created with the aim not only of providing water, but also as a tool for social, economic, and environmental transformation. As such, they follow a "theory of change" where they believe that through providing reliable and cost-effective irrigation, year-round commercial farming can be achieved, resulting in employment opportunities, an increase in income and an overall improvement in society (aQysta, 2019).

To evaluate whether aQysta has been successful in its aim of improving water access for farmers in Nepal, a field evaluation was carried out. The evaluation involved fieldwork from July 16, 2019 to August 30, 2019. During that period, 54 semi-formal interviews were conducted, 52 of which were with farmers/end-users of the innovation. Two interviews were with mediators who work with organizations responsible for distributing the pump and supporting farmers.

METHODOLOGY

Sample selection

A list of end-users of the Barsha pump, provided by aQysta, was the starting point for selecting the interviewees. Complete contact information (name and phone number) was provided for only 100 of the 150 end-users on the original list. The other 50 were removed from the list of possible interviewees.

Initially, a short script was run in Python to randomly select 50 interviewees from the list of 100. This list of potential interviewees was then categorized into five groups, based on location. Due to the large distances between the different interviewee locations, as well as time and budget limitations, it was decided that all of the potential interviewees in a district should be contacted and not just those selected during the initial random sampling.

Following advice from aQysta team members and the local interpreter, it also was decided that certain areas could not be visited due to safety concerns related to the monsoon period and/or the location itself being too far from the study's base in Kathmandu.

The potential interviewees were contacted in advance to confirm their availability. This allowed the field evaluator to use the available time in the field efficiently. The interpreter was provided with clear instructions on how to explain the aims of the research to the farmers. The field evaluator monitored communication between the interpreter and farmers to ensure the correct information was conveyed during initial phone calls, meetings, and interviews.

Data collection and analysis

Table 1 and Map 1 provide an overview of when and where the 54 interviews were conducted during the fieldwork.

TABLE 1. INTERVIEW INFORMATION

FIELD TRIP DATES	DISTRICT	TOTAL NUMBER OF INTERVIEWS COLLECTED DURING EACH FIELD TRIP	NUMBER OF PARTICIPANTS IN EACH DISTRICT
TRIP 1: July 22, 2019 – July 24, 2019	Nuwakot	9	7
	Kathmandu		2
TRIP 2: July 26, 2019 – August 4, 2019	Gorka	18	2
	Tanahu		4
	Baglung		4
	Syangja		2
	Argakhanchi		1
	Dang		5
TRIP 3: Augst 8, 2019 – August 16, 2019	Sinduli	27	2
	Sindhupalchok		3
	Kavre		6
	Ramechhap		8
	Dhadhing		8

MAP 1. INTERVIEW LOCATIONS

The interviews were conducted by the field evaluator, with aid from an interpreter. During an interview, the questions were asked in English and translated into Nepali. Only one interview was conducted entirely in English without the support of the interpreter. On average, two to three interviews were conducted per day, with a maximum of six per day and a minimum of one.

All 54 interviews were conducted with individuals. However, family members, neighbors and/or other members of the interviewee's cooperative often joined to listen and occasionally added comments. Those comments were taken into consideration but focus was maintained on the answers given by the main interviewee.

The semi-formal interviews were structured using a questionnaire provided by SWFF. Answers were entered into the mobile-based version of the Fulcrum application during the interviews, and the interviews also were recorded using a mobile phone application. The questionnaire included approximately 50 questions and was structured to collect data on general background information (name, age, family size, farm size); effect of the innovation on farming activities; effect on income; and experience with and thoughts on the benefits of the innovation, as well as any improvements that could be made. To address those topics, a mixed-methods approach was used. Some questions required detailed qualitative answers from the interviewee, while other questions needed quantitative answers in the form of percentages or currency. Field observations, along with photographs of the interviewees and their property/farmland, also were included in the evaluation.

Once all the interviews had been collected, the data from the Fulcrum App was downloaded and processed in Excel. The data was cleaned and an analysis of each question was performed to summarize the answers given by the 52 end-users. This final report summarizes the findings.

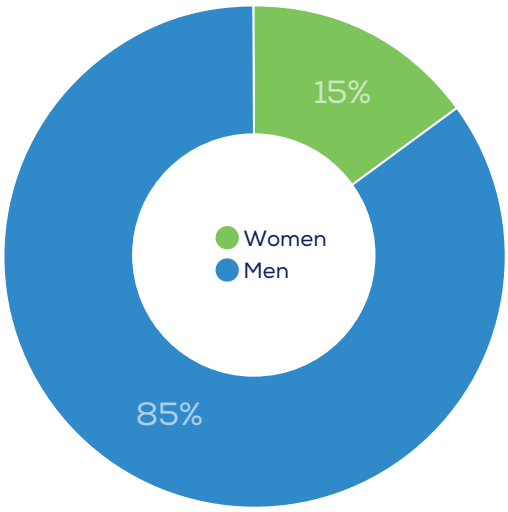
BACKGROUND

Background information regarding the gender, family size, occupation, and farming methods of the interviewees is provided below.

Gender

Of the 52 end-users interviewed, eight (15 percent) were women. This demonstrates the general trend in agriculture in Nepal: although women are involved and play an important part in farming, men have a more dominant role in this sector. Due to cultural norms, it was difficult to speak to women alone. Even though several women were listed as the main contact in the original information provided, their husbands often agreed to meet for the interview instead.

GRAPH 1. GENDER RATIO
N=52



Although it is not believed to have majorly influenced the research, it is important to note that a difference was experienced in male and female interviewee attitudes toward the female field evaluator. Interviews conducted with men often resulted in the conversation being directed to the male interpreter. Female interviewees, on the other hand, tended to direct their answers to the field evaluator, despite language barriers. Even though only eight women were included in this study, their willingness to participate in deeper discussion with the field evaluator provided the opportunity to collect plenty of data.

Family size

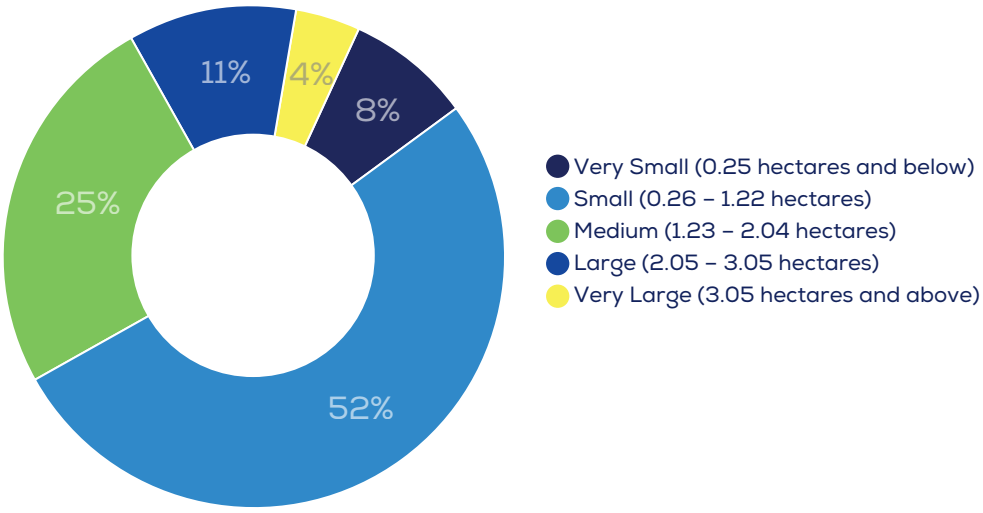
The average household included six members. The range in household size for the 52 interviewees was between 2 and 19 members. As most interviews were conducted during the day, children tended to be at school and were not seen.

Farm size

Thirty-five of the 52 interviewees (67 percent) said that they only use land that they own for their farming activities. The other 17 (33 percent) said that they also rent land to farm alongside the land that they own. Of those 17, 12 (70 percent) said that they pay rent for the additional land. The average amount of land owned or rented by an interviewee was 1.48 hectares (29 Nepali Ropani) and the land size range was between 0.05 to 16.28 hectares (1 - 320 Nepali ropani). The annual amount spent by each farmer on land ranged from approximately USD 561.63 to USD 28,958.82 (NPR 64000 - 3300000).

Three of the 17 who said they rent land (18 percent) reported that they give a percentage of their earnings to the landowner to cover the costs of renting the land and two (12 percent) said they received the land for free from the Nepali Government.

GRAPH 2. FARM SIZE
N=52



Graph 2 shows that the majority of the interviewees' farms fall in the "small size" category. This result is similar to the data collected previously by SWFF on end-users' farm size, which notes the average farm size to be 1.60 hectares.

Participation in farming

All of the 52 interviewees (100 percent) said that they participate in farming. Roles within farming varied depending on age and gender, as well as farm size, location and wealth of the family. For example, women tended to take on the role of planting and harvesting crops in the field, while the men were responsible for the more labor-intensive roles such as carrying heavy loads, ploughing the land and, if needed, taking the crops to market.

Other occupations or sources of income

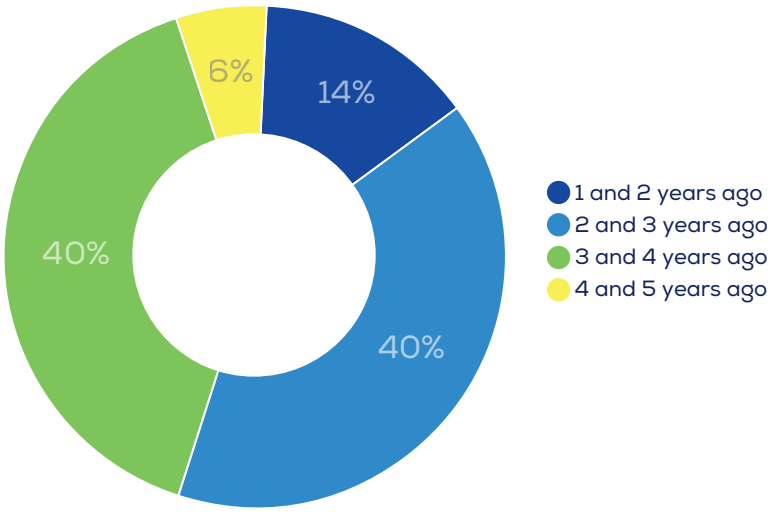
Seven of the 52 interviewees (13 percent) said their main occupation was not farming. The non-farming occupations included: teachers (2), a local cooperative manager, a hotel business owner, an agricultural office worker, and a field observer for an agricultural organization.

Of those interviewees whose main occupation was farming, 12 (27 percent) said that they also had other occupations/commitments. Those other occupations included working in a construction company, as a primary school teacher, as a construction laborer, in the restaurant business, in the transportation sector, in an office of an agricultural organization, and as a grocery store owner/within the seed business. One interviewee was enrolled in a Master's program. All seven (100 percent) who said their main occupation was non-farming related said their other occupation was farming.

Installation of the Innovation

The interviewees said the innovation had been installed between one and four years ago (between 2014 and 2018). Graph 3 shows that there has been an increase over the last four to five years in the number of pumps installed in Nepal.

GRAPH 3. INSTALLATION OF THE INNOVATION
N=52



RESULTS

EXPERIENCE WITH INNOVATION

Previously used technology

Many of the interviewees said that they had used an electric or petrol water pump before the innovation was installed. When comparing the electric/petrol powered pump to the Barsha pump, the interviewees felt that a clear benefit of the Barsha pump was that it required less labor. When an electric pump is used, farmers need to continuously monitor it so money is not wasted on unnecessary electricity use. The Barsha pump can be left unattended in a river during the day or overnight, providing the water flow is not too strong. Theft was not mentioned to be a concern by any of the interviewees. This was likely due to the fact that all the interviewees live in rural, tight-knit communities where crime is not generally a problem.

Despite the positives of the Barsha pump, many of the interviewees still said that they felt the electric pump is more reliable and three of them (6 percent) said explicitly that to meet their water demands they are still using an electric pump alongside the innovation.

Acquiring the Barsha pump

The majority of the interviewees said that they had no issue acquiring the pump. Most had been given the pump by the Ministry of Agriculture or an NGO and as such, had little or no contact with aQysta.

BENEFITS OF INNOVATION

Agricultural activities benefit

HARVESTS

All of the interviewees said that there is no primary growing season, and crops are grown year-round. However, the rainy season has traditionally been the main growing season. The average amount of harvests noted in one year was three. Two of the 52 interviewees (4 percent) felt that the pump had influenced the amount of harvests per year. Previously, due to reliance on the rainy season, farmers were only able to harvest one or two times per year. With access to the pump, they have been able to increase the amount of harvests to three to four times per year. Eight of the interviewees (15 percent) noted that they have been harvesting more than three times a year for at least one year.

Water benefits

MAIN WATER SOURCE

Forty-five of the 52 interviewees (87 percent) said that their main water source was a nearby river. Six (11 percent) said that their main water source was a nearby stream and one (2 percent) said that they used water from both a stream and a river.

CURRENT IRRIGATION METHODS

Forty-six of the 52 interviewees (89 percent) said they use the pump in the dry season (when and where possible), and during the rainy season, they tend to rely on the rains to water their crops. Of the 46, 12 (26 percent) said that they store the water in a pond so that it can be used in the dry season and distributed to the crops when needed. Three (6 percent) said that they use a combination of an electric pump and the hydro-pump to meet their water needs. One (2 percent) said that they use the pump during both the dry and rainy seasons. Six of the 52 interviewees (11 percent) said that although they tried to use the pump in the past, they currently rely solely on rain-fed irrigation.

ACCESS TO WATER

Thirty-nine of the 52 interviewees (75 percent) said that their access to water has improved due to the pump. One (2 percent) said that access had vastly improved. Six of the 52 (11 percent) said that access had only slightly improved and six (11 percent) said that there had been no change.

WATER USAGE SINCE THE INSTALLATION OF THE PUMP

Forty of the 52 interviewees (77 percent) said that they had used more water since the installation of the pump. Many of the interviewees commented that their water usage increased once the pump was installed due to increased access to water during the dry season. Previously, they relied only on rainwater during the rainy season to grow their crops. One interviewee noted that the increased access to water during the dry season due to the pump allowed them to start a fish farm business.

For several of the interviewees, before the installation of the pump, their land could not be used in the dry season. As such, water access of any kind in the dry season dramatically increases their overall water usage. Even those who said that the water supply is not sufficient for their crops still recognized that the situation now is better than in the past.

For several of the farmers, water usage has increased because they no longer have to carry the water themselves. The Barsha pump allows for irrigation and water storage to be done more efficiently.

During the rainy season, the amount of rainwater was often sufficient. But due to a rise in population and an increase in farms in the area, more water access during the dry season is needed to meet needs for water. However, despite the many noted improvements, 12 of the 52 interviewees (23 percent) still felt there had been no change in their water use since the installation of the pump.

Crop benefits

CROP SURVIVAL RATES

Forty-seven of the 52 interviewees (90 percent) said that the survival rates of their crops had increased, while five (10 percent) said that the survival rates of their crops had not increased due to the pump.

CROP YIELDS

Thirty-eight of the 52 interviewees (73 percent) said that their crop yields had increased due to the pump. Two (4 percent) said that their crop yields had substantially increased. Six (11 percent) felt that yields had only slightly increased and six (11 percent) said their crop yields had remained the same before and after the innovation was installed.

DIVERSIFICATION OF CROPS

Twenty-four of the 52 interviewees (46 percent) said that before the installation of the Barsha pump they were only growing staple crops. Since the installation, however, they have been able to successfully grow and harvest a combination of staple crops and vegetables. Eight of the 52 (16 percent) noted that in the past their land had either been barren/not useful during the dry season, but now due to the pump they are able to grow more staple crops and/or vegetables. Despite having access to the pump during the dry season, 7 of the 52 (13 percent) said that they are still only growing staple crops in the rainy season and sometimes in the dry season.

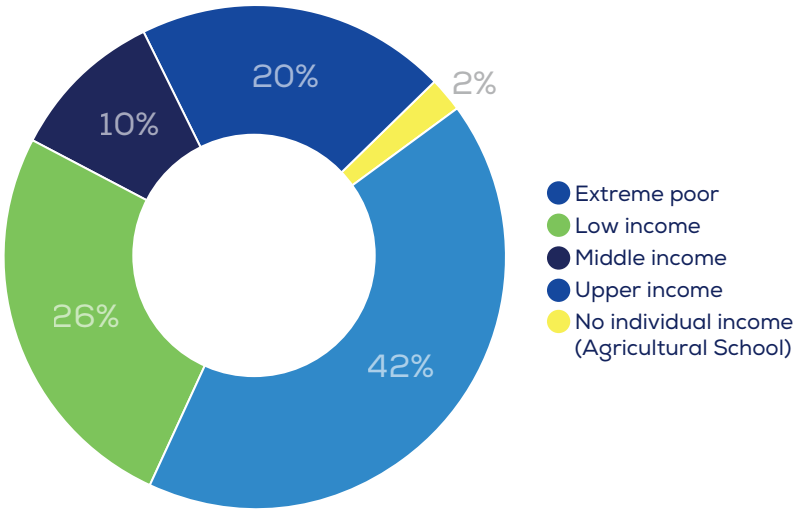
Eleven of the 52 interviewees (21 percent) experienced no change in the crops they have been growing since the installation of the pump. They have continued to grow a mixture of staple crops and vegetables depending on the season. Two of the 52 (4 percent) said that they have not been able to grow anything successfully despite trying to do so both before and after the innovation arrived.

Income benefits

The incomes of those who were interviewed averages approximately USD 6,500 (range = USD 200 to 40,000). The annual household income of the 52 interviewees is shown in the graph below.

GRAPH 4. ANNUAL HOUSEHOLD INCOME

N=52



NON-FARMING SOURCES

In terms of the percentage of income coming from non-farming sources, 33 of the 52 interviewees (63 percent) said that between 0 and 25 percent of their income was from non-farming related activities. Nine of the 52 (17 percent) said between 26 and 50 percent of income was from non-farming related activities, four (8 percent) said it was between 51 and 75 percent, and six (12 percent) said it was between 76 and 100 percent.

CHANGES IN INCOME DUE TO INNOVATION

When the interviewees were asked to compare their income before and after the installation of the innovation, 35 of the 52 (67 percent) noted an improvement in their annual income. Seventeen of the 52 (33 percent) felt that there had been no change in their income due to the innovation.

Of the 35 who experienced an increase in income, 24 (68 percent) said their income improved by between USD 1 and USD 2,000. Of the 24, 18 (75 percent) experienced an increase in income below USD 1,000. Seven of the 35 interviewees (20 percent) noted their income improved by between USD 2,001 and USD 4,000, and four (12 percent) noted their income improved by between USD 4,001 and USD 6,000.

Poverty reduction benefits

When asked whether they felt their overall family income had improved, eight of the 52 (15 percent) felt that the innovation had not improved their income at all, 25 (48 percent) felt that it had improved somewhat, and 16 (31 percent) said it had improved significantly. Only three (6 percent) said they felt their overall family income improved very significantly.

Gender differences

As noted previously, only eight of the 52 interviewees (15 percent) were female. In some cases, even when the original name provided was for a female end-user, the husband came for the interview instead of the wife.

The Barsha pump was not distributed with the direct aim of addressing gender inequality issues in Nepal. However, there were cases, noted in detail later in the report, where the pump has been used primarily by women farmers.

Regional differences

PROXIMITY TO THE CITY

One of the interviewees in Dhadhing felt that the areas closest to the cities, particularly Kathmandu, receive more support from NGOs and the Nepali Government. Table 2 below shows the average annual income for each district included in this research project.

Table 2 shows that there is not a clear relationship between the average annual income of each district and the proximity of the district to Kathmandu. The districts of Nuwakot and Dhadhing, both located close to Kathmandu and with decent road access, have two of the highest average annual incomes.

TABLE 2. AVERAGE ANNUAL INCOME FOR EACH DISTRICT*

DISTRICT	AVERAGE ANNUAL HOUSEHOLD INCOME (USD)
Nuwakot	9,785
Kathmandu	600
Gorka	2,500
Tanahu	3,050
Baglung	17,500
Syangja	3,250
Argakhanchi	11,000
Dang	5,666.66
Sinduli	2,300
Sindhupalchok	3,933.33
Kavre	4,366.66
Ramechhap	9,100
Dhadhing	7,000

*Refer to Color Code on Map 1

DISCUSSION

ISSUES/LIMITATIONS

Overall, the fieldwork ran smoothly. Despite initial safety and access concerns regarding the monsoon, the data collection requirements were met within the given time frame and budget. It should be noted, though, that certain limitations were experienced.

When using an interpreter, it can be difficult to ensure that all the information given during an interview is correctly translated. Though measures were taken to carefully monitor and check the information, it is still important to note that translations sometimes may not always be completely accurate. This is not to criticize the work of the interpreter, but instead to note that due to differences in culture, sometimes certain ideas and views are difficult to translate.

RESPONDENT ATTITUDES TOWARD THE INNOVATION

In general, the interviewees recognized the benefits of the innovation, despite some not feeling the benefits to date. Some farmers felt that they had not yet benefited financially from the innovation. In general the main issues noted had to do with the need for extra support or equipment.

Usage and availability

For the majority of the interviewees (42 of the 52, or 82 percent), information about the pump was first provided by the Ministry of Agriculture. One of the interviewees (2 percent) said they attended an agricultural show where they had seen the Barsha pump on display and this inspired them to then inquire about the pump. Two (4 percent) said that they saw an advertisement in the newspaper, and then contacted the Ministry of Agriculture about how to acquire a pump. Two (4 percent) heard about the innovation from a neighbor and then received the pump from the Ministry of Agriculture. Two (4 percent) heard about it from HEIFER, a non-profit working the area, and one (2 percent) said they heard about it from both IPAC and HEIFER. One interviewee (2 percent) said they had not been involved in the process of obtaining the pump at all and only heard about it once it arrived in the village.

When asked what initially influenced them to try the innovation, 21 of the 52 (40 percent) said the main factor was that it was provided for free. Seventeen (32 percent) said that it was due to a combination of the general benefits such as zero energy, low cost and portability, which they had either seen advertised or had been told about directly. Six of the 52 (12 percent) said that, in particular, the "zero energy" element caught their attention and inspired them to try it. Five (10 percent) said they were influenced by seeing the benefits demonstrated by a neighbor and by the fact that the pump was provided for free. Three (6 percent) said that they tried the innovation because they had no alternative options, and added that they were influenced to try it due to receiving it for free from the Ministry of Agriculture.

Crop yield and survival rates

Thirty-eight of the 52 interviewees (74 percent) said that their crop yields had increased following the installation of the Barsha pump. Two (4 percent) said that their crop yields had substantially increased and six (11 percent) said that they had slightly increased. Six (11 percent) said their crop yields had not been influenced by the Barsha pump. Importantly, none of the interviewees felt that their crop yields had decreased due to the innovation.

Forty-seven of the 52 interviewees (90 percent) noted that there had been an increase in crop survival rates due to the pump. Five of the 52 (10 percent) noted that the survival rates of their crops had not increased due to the pump. None of the interviewees said that crop survival rates decreased due to the innovation.

The interviewees who experienced a positive impact on their crops felt that this was due to their increase in access to water in the dry period. The zero-energy element of the Barsha pump resulted in lower costs, adding to their positive perception of it. External factors such as weather conditions and government subsidies also impact the crop yields and survival rates and as such, from this research, it is difficult to determine the exact extent to which the pump has helped improve crop yields and survival rates.

Affordability

FINANCING OF CURRENT AGRICULTURAL ACTIVITIES

When asked how they were financing their farming activities, 21 of the 52 interviewees (40 percent) said that they only used their own savings. Seventeen (33 percent) said that they fund their farming through a combination of credit (small-medium loans from the bank) and their own savings. Eight (15 percent) said that they used their own savings along with support from small loans and subsidies from the Ministry of Agriculture, their own cooperative and/or an organization such as HEIFER or IPAC. Five (10 percent) funded their farming activities only through loans taken from the bank. One (2 percent) said that they used their own savings and income from their pension. When asked whether their access to credit had improved due to the innovation, 16 of the 52 (31 percent) said that they felt it had improved, while 36 (69 percent) said they had not seen an improvement.

INNOVATION COSTS

Thirty-four of the 52 interviewees (65 percent) did not pay anything for the pump. Eighteen (35 percent) paid between USD 307.14 and USD 658.15 (NPR 3500 - 75000) for the Barsha pump. In most cases, approximately 85 to 90 percent of the cost was subsidized by the Ministry of Agriculture. Four of the 18 (22 percent) said they paid 10 percent of the total cost for the pump as a cooperative. Three of the 18 (17 percent) said they have not yet actually paid the 10 percent for the pump, either because they wanted to wait to see if the pump was useful or because the Ministry had not yet followed up on the payment. Five (28 percent) said they had to pay for the transportation/installation costs themselves. It should be noted that it was difficult to understand what payments were actually made by the interviewees for the pump, as the interviewees were often not entirely sure themselves.

PERCEPTIONS ON PAYMENT

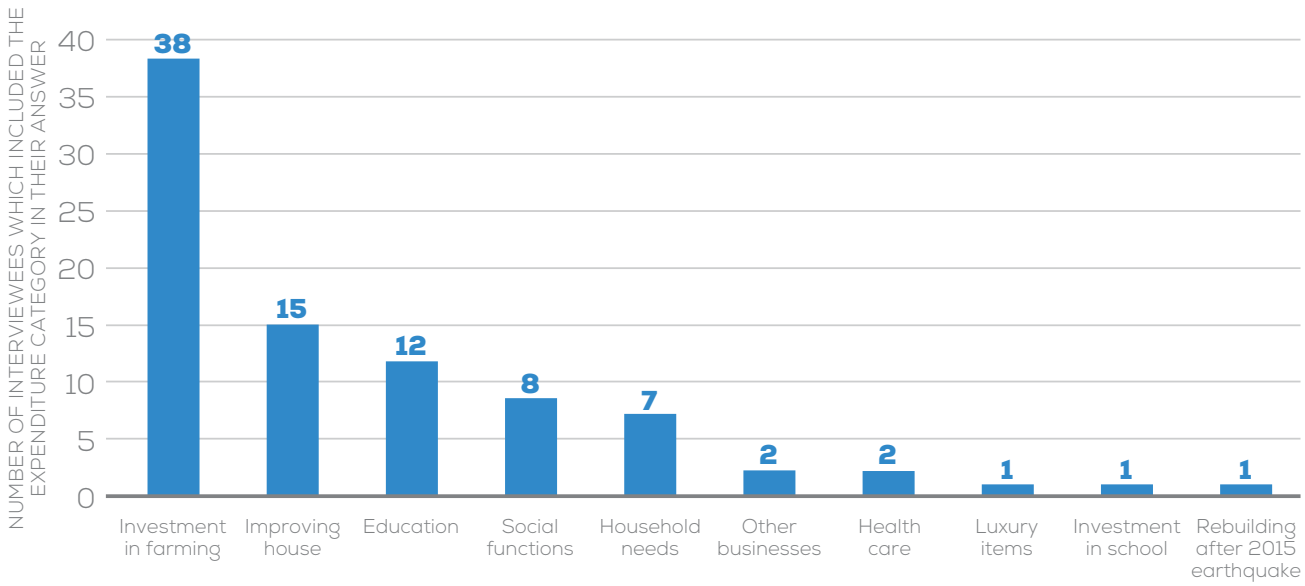
Based on their knowledge of the innovation and how beneficial it has been for them, the interviewees were asked how much they would be willing to pay for it. Thirty-two of the 52 (61 percent) said they would not be willing to pay for the innovation knowing that they could receive it for free. Fifteen (29 percent) said they would pay the same amount they had paid in the past. Three (6 percent) said they would be willing to pay 50 percent more now that they know the benefits of the pump. One (2 percent) said they would pay 50 percent less now that they know the benefits, and one (2 percent) said they would not be willing to pay anything.

Changes in income

As noted previously, 35 of the 52 interviewees (67 percent) noted an improvement in their annual income due to the innovation. Seventeen interviewees (33% percent) noted that there had been no change in their annual income due to the innovation. Of the 35 who noted that they had experienced an improvement, 24 (68 percent) noted their income improved by between USD 1 and USD 2,000, and of those, 18 (75 percent) increased their income by less than USD 1,000.

The table below summarizes the expenditures of the 35 interviewees who noted an improvement in their income. Note that the interviewees often noted multiple new expenditures.

GRAPH 5. USE OF NEW INCOME



As shown in Graph 5, the majority of interviewees chose to invest their new income back into their farms. Interviewees also noted that their new income went toward improving their houses and providing education for their children. One interviewee said they had used their new income to rebuild their home. Rebuilding around the country is still ongoing following a 7.8 magnitude earthquake in 2015 that left more than 8,600 dead and destroyed more than 500,000 homes.

Of the 33 percent who noted that there had been no change in their annual income, the majority felt that was due to the pump not being suitable for the landscape of their farms. However, it should be noted here that in the context of a developing country, financial gains are not the only way benefits can be experienced. Although some interviewees did not experience an improvement in their income, many noted that due to the pump requiring zero energy, unlike the electric pumps used previously, the pump did not need to be monitored, which freed up their time. For those who were not using any form of a pump before, access to this innovation allowed them to irrigate their land more efficiently and decrease their workload. They might not have experienced any increase in their income to date, but this does not mean that changes will not be experienced in the future.

Changes in inputs

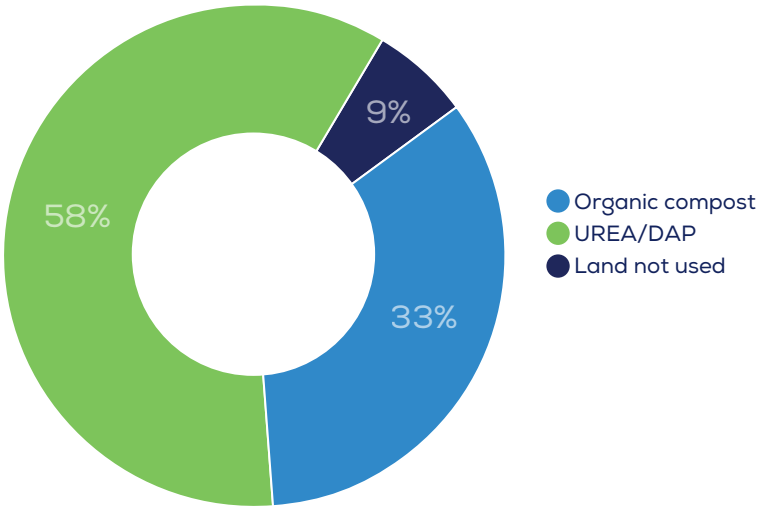
Data was gathered on changes in fertilizer, labor, equipment and storage and transportation before and after the innovation was installed. The data helps understand how those inputs were impacted by the innovation.

FERTILIZER

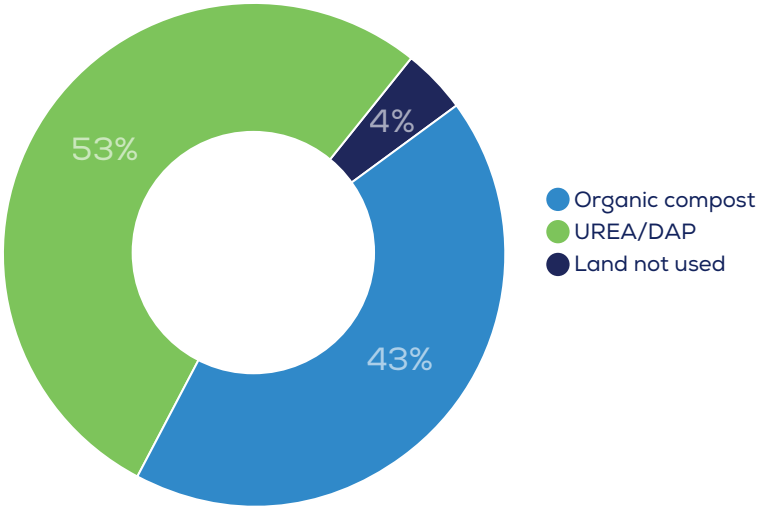
Types of fertilizer used

Two main types of fertilizer - UREA and DAP - are used in Nepal. For this data collection, the two types of fertilizer are categorized together.

GRAPH 6. FERTILIZER USE BEFORE THE INNOVATION N=52



GRAPH 7. FERTILIZER USE AFTER THE INNOVATION N=52



Comparing fertilizer use before and after the installation of the Barsha pump, Graphs 6 and 7 show that there has been a decrease of 5 percent in the use of UREA/DAP and an increase of 10 percent in the use of organic composts.

Changes in use of DAP/UREA

Table 3 provides a breakdown of the percentage of interviewees using DAP/UREA, using each amount of fertilizer (0-200kg, 201 - 400kg, 401-600kg, 601-800kg, 800kg +), before and after the installation of the Barsha pump.

TABLE 3. COMPARISON OF PERCENTAGE OF INTERVIEWEES USING DIFFERENT AMOUNTS OF FERTILIZER BEFORE AND AFTER INNOVATION

AMOUNT OF FERTILIZER USED (KG)	USING FERTILIZER BEFORE INNOVATION (% OF INTERVIEWEES)	USING FERTILIZER AFTER INNOVATION (% OF INTERVIEWEES)
0 – 200 kg	73%	71%
201 – 400 kg	70%	7%
401 – 600 kg	3%	4%
601 – 800 kg	3%	11%
800+ kg	3%	7%

A slight decrease can be seen in the percentage of interviewees using smaller annual amounts of fertilizer (0 - 200 kg and 201 - 400 kg) after the installation of the pump. However, an increase also can be seen in the percentage of interviewees using larger amounts of fertilizer (601 - 800 kg and 800+ kg) after the installation of the pump.

Changes in fertilizer usage

Thirteen of the 52 interviewees (25 percent) said they used organic compost both before and after the innovation. Three (6 percent) said they changed from organic compost to fertilizer. Eight (15 percent) said they changed from fertilizer to organic compost. One (2 percent) said that before the innovation they were not using any fertilizer on their land, but now due to the innovation they have started to use organic compost on their crops. Two (4 percent) said that they went from not using anything to using fertilizer. Seven (13 percent) said that they are using less fertilizer, with the decrease in the amount of fertilizer used ranging from 10 to 200 kg per year. Four (8 percent) said they are now using more fertilizer, with the increase in the amount of fertilizer used ranging from 10 to 55 kg per year. Twelve (23 percent) said there have been no changes in the amount used and one (2 percent) said they are not using any at all.

Fertilizer cost

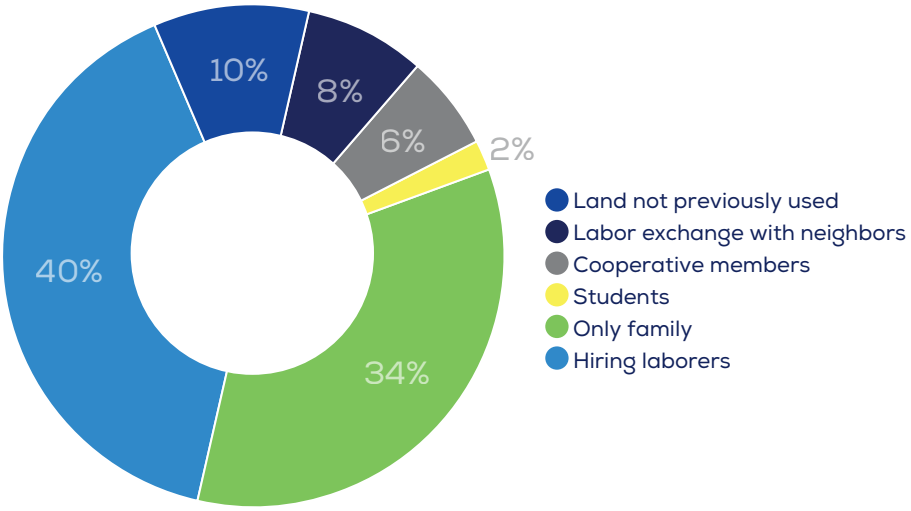
In the past, the average amount spent on fertilizer was USD 112.02 per year (NPR 12,765 per year). The fertilizer cost range was USD 13.16 - USD 702.03 per year (NPR 1500 - 80000 per year). Compared to the average amount currently spent on fertilizer by those using it (USD 96.75 per year, or NPR 11,025) and the fertilizer cost range (USD 7.02 - USD 175.51 per year, or NPR 800 – 20000), there has been a decrease in the amount spent. Many of the interviewees said the decrease is largely due to a movement by the Ministry of Agriculture to encourage farmers to use organic fertilizers.

LABOR

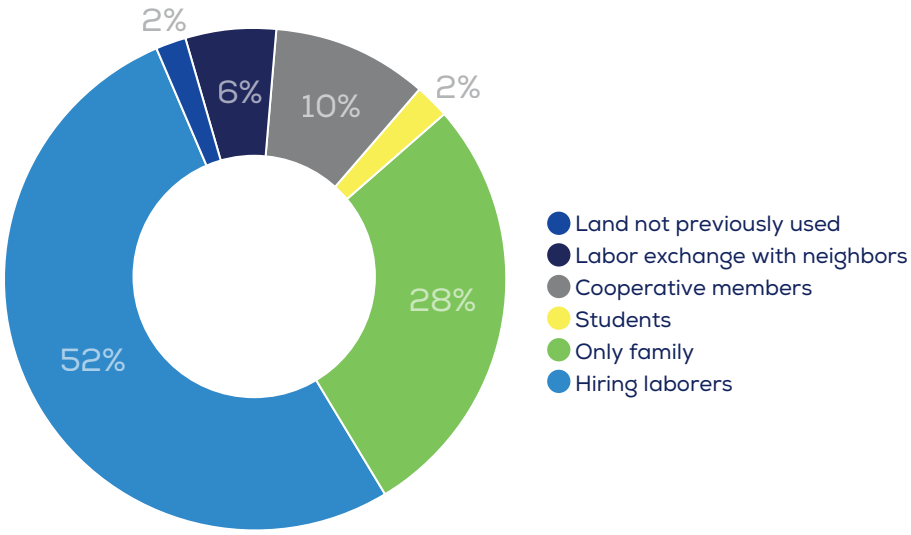
Changes in usage of different labor types

Graphs 8 and 9 show the difference in the labor types used by the interviewees for their farming activities.

GRAPH 8. LABOR USE BEFORE THE INNOVATION
N=52



GRAPH 9. LABOR USE AFTER THE INNOVATION
N=52



There was a 12 percent increase in the percentage of interviewees hiring laborers to work on their farms. There was also a 6 percent decrease in the percentage of interviewees only using their families to work on the land.

Changes in hired labor

TABLE 4. COMPARISON OF PERCENTAGE OF INTERVIEWEES HIRING LABORERS BEFORE AND AFTER INNOVATION

ANNUAL NUMBER OF LABORERS HIRED	HIRING LABOR BEFORE INNOVATION (% OF INTERVIEWEES)	HIRING LABOR AFTER INNOVATION (% OF INTERVIEWEES)
0 – 50	48%	52%
51 – 100	23%	26%
101 – 150	14%	11%
151 – 200	5%	0%
200+	10%	11%

Table 4 above shows an overall increase in the percentage of interviewees hiring laborers since the innovation was installed.

Changes in labor usage

Looking closer into the changes in labor usage, 15 interviewees (28 percent) noted that there has been no change in the amount of labor they have hired due to the innovation. Thirteen (24 percent) noted that previously only their family was working the land and this has not changed. Three (6 percent) noted that the cooperative they are involved with all worked on the land together, both before and after the innovation was installed. Two (4 percent) noted that they have continued to exchange labor. One (2 percent) noted that they are still not using the land and as a result have never needed to hire any laborers.

One interviewee (2 percent) is an agricultural school, and the students work on the land as part of their curriculum. As a result, they have not experienced a change in labor type due to the innovation.

Table 5 summarizes the changes in labor type and usage for the 17 interviewees who are using their land and have experienced change.

TABLE 5. COMPARISON OF USAGE OF LABOR TYPES BEFORE AND AFTER INNOVATION

PERCENTAGE OF INTERVIEWEES (%)	LABOR TYPE BEFORE INSTALLATION OF THE INNOVATION	LABOR TYPE AFTER INSTALLATION OF THE INNOVATION
18%	Hiring laborers	Increase in hiring laborers: 8 – 100 laborers per year
18%	Hiring laborers	Decrease in hiring laborers: 10 – 80 laborers per year
18%	Only family working	Hiring laborers: 30 – 50 laborers per year
18%	Land not previously used	Hiring laborers: 15 – 70 laborers per year
5%	Only family	Cooperative
12%	Land not previously used	Cooperative
5%	Labor exchange with neighbors	Only family
6%	Only family	Labor exchange with neighbors

Labor cost

The average amount spent on labor in the past was approximately USD 6.84 per person per day (NPR 780 per person per day). The labor cost range was from USD 4.39 to USD 10.53 per person per day (NPR 500 – 1200 per person per day) with a range of USD 1.76 to USD 5.27 (NPR 200 – 600) difference in men's and women's wages. The average amount spent on labor now by those hiring laborers is approximately USD 6.95 per person per day (NPR 792 per person per day). The labor cost range is USD 4.39 to USD 8.78 per person per day (NPR 500 - 1000 per person per day).

FARMING EQUIPMENT

Tractor

Two of the 52 interviewees (4 percent) said that they had already bought a tractor due to the innovation, at a cost of between USD 702.03 and USD 833.66 (NPR 80000 - 95000). One of them also bought a power tiller and an electric pump. One said that they also plan to invest in a pond for a fish farm/water storage. One of the 52 (2 percent) also noted that they hire a tractor when needed, at a cost of USD 30.71 per hour (NPR 3500). However, they have been doing this for more than 10 years and it is not due to the installation of the innovation.

Mini tiller

Three of the 52 (6 percent) said that they bought a mini tiller due to the innovation, in a cost range of USD 351.02 to USD 614.28 (NPR 40000 - 70000). All did so with an approximately 50 percent subsidy. One (2 percent) now rents a mini tiller when needed, at a cost of USD 1.76 per hour (NPR 200). Four of the 52 (8 percent) said that they bought a power tiller, with a cost range of USD 394.89 to USD 702.03 (NPR 45000 - 80000), and all did so with a subsidy. One of the four (2 percent) also brought a tractor and an electric pump at the same time.

Hand tiller

Thirteen of the 52 interviewees said that they bought a hand tiller due to the innovation (25 percent). One of the 13 (8 percent) bought two hand tillers. The cost range for a hand tiller was between USD 351.02 (with a 50 percent subsidy) and USD 1,491.82 (with no subsidy, though only one person bought a hand tiller for the full price) (NPR 40000 - 170000). Of the 13, five (38 percent) also bought other farming equipment. Two of the five (40 percent) bought a thresher, one (20 percent) bought a pesticide sprayer, one (20 percent) bought a rice processor, and one (the agricultural school, 20 percent) invested in their agricultural lab.

Two of the 52 interviewees (4 percent) said they are currently renting a hand tiller, when needed, due to the innovation, at an approximate cost of USD 42.12 per day (NPR 4800). One of those two said they aim to buy a hand tiller in the future. Five of the 52 (10 percent) were interested in investing in their own hand tiller in the future.

Future Aspirations

Twenty-three of the 52 interviewees (44 percent) said they have not bought any new equipment since the installation of the pump. Of the 23, eight (35 percent) said they aim to invest in new farming equipment in the future. Of the eight, five (62.5 percent) said they would be interested in buying a hand tiller, one (12.5 percent) said they are looking for a machine to supply oxygen in the fish ponds, one (12.5 percent) aims to invest in a mini tractor and one (12.5 percent) is aiming for a large tractor.

TRANSPORT AND STORAGE

Thirty-three of the 52 interviewees (63 percent) said they do not spend anything on transport and storage, because they tend to sell the crops directly, there is no need for storage, and they either carry the crops to market by foot or a buyer comes to them to buy the crops. One of the 33 (3 percent) said they purposely grow only a small amount so that they do not need to store the crops. And one (3 percent) commented that he sells his crops in his own shop directly from the field. Two (6 percent) said they have not been able to grow any crops or a large quantity of crops, and therefore have not needed to spend on transport or storage.

Of the 17 remaining interviewees, 14 (82 percent) said they spend money on transportation of their crops but not on storage because they tend to sell the crops directly and do not need to store them. Three of the 17 (18 percent) said they spend money on both storage and transportation. The main crop that was stored was potatoes. The rest of the crops, particularly vegetables, tend to be sold directly to the market once they are harvested.

Impact on poverty

Table 6 below provides further insight into the impact of the innovation on the interviewees' income. Before the innovation, 75 percent of the interviewees were toward the lower end of the income bracket. Twenty-three percent were in the higher income bracket. The agricultural school accounts for the remaining 2 percent. This indicator is not applicable to the school. Following the implementation of the innovation, a slight improvement in income levels can be seen. Three percent of the interviewees experienced a change in income, moving them into a higher income bracket. Of course, it is difficult to truly determine whether those changes are entirely due to the innovation.

TABLE 6. CHANGES IN INCOME CATEGORY

EXTREME POOR AND LOWER INCOME		MIDDLE AND UPPER INCOME	
BEFORE INNOVATION	AFTER INNOVATION	BEFORE INNOVATION	AFTER INNOVATION
39 (75%)	36 (68%)	12 (23%)	15 (30%)

Gender differences

As noted previously, only eight of the 52 interviewees were female. Many interesting discussions were conducted with the limited number of available female farmers regarding the benefits of the innovation for women. Two female interviewees provided different insights into the potential benefits of the pump as well as the challenges involved in its successful implementation as a tool for social, economic, and environmental improvements.

One female interviewee, located in the district of Tanahu, and fitting into the "extreme poverty" category, said the pump had not been beneficial to her. She was happy with the land given to her for free by the Government and was keen to be provided with further support for her farm in the form

of the Barsha pump. As part of the agreement for receiving free land, she was required to form a cooperative. Her expectations were that the innovation would help her and other members of her group irrigate their crops during the dry season and provide them with the ability to grow a wider range of crops, particularly cash crops. However, due to a lack of training and support, she said that despite having the pump for two years, she has not seen any benefits. She indicated she would be happy to give the pump to someone else who could make better use of it. Observations during the interview highlighted that the education level of the user has likely created a barrier to the pump's successful uptake, supporting the notion that more support needs to be provided with the pump.

Another female interviewee, located in Phadhing, Kathmandu, also categorized in the "extreme poverty" income bracket, said that for her and her female-focused cooperative, the pump has been very beneficial. Since the pump does not require any electricity, she said input costs dramatically decreased compared to when they were only using the electric pump. They have been able to reinvest their new income into their farms, giving them agency over their own lives. Although the pump has not been directly aimed at improving conditions for women in agriculture, this case provides an example of the indirect benefits of an innovation with low input costs.

Benefits of the innovation for the end-user

Thirty-six of the 52 interviewees (69 percent) said that the innovation helps due to the lower cost of inputs. Fifteen (29 percent) said that it helps in producing more of their main crop. Twenty-eight (54 percent) said that it helps reduce labor. Four (8 percent) said that it helps improve the health and strength of their livestock. Twelve (23 percent) said that the innovation has helped due to the reduced energy costs. Five (10 percent) said that it has helped make the water reusable. Eight (15 percent) said that it has helped reduce crop waste. Two (4 percent) said they felt it has helped women farmers. One (2 percent) said it has helped for educational purposes. Fourteen (27 percent) said it has helped them with deciding which crops to plant and when to plant them. One (2 percent) said that the innovation needs less maintenance than other previously used (electric) pumps. One (2 percent) said it had helped because it is not dangerous since there is no electricity. Seven of the 52 (13 percent) said that the innovation has not helped them at all and four (8 percent) said that the question was not applicable to them due to not being able to use it properly.

RECOMMENDATIONS AND FUTURE USE

Ten of the 52 interviewees (19 percent) would "strongly recommend" the innovation and 39 of the 52 (75 percent) would "recommend" it. Of the 39 who would recommend the innovation, 10 (27 percent) said that they would recommend it because they recognize the benefits, however, they themselves have either not felt the benefits or believe that improvements would be needed to the pump for them to recommend it. Two (4 percent) were indifferent and only 1 (2 percent) said that they would not recommend the innovation.

Three of the 52 (6 percent) said they would not be willing to continue using the innovation as the pump is not suitable for the landscape in which their land is situated. Those interviewees noted that their land was located close to the river, but there was a steep incline preventing the water reaching their land.

Forty-nine of the 52 (94 percent) said they will continue to use the innovation. However, several of these interviewees said that further improvements or changes in their approaches would be needed. One (2 percent) commented that they will need the pump to be fixed before they can do so, adding that the pump had been broken into pieces and needed to be completely repaired. One (2 percent) said that although the pump has not yet been useful, they will continue to try using it on another piece of land they have rented. One (2 percent) also said that although the pump had not been useful for their crops, they will continue to use the pump to collect water for their cattle. One interviewee (2 percent) said the pump may even become useful in the rainy season as the rainfall decreases.

Benefits of innovation on community

All of the interviewees noted that in one way or another they share their knowledge about the innovation. Forty (77 percent) said they mainly share information by talking with neighbors and other farmers. Most said that they share information locally. Eight (15 percent) said that others either pass by or come to see the pump, so they don't need to share information about it. Four (8 percent) said that everyone in the area already has a pump, so they don't need to inform anyone about it.

Overall, it was observed that the benefits provided by the innovation were mainly felt on an individual/household level. There were no cases where an entire community has benefited from the innovation. There were, however, some negative impacts noted on a community level. Overall, 47 of the 52 interviewees (90 percent) said there have been no negative impacts on their community due to the pump. However, five of the 52 (10 percent) said that there had been negative impacts explicitly due to the pump. Of the five, four (80 percent) said that access to the pump caused jealousy between neighbors. One of the five (20 percent) said the pump was helping, but then it broke and the "help" was taken away, and they had become reliant on it.

When asked whether any efforts had been made to resolve these negative impacts, three of the five interviewees (60 percent) said yes. One said they contacted the Ministry of Agriculture and will hopefully get a new pump next year. One said they contacted the Ministry about spare parts, but they have not yet received them. One said that the Ministry gave them some plastic for a pond, but they haven't been given any land for the pond. Two of the five (40 percent) said that neither they nor anyone else had done anything to try and resolve the issues.

Resilience to Climatic Variability

Fifty-one of the 52 interviewees (98% percent) said they have been affected by changes in temperature and rainfall. Only one of the interviewees (2% percent) said that they have not been affected because they are located close to a river with a steady flow of water year round. Overall, the interviewees felt that there has been a decrease in rainfall during the rainy season and now rainfall is patchier. Many added that they feel there has been a switch in the seasons – more rain in the dry season and less rain in the rainy season, and that natural waters that used to appear during the rainy season are no longer forming.

The potential of the innovation to mitigate the impacts of climatic variability was often discussed. Access to the pump, along with complementary equipment such as a pond, would allow farmers to store water, and even, in some cases, expand to fish farming. Two interviewees said that along with the uses of the innovation in climatic adaptation and mitigation strategies, information on climate resilient crops should be provided.

CONCLUSION

Overall, there is a positive attitude toward the innovation. Approximately 80 percent of the end-users interviewed for this study said that the Barsha pump has been beneficial and the lower costs of inputs due to the pump using zero energy have been particularly beneficial. Access to water during the dry season was also noted as one of the key benefits of the pump: 62 percent have experienced a change from either only growing staple crops or not being able to grow crops at all to being able to successfully grow and harvest a combination of staple crops and cash crops throughout the year. Continued monitoring of aQysta and the performance impact of its innovations are needed to determine the full extent of the benefits.

With regard to affordability, 65 percent of the interviewees did not pay for the pump, and the 35 percent who did pay for it received a subsidy from the Government. As such, it is difficult to provide solid feedback on whether the Barsha pump is commercially viable. If there are plans to sell the Barsha pump directly to the end-users without using subsidies from the Ministry of Agriculture or NGOs, more research would be needed to predict the possibility of commercial success.

Concerns among the interviewees over climate variability and its influence on precipitation in Nepal provide a basis for discussion of the potential use of the Barsha pump for climate mitigation purposes. However, one of the key takeaways from this project is the need for more support in both tangible and intangible forms. The majority of the interviewees, whether they have felt them directly or not, recognize the benefits of the Barsha pump, but they note the need for further improvements. As long as the suggestions put forward by the end-users are considered and acted upon, aQysta appears to be set to achieve its long-term goals.

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ANNEX I

FARMER INFORMATION

NAME _____

AGE _____

DATE _____ TIME _____

GROUP INTERVIEW? ❑ Yes ❑ No

GROUP INTERVIEW NOTES

_____

_____

_____

HOW MANY FAMILY MEMBERS LIVE WITH YOU? _____

GENDER ❑ Male ❑ Female

WHAT IS YOUR PRIMARY OCCUPATION?

- ❑ Farming
- ❑ Wage Labor
- ❑ Seasonal Migrant Labor
- ❑ Small Enterprise
- ❑ Other: _____

DO YOU HAVE ANOTHER OCCUPATION?

- ❑ Farming
- ❑ Wage Labor
- ❑ Seasonal Migrant Labor
- ❑ Small Enterprise
- ❑ Other: _____

WHAT IS THE NAME OF YOUR VILLAGE/TOWN? _____

HOW MUCH LAND DO YOU OWN? _____

HOW LARGE IS YOUR FARM/PLOT?

- ❑ Large
- ❑ Medium
- ❑ Small
- ❑ Very Small

HOW MUCH IS LAND RENT? _____

OTHER LAND NOTES

_____

_____

_____

HOW LONG HAVE YOU BEEN USING AQYSTA? _____

DID YOU PARTICIPATE IN AGRICULTURAL ACTIVITIES THIS YEAR? ❑ Yes ❑ No

HOW MANY MONTHS IS THE PRIMARY GROWING SEASON? _____

HOW MANY TIMES DO YOU HARVEST PER YEAR? _____

FARM INFORMATION

WHAT CROPS DO YOU GROW AS A RESULT OF AQYSTA? LIST FROM MOST IMPORTANT TO LEAST IMPORTANT:

1. _____

2. _____

3. _____

DID THE MOST IMPORTANT CROP BENEFIT FROM AQYSTA? ❑ Yes ❑ No

DID THE SECOND MOST IMPORTANT CROP BENEFIT FROM AQYSTA? ❑ Yes ❑ No

DID THE THIRD MOST IMPORTANT CROP BENEFIT FROM AQYSTA? ❑ Yes ❑ No

WHAT IS THE WATER SOURCE FOR YOUR IRRIGATION OF CROPS?

- ❑ Own pond
- ❑ River
- ❑ Groundwater
- ❑ Innovation Source
- ❑ Other _____

WHAT IS YOUR METHOD OF IRRIGATION?

- ❑ Drip feed
- ❑ Flooding
- ❑ Hand watering
- ❑ Rainfed
- ❑ Other _____

HOW MUCH HAS YOUR WATER USAGE CHANGED SINCE USING AQYSTA, IF AT ALL? _____

_____

USING AQYSTA HAS YOUR ACCESS TO WATER:

- ❑ Had no change
- ❑ Improved
- ❑ Fundamentally improved (Improved a lot)
- ❑ Other: _____

PREVIOUSLY GROWN CROPS: DID YOUR FARM PRODUCE DIFFERENT CROPS IN THE PAST THAT ARE NO LONGER GROWN HERE? IF SO, WHICH ONES? _____

_____

MASS OF PRODUCE: WHAT YIELDS DID YOU HAVE FOR EACH CROP YOU MENTIONED?? _____

_____

MASS OF PRODUCE 2: WHAT YIELDS DID YOU HAVE FOR YOUR CROPS BEFORE USING AQYSTA? _

_____

USING AQYSTA HAVE YOU, FOR EACH CROP:

- ❑ Used more water
- ❑ Had no change in water use
- ❑ Used less water
- ❑ Other: _____

USING AQYSTA HAVE YOUR CROP YIELDS (ASK FOR EACH CROP):

- ❑ Declined
- ❑ Remained the same
- ❑ Increased
- ❑ Substantially increased

IS THERE A DIFFERENCE IN THE SURVIVAL RATES OF YOUR CROPS DUE TO AQYSTA?

❑ Yes ❑ No

HOW MUCH OF YOUR PRODUCE DID YOU CONSUME IN YOUR HOUSEHOLD? (PERCENTAGE – NOTE IF DIFFERENT FOR EACH CROP) _____

_____

HOW MUCH OF EACH OF THE FOLLOWING INPUTS DID YOU USE BEFORE AQYSTA?

FERTILIZER _____ (KG)
PESTICIDE _____ (KG)
HERBICIDE _____ (L)
CHARCOAL _____ (KG)
WATER _____ (TOTAL)
LABOR _____ (DAYS)
OTHER _____

HOW MUCH DID YOU SPEND ON EACH OF THE FOLLOWING INPUTS BEFORE AQYSTA?

FERTILIZER _____ (KG)
PESTICIDE _____ (KG)
HERBICIDE _____ (L)
CHARCOAL _____ (KG)
WATER _____ (TOTAL)
LABOR _____ (DAYS)
OTHER _____

HOW MUCH OF EACH OF THE FOLLOWING INPUTS DO YOU USE AFTER AQYSTA?

FERTILIZER _____ (KG)
PESTICIDE _____ (KG)
HERBICIDE _____ (L)
CHARCOAL _____ (KG)
WATER _____ (TOTAL)
LABOR _____ (DAYS)
OTHER _____

HOW MUCH DID YOU SPEND ON THE FOLLOWING INPUTS AFTER AQYSTA?

FERTILIZER _____ (KG)
PESTICIDE _____ (KG)
HERBICIDE _____ (L)
CHARCOAL _____ (KG)
WATER _____ (TOTAL)
LABOR _____ (DAYS)
OTHER _____

HOW MUCH DID YOU SPEND ON EQUIPMENT BEFORE AND AFTER AQYSTA AQYSTA?

HOW MUCH DID YOU SPEND ON TRANSPORT AND STORAGE BEFORE AND AFTER AQYSTA?

DO YOU HAVE PROBLEMS FINDING A MARKET TO SELL YOUR CROPS IN? ❑ Yes ❑ No
PLEASE EXPLAIN.

OTHER FARM NOTES (OPTIONAL).

INCOME AND EXPENDITURES

WHAT IS YOUR ANNUAL HOUSEHOLD INCOME?

HOW MUCH INCOME DID YOU MAKE BEFORE AQYSTA?
AFTER AQYSTA?

HAS AQYSTA IMPROVED YOUR FAMILY INCOME?

WHAT PERCENTAGE OF YOUR INCOME DO YOU GET FROM NON-FARM SOURCES?

HOW MUCH PRODUCE DID YOU SELL FOR EACH OF YOUR CROPS IN THE LAST SEASON AND THE LAST YEAR?

WHAT IS THE PRICE PER KILO YOU RECEIVED FOR EACH OF YOUR CROPS FOR THE LAST SEASON?

USING AQYSTA HAS YOUR ACCESS TO CREDIT:

- ❑ Not improved
- ❑ Improved
- ❑ Improved and have been able to repay over a short period

HOW DO YOU CURRENTLY FINANCE AGRICULTURAL ACTIVITIES?

- ❑ Own savings
- ❑ Credit and savings scheme
- ❑ Other credit

HOW MUCH DO YOU PAY FOR AQYSTA? _____

HOW MUCH ARE YOU WILLING TO PAY FOR AQYSTA?

- ❑ Nothing
- ❑ AQYSTA is free
- ❑ The same as what I pay now
- ❑ 50% less
- ❑ 50% more
- ❑ Other: _____

HOW HAVE YOU SPENT YOUR NEW INCOME?

- ❑ N/A (if no new income)
- ❑ Send children to school or keep children in school
- ❑ Social functions (like weddings)
- ❑ Investment in farming
- ❑ Improving house
- ❑ Other: _____

OTHER INCOME NOTES (OPTIONAL)

_____

_____

_____

PERCEPTIONS OF AQYSTA

WILL YOU USE AQYSTA IN THE FUTURE (5 TO 10 YEARS)? ❑ Yes ❑ No
PLEASE ELABORATE: _____

_____

HOW, IF AT ALL, HAVE YOU CHANGED YOUR FARMING PRACTICES DUE TO AQYSTA?

- ❑ No change
- ❑ Introduced new crops
- ❑ Changed irrigation system
- ❑ Reduced water usage
- ❑ It helps me decide when to plant
- ❑ It helps me decide which crops to plant
- ❑ Other: _____

HAVE YOU FACED ANY DIFFICULTIES OR PROBLEMS USING AQYSTA? ❑ Yes ❑ No

HOW CAN AQYSTA BE IMPROVED? _____

_____

HOW DID YOU HEAR ABOUT AQYSTA?

- ❑ Wealthy farmer
- ❑ Neighbor
- ❑ Innovation personnel
- ❑ Extension worker
- ❑ Other: _____

WHAT FACTORS INFLUENCED YOU TO TRY AQYSTA?

- ❑ Demonstration from neighbor's farm
- ❑ Innovation is free from extension services
- ❑ No alternative water source
- ❑ Other: _____

DO YOU SHARE YOUR KNOWLEDGE SKILLS FROM AQYSTA WITH OTHERS? ❑ Yes ❑ No
IF SO, HOW? _____

_____

_____

WHAT DO YOU FEEL ARE THE BENEFITS OF AQYSTA? _____

_____

_____

HOW HAS AQYSTA HELPED YOU? PLEASE RANK THE TOP 3 AND EXPLAIN POSITIVES/NEGATIVES.

☐ Helps in producing more of our most important crop _____

☐ Helps by lowering cost of inputs _____

☐ Helps reduce labor _____

☐ Reduces crop wastage _____

☐ Other: _____

WOULD YOU RECOMMEND AQYSTA?

❏ No
❏ Yes
❏ Yes, would strongly recommend

ARE THERE NEGATIVE IMPACTS FROM AQYSTA IN THE COMMUNITY? ❏ Yes ❏ No

IF YES, PLEASE EXPLAIN. _____

_____

_____

IF THERE HAVE BEEN ANY NEGATIVE IMPACTS, HAVE EFFORTS BEEN MADE TO RESOLVE THEM?
❏ Yes ❏ No

EXPLAIN. _____

_____

_____

DO YOU HAVE PROBLEMS FINDING A MARKET TO SELL YOUR CROPS IN? ❏ Yes ❏ No
EXPLAIN. _____

_____

_____

DO YOU HAVE PROBLEMS GETTING YOUR CROPS TO THE MARKET? ❑ Yes ❑ No
EXPLAIN. _____

_____

_____

HAVE CHANGES IN RAINFALL OR TEMPERATURE AFFECTED YOUR FARMING PRACTICES OR CROP YIELDS COMPARED TO HISTORICAL RAIN/DRY SEASON PERIODS? ❑ Yes ❑ No

OTHER

INCOME/POVERTY NOTES

_____

_____

GENDER OBSERVATIONS

_____

_____

QUESTIONS/REQUESTS

_____

_____

OTHER NOTES

_____

_____

_____

SECURING
WATER
FOR FOOD:
A GRAND CHALLENGE
FOR DEVELOPMENT

Securing Water for Food has sourced and invested in a portfolio of innovative solutions that aim to help farmers use water more efficiently and effectively, improve water storage for lean times, and remove salt from water to make more food. Our cohort of innovators are helping people in 35 low-resource countries with tools they need to produce more food with less water.

To learn more about Securing Water for Food,
visit www.securingwaterforfood.org.