

Evaluating the Impact of Solar Powered Irrigation on Women in Eastern Nepal



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Abbreviations

1. SPIPs: Solar Powered Irrigation Pumps
2. WEAI: Woman's Empowerment Agricultural Index
3. A-WEAI: Abbreviated Woman's Empowerment Agricultural Index
4. 5DE: Five Domains of Empowerment
5. GPI: Gender Parity Index
6. FDG: Focus Discussion Group

I. Personal Introduction

Growing up in the progressive urban culture of Ithaca, New York, fresh, local, and organic vegetables were always available. I grew up aware of dangers of global warming, the rising population, and the increasing income gap, but understanding large-scale domestic and global agriculture was never in my childhood syllabus. I joined Model United Nations freshman year of high school and decided by junior year that I wanted to pursue a career in international development and policy. But I did not know what field to focus in until I wrote my essay for the 2016 New York Youth Institute that summer. As I researched the effects of climate volatility on subsistence farmers in northeastern Brazil and possible solutions, I became more excited and interested by agriculture.

When I was chosen to attend the 2016 Global Youth Institute as a New York Delegate I was thrilled, nervous, and ready to absorb as much information as possible. Throughout the week of the Global Youth Institute, I realized there were hundreds of students and professionals who were passionate about the same issues surrounding global food security as I was. I had heard of the Borlaug-Ruan Internship and in the back of my mind was planning to apply. But it was Joyce Banda, the former president of Malawi and one of three women to be the president of an African nation, who motivated me to give the application my all. During the Borlaug Dialogue she asked her crowd, “Why is it that men are eating first, best, and most, while women are growing the food, harvesting the food, processing the food, and cooking the food, and eating last and least, with babies on their backs?” a career light-bulb went off in head. Agriculture impacts every facet of poverty, inequality, and development, and is one of the best ways to facilitate change. As soon as I returned home I got right to work.

I made it a personal goal to become as educated as possible on issues around women and agriculture, and to find and take advantage of as many educational opportunities as I could. I was incredibly fortunate to live in a town with one of the world’s agricultural education gold mines: Cornell University. I became involved in International Programs in the College of Agriculture and Life Science and realized that there were opportunities all around me. It was this push to agriculture that has kept me at Cornell, where I’ll start in 2018 as an International Agriculture and Rural Development major.

Cornell’s international community helped me narrow-down my interests in policy, innovative agricultural technology, water management, and social justice, specifically women’s rights and empowerment. I applied to the Borlaug-Ruan International Internship with a fervor to travel and see as much of the world and its food system as I could. I had researched ICIMOD as a possible internship site and read Dr. Mukherji water, policy, and gender empowerment background, choosing it as my top choice location if I was accepted into the program.

II. Program Background: ICIMOD

I was hosted by the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu, Nepal. ICIMOD is a regional intergovernmental learning and knowledge sharing center with four areas of expertise: Livelihoods, Geospatial Solutions, Ecosystem Services, and Water and Air. ICIMOD is active in the eight countries connected by the Himalayan Kush: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. Its transboundary regional programs aid communities in understanding and adapting to mountain ecosystem and livelihood instability, united by the phrase, “For the Mountains and the People.”

I worked alongside researchers, Aditi Mukherji, Nabina Laminchane, and Sugat Bajracharya to evaluate the impact of Solar Powered Irrigation Pumps on the lives of women. This project matched my interests in gender equality, water security, and rice cultivation, which grew with the exposure to the broader thematic areas at ICIMOD.

Aditi Mukherji is the Water and Air Theme Leader at ICIMOD. Dr. Mukherji holds a Masters and Bachelors in Geography from Jawaharlal Nehru University, an M.Phil. in Planning and Development from Indian Institute of Technology, and a PhD in human geography from Cambridge University. Prior to joining ICIMOD in 2013, she spent twelve years working in the field of water management policy in South Asia, the Nile basin and Central Asia. In 2012, she was awarded the Norman Borlaug Field Research and Application Award by The World Food Prize Foundation, endowed by the Rockefeller Foundation, for her policy work in West Bengal, India.

Nabina Lamichhane is the Field Research Associate for the Water Land and Ecosystem (WLE) Project at ICIMOD. After completion of her master in Environmental Science from Tribhuvan University, she was a Research Associate at Research Consultant for Hydrology and Meteorology (RECHAM) before joining ICIMOD in 2015.

Sugat Bajracharya is the Socioeconomic Survey and Data Analyst within ICIMOD’s Livelihoods Theme. After receiving his Masters in Economics at Eastern Illinois University, he worked as a Data Analysis Assistant for the Asian Development Bank and Research Associate at the Abdul Latif Jameel Poverty Action Lab (J-PAL), conducting impact evaluation programs in health and education, joining ICIMOD in 2015.

As the intern assigned to this project, I prepared and completed a pilot impact evaluation study, ensuring that our tool of evaluation and statistical analysis accurately conveyed the position, lifestyle, and solar pump impact on our respondents. I was responsible for the background research on the questionnaire we used, the modification of it, the piloting, and the follow-up qualitative assessment planning.

III. Research Report

a) Abstract

The Saptari District of Nepal is known for its agriculture, extreme flooding and droughts, lack of women's empowerment, and shortage of resources. In the beginning of 2015, International Centre for Integrated Mountain Development (ICIMOD) successfully distributed twenty-three Solar Powered Irrigation Pumps (SPIPs) into the hands of women and men in farming households throughout Saptari. To evaluate the impact of the pumps, The Abbreviated Women's Agricultural Empowerment Index (A-WEAI) was chosen to be administered to the SPIPs households and selected non-SPIPs households. The questionnaire was modified to provide detailed data about irrigation and to specify questions to the Saptari region and for-profit agriculture. Piloting of the questionnaire in villages throughout Saptari and analysis of the results shed light on possible biases of respondents and indicators that contributed to their disempowerment. These findings resulted in additional plans for qualitative Focus Discussion Groups and case studies in the district. Training of the enumerators was completed in preparation for the administration of the questionnaire to twenty-three SPIP and 100 non-SPIP households, planned to take place in December of 2017. Further efforts will include questionnaire completion by these 123 households, focus discussion groups, case studies, and overall data analysis using Stata in order to gauge the effect of the SPIPs over time in Saptari.

b) Introduction: Solar Powered Irrigation Pumps in the Saptari District

Saptari is a district in eastern Nepal, bordering India and settled by the Koshi river, the largest river in Nepal.



Figure 1: Map of Nepal (Nepal Viaje)

As a result, when it rains, the region is subject to serious flooding. When the monsoons fail though, drought spreads throughout the district, resulting in detrimental crop loss. Figure 2 shows the extreme variability of rainfall in Saptari. Due to the Himalayan Kush regions water supply, groundwater is plentiful. The current cost of exploiting the source through diesel or electric pumps is high and unpredictable. This is the limiting factor for farmers in the impoverished district to irrigate their land (Mukherji, 2017).

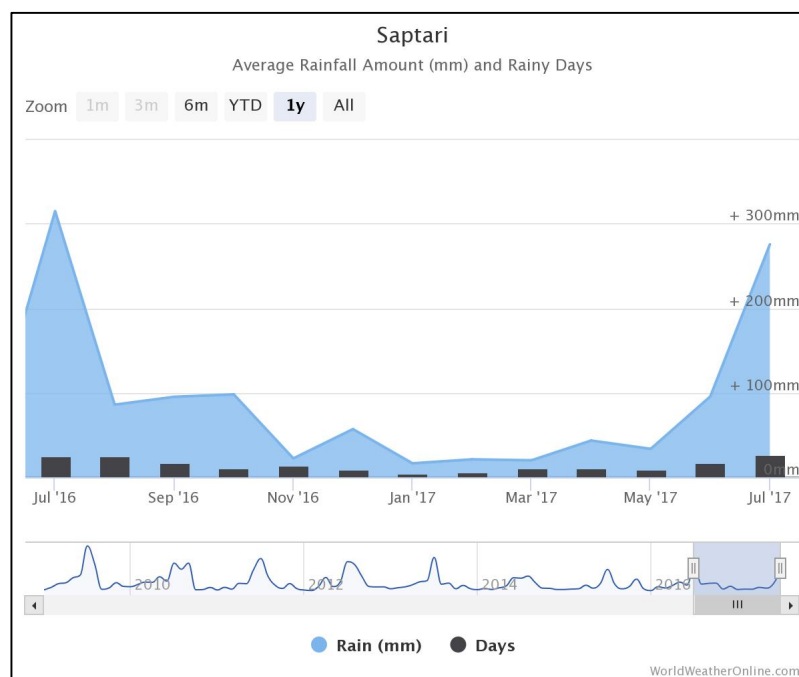


Figure 2: Saptari Average Annual Rainfall (OnlineWeather, 2017)

Aside from the Terai's local economy being based on agriculture, the region is considered the "food basket" of Nepal, providing 71% paddy, 64% wheat, and 58% total vegetable production (CBS, 2014). The agricultural success of the region is crucial to the food security of the country.

Solar powered irrigation pumps are a promising solution during periods of drought. Solar is a single cost irrigation solution, and can be bought with loans that have a predictable pay-off, allowing for possible investment, unlimited irrigation, and therefore higher yields. Furthermore, diesel is physically intensive and operation requires constant monitoring by men. Solar is operated by the flip of a switch and can be controlled by women. This realization began the idea that SPIPs could empower women in the region while also increasing food security and economic stability.

ICIMOD has distributed twenty-three pumps throughout Saptari. Twelve pumps are owned by the female head of household. To own an irrigation pump in Nepal, one must own the land being irrigated. We discounted these women-owned pumps by 70%, giving families large incentives to transfer the land to the woman's name and then buying the pump under her name. As women become land and pump owners, we hypothesize they will become more empowered. The question is if this new role of ownership will lead to increased women's empowerment and gender equality. If it does, studies show that the economic and personal benefits of farm success

and female empowerment will reflect on their children's nutrition and education and as well as business growth. The Food and Agriculture Organization's 2011 report, *The State of Food and Agriculture: Women in Agriculture: Closing the Gender Gap for Development*, stated "Closing the gender gap in agriculture would put more resources in the hands of women and strengthen their voice within the household – a proven strategy for enhancing the food security, nutrition, education and health of children. And better fed, healthier children learn better and become more productive citizens."

These predictions are useful and provide hope, but a quantitative analysis of the gender impact of SPIPs is necessary to evaluate the pumps' empowerment effect and increase the scale of the project. We will also be completing economic and yield surveys to ensure that SPIPs are directly increasing yields and income as well.

c) Methodology

The Women's Empowerment Agricultural Index (WEAI), a system of measurement created by the International Food Policy Research Institute (IFPRI), was chosen by the SPIP team as the evaluative survey method I would study and practice. WEAI translates the qualitative questionnaire responses to quantitative data to reveal the empowerment of women. WEAI was created in 2012 and has been implemented world-wide and modified over the past five years, resulting in the Abbreviated Women's Empowerment Index (A-WEAI) (Malapit et al., 2015). Both versions of the index consist of two categories: The Five Domains of Empowerment (5DE), which includes six (A-WEAI) to ten (WEAI) indicators, and the Gender Parity Index (GPI), a comparison of 5DE scores between genders in the same household. When calculated, the 5DE and GPI produce a thorough analysis of women's empowerment (Malapit et al., 2017). I chose A-WEAI instead of WEAI as the survey method best fit for our purposes due to its shorter and simpler analysis for our small sample size of one hundred and twenty-three households. While my work prepared and practiced for survey implementation and analysis, resulting in a completed pilot study, the surveying of our one hundred twenty-three SPIPs and non-SPIPs households will occur in late December of 2017.

i. The Five Domains of Empowerment

The Five Domains of Empowerment for A-WEAI consist of five domains and six indicators. The domains and their indicators were created as part of the Alkire et al., 2012 study at IFPRI through "an extensive review of hundreds of indicators used to measure empowerment in more than 30 recent cross-country studies conducted by researchers in the fields of economics, sociology, and psychology, and were based on several criteria, most notably international comparability." The questionnaire defines empowerment as: "The expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them." (Kabeer, 2001.).

The original 2012 WEAI questionnaire that covered the 5DE was lengthy and unpolished. IFPRI held an event in November of 2013 to discuss implementation and improvement of the WEAI module. The conclusion was that the verbal questionnaire was time consuming, the field costs were high, and the workload, autonomy in production, and speaking up in public were identified

as “time consuming, sensitive in nature, and difficult to understand” indicators (Malapit et al., 2015). Since then, a refined and condensed version, A-WEAI, has been developed to eliminate confusing questions and indicators (including public speaking and autonomy in production) and reduce the length of interviews to 20-30 minutes. The A-WEAI still includes all Five Domains of Empowerment (5DE) and uses the GPI in analysis just with fewer indicators and questions (Malapit et al., 2017).

The 5DE score is calculated by subtracting the disempowerment (the sum of below benchmark response scores, referred to as inadequacies, of respondents) from 1. Disempowerment is the score determinant because it identifies the specific domains that contribute most to disempowerment. The Gender Parity Index (GPI) compares the 5DE score of the male and female respondents of the same households (usually husband and wife). The GPI shows whether a low WEAI score is caused by gender inequality rather than solely low economic status. The aggregate WEAI score (a number between 0 and 1) is calculated using Stata, a statistical software, which combines the 5DE score (given a weight of .9) and GPI score (given a weight of .1). A score of 0.8 or higher is considered empowered and below 0.8 disempowered (Alkire et al., 2012). This calculation process was created, perfected, and tested by IFPRI but our statisticians are edited the Stata calculation codes to match our questionnaire modifications.

Domain 1: Production; *Indicator 1: Input in Productive Decisions*

Input in productive decisions refers to the range of agricultural activities present on a farm and how much input the respondent has on decisions made regarding them or how able they are to have input in the decisions if they wanted (some may not have an interest and therefore no input) (Alkire et al., 2012). In our modified questionnaire, there are fourteen of these activities including aquaculture, cereal farming, hiring of employee and irrigation pump operation.

An individual is considered to have adequate empowerment for the indicator if there are at least four types of agricultural activities in which he or she has some input in decisions, makes the decision, or feels he or she could make it to a medium extent if he or she wanted to. This number was raised from the Alkire et al. study’s standard of two to four because of the modifications and additions we made to agricultural activities.

Domain 2: Resources

This domain consists of two indicators, ownership of assets and access to and decisions on credit (Malapit et al., 2017).

Indicator 2: Ownership of Assets

Ownership of assets assesses the ownership (sole or joint) individuals have of land and assets (Alkire et al., 2012). Our questionnaire includes thirteen assets including agricultural land, large livestock, small livestock, farm equipment, poultry, and consumer durables. To be adequate in this area, one must have ownership of at least one of the assets besides poultry (Alkire et al., 2012).

Indicator 3: Access to and Decision-making About Credit

This indicator is assessed through two characteristics, the household of the respondent having access to credit, meaning they have taken out a loan in the past 12 months, and whether or not

the individual has made, solely or jointly, at least one decision relating to borrowing or using credit. For each characteristic, a score of 1 (yes) or 0 (no) is given. Respondents have adequate empowerment relating to access to and decision-making about credit if they have an aggregated score of 1 or higher, meaning they make one or more decisions relative to credit about one or more sources of credit (Alkire et al., 2012).

Domain 3: Income; Indicator 4: Control of Use of Income

Control over use of income is determined from whether or not the respondent has input in income generated from each agricultural activity used for assessing input in productive decisions. Individuals are considered adequate in the domain if he or she has input in some income decisions or input in most/all income decisions in at least one of the agricultural activities that the respondent has adequacy in under the productive decision indicator (Alkire et al., 2012).

Domain 4: Time; Indicator 5: Workload

This indicator is constructed using a 24-hour time allocation module. Respondents are asked to record the time they spent on activities in the 24 hours prior to the interview, starting at 4:00 a.m. on the day before the interview. Work-related activities include wage and salary employment, own business work, farming, construction, shopping/getting service, fishing, weaving/sewing, textile care, cooking, domestic work, caring for children/adults/elderly, commuting, and traveling. Researchers should note that in Saptari, sunrise is ~5:15am and sunset is ~7:00pm (Saptari). This might affect how respondents answer questions because they may organize their day by sunrise and sunset, and answer questions that way, instead of by hour. The respondent is defined as adequate on workload if the number of hours they worked per day was less than the “time poverty line” of 10.5 hours (Alkire et al., 2012).

Domain 5: Leadership; Indicator 6: Group membership

A respondent is considered adequate in this indicator if the individual is an active member of one of the following, “(1) agriculture producers’ or marketing groups, (2) water users’ groups, (3) forest users’ groups, (4) credit or microfinance groups; (5) mutual help or insurance groups (including burial societies), (6) trade and business associations, (7) civic or charitable groups, (8) local government groups, (9) religious groups, and (10) other women’s groups” (Alkire et al., 2012).

ii. Modification of Questionnaire

Modification of the questionnaire was necessary to gain consumer data about irrigation pump time and dominant use, as well as to tailor our survey to the region. Questions concerning buying/selling of land, crops, fertilizers and machinery, pump operation, and hiring of labor were added in order to measure economic changes on the farm and their effect on women.

Two of the agricultural activities used to measure input in productive decisions and control over the use of income were also changed to specify them to the agricultural economy of the Eastern Terai region where Saptari is located. Food crop farming became cereal crop farming because the region’s main crop is rice and cash crop farming became vegetable farming because it is the main crop sold at market.

iii. Piloting of the Questionnaire in the Saptari District

Once the questionnaire was modified, Nabina and I flew to Biratnagar, the nearest airport to Saptari and then drove two hours to get to Rajbaraj, the single city in the district. There we met with Sabal Nepal workers, the outreach officers working for the local non-governmental organization and securing villages and families for us to interview in the district. Each day we travelled to a new village and practiced the verbal survey with as many couples available, completing a total of 20 surveys, 10 couples from approximately 5 villages. Our pilot sample did not own SPIPs but the data about their diesel and electric pumps was sufficient for practice surveying and Stata analysis.

The goal of this trip was to practice and perfect the process of survey administration and statistical analysis. Therefore, it was conducted more casually than actual surveys will be, with Nabina as the only enumerator and without full randomization of our sample size; we only surveyed villages in a thirty-minute radius from Rajbaraj. WEAI is meant to be conducted with one male and one female enumerator to ensure separation of the husband and wife during the survey. The male enumerator would speak with the husband and the female enumerator with the wife. As our only enumerator was Nabina, the husbands and wives were not separated. The result was that the husbands partook in the wives' interviews, listening and answering some questions, with or without prompting from their wives. Due to this, we could not be sure that the women's answers were representative of their lives. This bias highlights the importance of having both male and female enumerators, something we took into consideration when we returned to train our enumerators.

iv. Training of Enumerators in the Saptari District

I created an enumerator manual and training packets and two weeks later, we returned to Saptari to train six enumerators, three males and three females, to conduct the interviews. Once we trained them for two days, we headed to surrounding villages for them to practice.

I sat through one survey with one of our female enumerators as she interviewed a wife whose husband was being interviewed by a male enumerator outside, following the training rule of marital separation. Theoretically, this would allow us to interview the wife alone and gather unbiased data through our survey. But the reality was that the nephews, brother-in laws, and sons of our respondent sat on the bed next to her, listened, and responded to many of the enumerators questions. The female enumerator started by asking women the questions. But half-way through the interview, after the boys next to her had been asked some questions for verification, she began to default some of her answers to them for multiple parted section. If the female respondent had not known the first answer in the section, our enumerator would ask the boys. This trend increased in regularity throughout the interview, if the women paused or did not know, the boy sitting next to her was asked immediately. The culture of women's role not being part of economic decisions of the household or head of household was woven so deeply into social normality that even our trained female enumerator defaulted to it.

I took note of this to press single respondent importance during the next training but concluded that it would be impossible to entirely separate the women during surveys. Even if we noted the

questions answered by “observers”, the possible bias of a male presence would call the overall integrity of the respondent’s answers into question. With a small sample size, this bias would interfere significantly with our results.

d) Results: Pilot Study

With a small sample size of only twenty respondents and narrow sampling of only villages in a small radius from Rajberaj, these results lack statistical significance. Therefore, the quantitative conclusions from it do not necessarily show the true empowerment levels of the area.

Using Stata to analyze our pilot results, we concluded that the average 5DE Index for women was .62 and .76 for men, both less than .8 and therefore, on average, both disempowered. To understand the data more, we found that eighty percent of women were disempowered and only fifty percent of men were disempowered., shown in Figure 3.

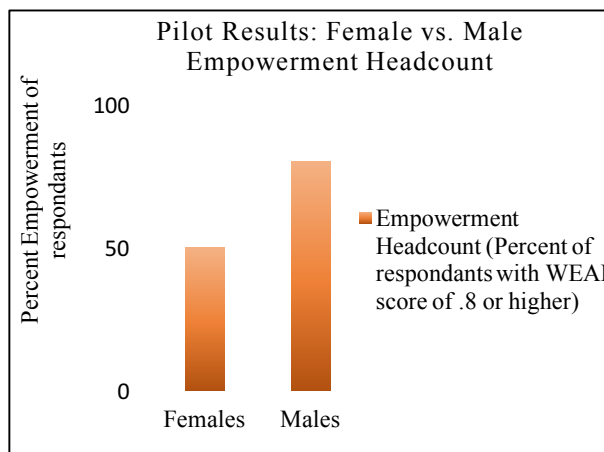


Figure 3: Pilot Results: Female vs. Male Empowerment Headcount

This was likely due to outliers in our data. Figure 4 shows only five out of the twenty respondents have adequate empowerment in workload; four out of the five are husbands. No one had adequate empowerment for access to and decisions about credit and only four respondents, one couple, one wife, and one husband, have adequate empowerment in group membership. For the most part, all respondents scored adequately for every indicator except for access to/decisions about credit. The outliers are likely due to our small sample size and possibly biased data; with husbands and family members present, it is possible that women did not give truthful answers.

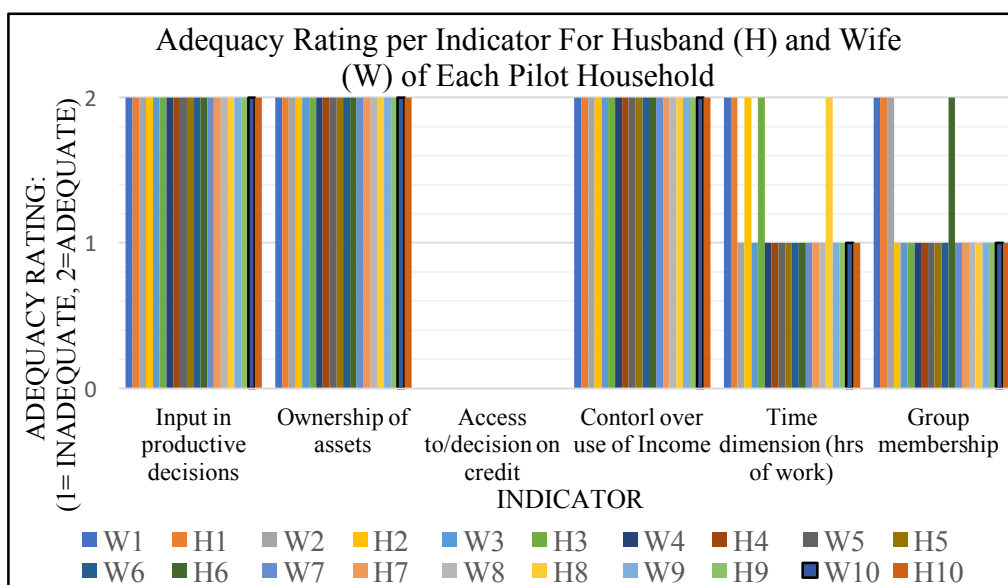


Figure 4: Adequacy Rating per Indicator for Husband and Wife

As shown in Figure 5, there were three indicators that respondents scored inadequately for, therefore being the only indicators contributing to disempowerment. Workload contributed to forty-three percent of disempowerment, group membership contributed to forty-three percent, and access to and decisions about credit contributed to fourteen percent. Again, this was most likely due to small sample size but allows us to see the three indicators that are most pressing. We are not changing the weights of our indicators in the calculation process due to these three indicators having such a large contribution to overall scores but are proceeding with caution for these three indicators during the actual survey calculation process.

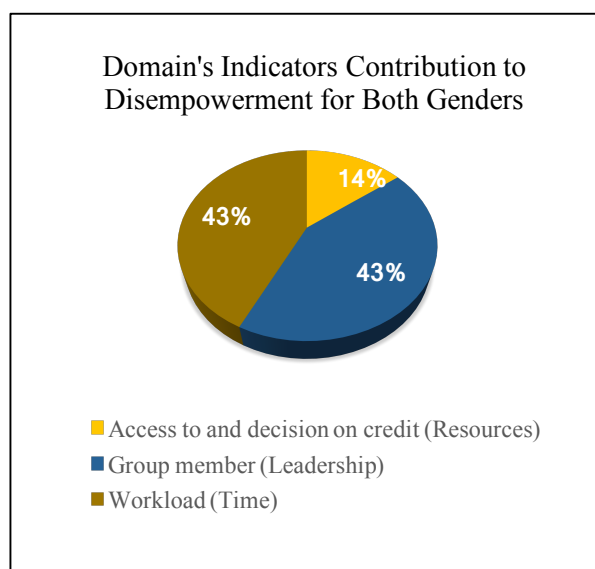


Figure 5: Domain's Indicators Contribution to Disempowerment for Both Genders

e) Discussion and Conclusion

i. Previous Findings

The International Livestock Research Institute (ILRI), Technical Assistance to NGOs (TANGO) International, Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING), and Feed The Future have completed WEAI studies to evaluate empowerment impacts. Their findings and modifications shed light on possible trends and common errors of WEAI. A decrease in empowerment was shown in ILRI's and TANGO International's results and SPRING found no empowerment difference between their control and benefactor groups. Feed The Future did not assess in a baseline and end line process but were the only organization that has used and published a WEAI study in Nepal. Understanding errors in WEAI or WEAI implementation allows us to better conduct our study and decrease the risk of decreased empowerment or false conclusions in our evaluation results.

ILRI used WEAI to evaluate the impact of three different livestock microcredit and value chain programs in Kenya. Their methodology followed the standard WEAI methodology except for the added domain of Rights, which included a reproductive health indicator and a Gender Based Violence (GBV) attitude indicator. ILRI also completed three case studies to gain more in-depth information and qualitative evaluation from three women which not included in the WEAI calculation. The most notable result was that for one livestock microcredit project, women who took out loans actually showed a decrease in empowerment in the time and leadership domains (Waithanji, Njuki, Mutua, Korir, and Bagalwa, 2013). The cause of the trend is unknown but possibly because an addition of household roles instead of a change.

The CARE Pathways Project was completed by TANGO International in 2016. The project was focused on multi-faceted community projects in Ghana, India, Malawi, Mali, and Tanzania. Methods were based around the overall community outreach programs and the WEAI was adjusted to fit. TANGO added health as a form of empowerment for women. The results showed a decrease of indicators empowerment between the womens baseline and end line surveys. Ownership of assets decreased by almost 15 percentage points in Ghana and control of the use of income decreased by 6 percentage points in India. CARE did not explain these effects (Brown V., Bower T., and Sutter P., 2016). However, other studies have reported increases in domestic violence after too much change in power between men and women, most likely because male heads of households compensated for the shift in gender roles by restricting women's movements or practicing forms of emotional, physical, or verbal abuse (Alkire, 2012). It is important to note that when aggregated, the overall data mask this trend. The most significant positive results were in India; the average decision to and access to credit empowerment score of men, increased by a nineteen-percentage point from fifty-seven to seventy-six percent for male, and the ownership of assets average empowerment score for females, increased by twenty-percentage point increase (Brown et al., 2016).

The SPRING program used A-WEAI for impact evaluation of Farmer Nutrition Schools (FNS). They used the A-WEAI methodology and performed base line, mid-line, and end-line surveys to evaluate FNS activity impact as well as visiting households each month for intensive courses relating to empowerment, nutrition, and food production. Due to the increase in empowerment in

both non-FNS and FNS households, SPRING was unsure whether or not other empowerment projects had been occurring in the region. This balanced increase could also be explained by the increased use of media in the region as technology accessibility increases and progressive ideas are spread easier. Overall, SPRING found that women were empowered by the FNS programs but only by ~10% more than non-FNS households (SPRING, 2017)

The Feed The Future project in Nepal focused on nutrition assessment using WEAI as one of the forms to evaluate impact. The samples were drawn from the three main western regions, the Terai, valley, and Himalaya's. The study mainly looked at anemia rates and nutrition and used WEAI for a small portion of the analysis. The results showed that access to and decisions about credit, workload, and group membership were the indicators that contributed to disempowerment the most (Feed the Future FEEDBACK, 2013). The same three indicators that contributed to disempowerment in our pilot study, supporting the trend of disempowerment in these three indicators in Nepal.

The trend in these studies have led us to be cautious with our program implementation and look for signs of over compensation for household power-shifts that could possibly lead to abuse and excessive workloads caused by new roles taken by women. It has also caused us to strongly consider completing midline surveys in addition to baseline and end line surveys, in case there are any decreases or balanced increases in empowerment by our beneficiary and control groups that are masked in end line results.

ii. Qualitative Assessment Literature Review

After thorough research and survey practicing in Saptari, it was concluded that the best way to validate our biased data and gain more insight into the true lives of women without the present male pressure during the survey process would be to complete a qualitative assessment that coincided with our quantitative evaluation. But the operation of it has to be creative to ensure that no bias would be present during qualitative interviews.

The two most coherent options for a qualitative assessment of women's empowerment are Focus Group Discussions (FDGs) and case studies. FDGs in the context of agricultural women's empowerment have been practiced in Jordan with University of Florida, International Center for Agricultural Research in the Dry Areas (ICARDA), National Center for Agricultural Research and Extension (NCARE), Kenya with ILRI, and Uganda with United States Agency for International Development (USAID). Case studies were used in the context of WEAI by ILRI in addition to the quantitative questionnaire examples for empowerment have been found with only ILRI.

University of Florida University, in collaboration with ICARDA and NCARE used FDGs and problem tree and calendar activities to use WEAI purely qualitatively in Jordan. They found that the ideal size for diverse yet productive FDGs was seven to eleven participants. They had gender separated groups, turning WEAI questions into open ended questions, asking of the whole group for each indicator of the WEAI. They facilitated a problem tree activity for the leadership domain, assessing how much voice the women have in the community by looking at all aspects of this issue from cause to effect in a cyclical manner. This activity creates a visual

representation and naturally facilitates discussion to create big picture understanding on the problem at hand, essentially female disempowerment. The calendar technique was used to map out time spent working during each cropping season for husbands and wives (McOmber C., Ludgate N., Russo, S., and Akroush S., 2012).

Resiliency through Wealth, Agriculture and Nutrition in Southern Karamoja (RWANU) was a project that received funding from USAID to implement and evaluate programs to increase food security through food access programs and decreasing malnutrition for women of child bearing age and children under five in Kenya. Their methodology included focus group discussions (FDGs) and key informant interviews (open- ended verbal surveys), using WEAI only as a guide. WEAI calculations were not used and therefore only qualitative calculations were. They used the 5DE from the WEAI but measured them through staff judgement during household visits, further training, and group discussions. They had two female translators facilitate fifteen FDGs, five male-only and ten female-only from groups that the RWANU project had formed (beekeepers group, dairy goat group, block farms, credit group, and a mother care group). They asked respondents what RWANU had done to impact their lives in each indicator. The findings showed overall empowerment and project success in all indicators but recognized that the gender specialists and translators asking such direct questions may have biased their results (Mbevi L. & Lorika J., 2015).

The International Livestock Research Institute (ILRI) that used WEAI for livestock finance evaluation also used case studies to determine how women perceive themselves and how their self-assessment compares to the WEAI evaluation. They selected their seventeen respondents by three categories. Women whose self-assessment matched their empowerment index; women whose self-assessment was higher than their empowerment index; and women whose self-assessment was lower than their empowerment index. They found that most empowered women felt empowered but that disempowered women also felt empowered. Their reasoning was that they considered themselves open-minded, hard-working, and good at taking advice from those that knew more than them. The outliers were women who thought inadequacy in specific indicators, such as public speaking and group membership, caused them to be disempowered, even though they were empowered overall. ILRI concluded that both self-assessment and WEAI accurately portrayed empowerment but should be “harmonized” if possible (Waithanji E. et al., 2013).

Our plan is to implement both FDGs and case studies, using a participant selection process similar to ILRI’s and a FDG facilitation method similar to the one used by the University of Florida project. The facilitators will be cautious with our questions and facilitation to avoid biased results.

iii. Conclusion

The people of the Saptari district face drought, varying diesel prices, and limited irrigation. ICIMOD’s distribution of SPIPs to female and male head of households is predicted increase economic stability, crop yields, and women’s empowerment. When a woman owns a SPIP her new role as land owner and irrigation pump owner is likely to be empowering, allowing her to control more of the irrigation on the farm, slowly having increase input in agricultural decisions.

The overall success of the farm with SPIPs will have a substantial impact on yields, increasing food security of the family. An instrument for qualitative impact evaluation was necessary to support the predicted increase in empowerment.

Our decision was to modify the Women's Empowerment Agricultural Index (WEAI) to the projects circumstances, using it to translate qualitative responses into quantitative data that would evaluate the predicted increase in empowerment. The verbal questionnaire was tested in the district and enumerators to administer it were trained.

After analyzing our results, we found three main things: the group membership and access to and decisions about credit significantly contributed to disempowerment, each by forty-three percent; it would not be possible to separate men from women during interviews, creating bias, that without outside validation of the WEAI scores, could result in statistically insignificant data.

Our conclusion was to add two forms of qualitative assessment, FDGs and case studies. The FDGs will be facilitated two at a time, one group of wives, one group of matching husbands at a municipal location. We would transport the couples, offering lunch and meeting time before they were split into gender divided groups. We also will complete four female case studies, one empowered and one disempowered from solar households and one empowered and one disempowered from non-solar household. The goal of this is to validate the WEAI results with qualitative data and gain more insight into the lives of the Saptari women, ensuring that the evaluation method is accurate and representative of all the conditions and effects of SPIPs on the life of women in the Saptari District of Nepal.

The final results will be known in 2018. If there is an increase in women's empowerment in solar-pump households, ICIMOD hopes to expand the project to other regions in Nepal. Our vision is to create a wide-spread solar system, for individual farms as well as whole communities to increased water accessibility for as many Nepali people as possible, whether it is through solar pump distribution for domestic or agricultural purposes.

IV. Final Reflection

I came to Nepal with a clear-cut agriculture-based vision about development. But with each village that I visited in Saptari, that vision faded, until I felt blind, without any clear path forward. And then I continued learning and talking to villagers and colleagues, and realized that clear cut paths don't exist and that that is okay, that the power of the people will find a way.

During my junior year of high school, I read in Howard Buffet's book, "40 Chances: Finding Hope in a Hungry World" that no aspect of development can be solved when people are hungry, that the basic need to nourishment will always overshadow any attempts of change. This resonated with me and I was so sure that solving hunger was the key to all forms of development that I blocked out other complexities. I focused on one thing: agriculture. I was subconsciously simplifying and self-assuring.

Then I visited Saptari. After a week of travelling through the villages, I felt utterly overwhelmed by the complexity of the development work that I observed. I was there to learn and mitigate

hunger through the implementation of solar powered irrigation pumps, increasing irrigation of rice paddies while empowering women. We had a strong method, adequate funding, and in my opinion, some of the most empowered, experienced, and driven professionals for the job, the main two of whom were women. And I was able to work with them, learn from them and gain as much experience as I possibly could. I thought that we were going to change lives.

But walking through villages in unimaginable conditions shattered my image. I saw small huts housing families of five, open defecation, and babies eating Styrofoam. As we began our surveys, I watched men interrupt their wives and give their input during their wife's interview. I met women who were prohibited from participating in Hindu worship because they were menstruating. And on my last day in Saptari I observed the beginning of the record-breaking August floods in the Indo-Gangetic plains of Nepal, India, and Bangladesh. These floods ultimately took more than 1,200 lives in the region (Al Jazeera, 2017) destroyed crops, and displaced more than 6,000 Saptari families.

It is a culture, economic system, and environment much more complicated than just hunger. The complexity was so much that I didn't know what to do. I thought about what I would do if I had the funds and time, to try to find a way, think through what I was observing. I never did. There was a settling, a slow reality check. The more time I spent in Saptari, the more adjusted I became and the easier it was for me to process my observations and experiences. I would spend the days and nights talking with Nabina and friends from the Sabal Nepal NGO. They knew the extremes of Saptari conditions and were able to focus on the separate sections. Their insights and work were and still are a relieving thought. The path is not clear but the power of the people will foster change.

I was so fortunate to learn and work with those people fostering that change at ICIMOD and Sabal Nepal. Every experience is going to be overwhelming to some extent, some more than others. But it's the people that you experience it with that are the most memorable and make all the difference. I learned how to affect small groups one at a time, increasing irrigation and gender equality to contribute to the greater population. And the more people there are doing that, the more people will be affected. So, I come out of this experience with more understanding of the complexity of our world, more drive to do my part to reduce the chaos, and the lesson that being a humble curious sponge for information will open doors of understanding I never imagined.

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VI. Captured Moments



From left to right:
 1: A SPIP installation
 2: Day 2 training enumerators
 3: Piloting our questionnaire
 4: Local meeting I attended about open defecation. A UNICEF worker and I were the only women out of ~50 men.
 5: Family observing wife's interview. The husband began answering questions soon after I took this.
 6: Women we spent time with in a Dalit village that was too poor for us to survey.



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