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**What does Empowerment Mean to Women in Northern Ghana?**

**Insights from Research Around a Small-Scale Irrigation Intervention**

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## Abstract

Women's empowerment is important to improve the status of women and achieve greater gender equity. It is also an important vehicle for achieving other development goals related to food security, nutrition, health, and economic growth. Increasingly, researchers seek ways to measure women's empowerment, trace the pathways through which women's empowerment is achieved, and provide guidance for policymakers and practitioners aiming to facilitate women's empowerment through their interventions. This paper explores local perceptions of empowerment in the Upper East Region of Ghana in the context of a small-scale irrigation intervention targeted to men and women farmers. Using data collected through qualitative interviews and focus groups, the paper traces the linkages between small-scale irrigation and aspects of women's empowerment, identified as important to men and women farmers themselves. The relationship between the components of empowerment and small-scale irrigation are placed within a larger context of social change underlying these relationships. Finally, this paper explores the ways that the introduction of modern technologies for small-scale irrigation may contribute to women's empowerment.

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## Introduction

Irrigation interventions have considerable potential to contribute to agricultural intensification and farm profitability (Burney, Naylor, & Postel, 2013; De Fraiture & Giordano, 2014; Giordano & de Fraiture, 2014; Giordano, Fraiture, Weight, & Van Der Bliet, 2012; Xie, You, Wielgosz, & Ringler, 2014; You et al., 2011). In particular, small-scale, farmer-led irrigation is a promising approach to rapidly scale irrigation adoption leading to livelihood and food security gains for vulnerable populations (Burney, Naylor and Postel 2013; You et al. 2011). Moreover, as climate change makes rainfed production riskier, irrigation is emerging as an important strategy to increase resilience to climate shocks and stressors. Supplemental irrigation, for example, can stabilize yield loss under climate change (Nangia & Oweis, 2016).

Until recently, less focus has been paid to other potential benefits of irrigation, such as benefits for improved nutrition and health, and women's empowerment and the pathways through which irrigation contributes to these outcomes. Evidence suggests that small-scale irrigation increases crop productivity, broadens the range of crops that farmers may cultivate, and increases the availability of nutritious foods throughout the year (Alaofe et al., 2016; Burney et al., 2010, 2013; de Fraiture & Giordano, 2014; Namara et al., 2011; Passarelli et al. 2018; Baye et al. 2019). Irrigation can also increase economic access to food, asset accumulation, employment opportunities, and spending on education and health care through an income effect (Burney and Naylor, 2012; Passarelli et al., 2018; Namara et al., 2011).

There are multiple pathways to women's empowerment, one of which is through the accumulation of productive assets that provide opportunities for women to earn and control additional income, expand their decision-making authority and improve their well-being. Irrigation interventions that expand women's access to technologies for small-scale irrigation, such as motor pumps, therefore, have the potential to increase women's empowerment by expanding their control over agricultural production decisions, income decisions, and time use. To the extent that irrigation contributes to these changes, this could have positive implications for well-being outcomes, such as improved diets for women and children and improved health status (Malapit and Quisumbing 2015; Ross et al 2015). In some cases, however, irrigation could negatively impact women's control over land and production as water usage and land values increase, particularly in context of large-scale irrigation projects (cf. Harris 2006).

Women's empowerment can also influence the extent to which women are able to adopt and benefit from irrigation. For example, an increase in women's decision-making authority over production and income decisions could lead to the adoption of irrigation systems that provide them with benefits, such as reduced labor burden, and may have implications for the health and nutritional status of women and their children (Quisumbing and Maluccio 2003). Conversely, women's disempowerment, such as their lack of control over productive assets like land, limited input in household and community decision-making, and heavy workloads often results in lower adoption of irrigation, limited participation in governance of irrigation, or fewer benefits from irrigation (Imburgia, 2019, Lefore et al., 2019; Theis et al. 2018). These varied experiences reinforce the need to understand the nuances and specific contexts of the relationship between irrigation and women's empowerment.

Little research looks at the processes by which women’s empowerment facilitates adoption of small-scale irrigation or how irrigation affects aspects of women’s empowerment. Moreover, as more development interventions aim to also contribute to women’s empowerment, additional research is needed to ensure these interventions identify locally-appropriate ways to facilitate positive social change. This requires an understanding of what empowerment means to women in agriculture-dependent communities, including a deeper examination of local definitions, aspirations and processes of empowerment. A deeper look at interventions promoting the expansion of small-scale irrigation within a specific context can, therefore, provide further insight into the process that links these interventions to women’s empowerment.

To facilitate this understanding, this study utilizes a framework to analyze the linkages between aspects of women’s empowerment and small-scale irrigation in the Upper East Region of Ghana using qualitative data collected through interviews and focus groups with men and women farmers and traders. The analysis of the relationship between irrigation and women’s empowerment is placed within an understanding of local definitions of empowerment and underlying processes of social change. The results shed light on the ways in which development interventions, particularly those that expand access to small-scale irrigation technologies, interact with women’s empowerment.

## Conceptual framework: Linkages between Small-Scale Irrigation and Women’s Empowerment

Women’s empowerment is multidimensional and several frameworks have been developed to capture the relationships among its various aspects. Women’s empowerment is often conceived as both an outcome (having greater access to and control over resources and decision-making ability) and a process of change (the process of expanding people’s freedom to act and capacity to make choices) (Alsop et al. 2006, Datta and Kornberg 2002, Stern et al. 2005, Nussbaum 2000, and Kabeer 1999, 2001).

Power relations are fundamental to understanding empowerment. Empowerment often includes a relational increase in the forms of power, including: “power to” (the ability and freedom to make decisions that achieve goals), “power with” (achieving shared interests through collective action), “power within” (an individual’s sense of freedom from restriction, self-respect, and self-efficacy), and “power over” (control over others, regarded as a negative form of coercive power), (Rowlands 1997, Mosedale 2005, Datta and Kornberg 2002, and Deshmukh-Ranadive 2005). Other frameworks of empowerment describe the opportunity structure (broader social and political context in which actors pursue their interests), agency (individual and collective ability to utilize assets and capacities to make choices), and the interaction between these as determinants of empowerment (Alsop et al. 2006, Narayan 2005, and Petesch et al. 2005). While these concepts can be applied across a variety of contexts and settings, frameworks should allow flexibility to integrate emic understandings of empowerment (Meinzen-Dick et al 2019, Mason 2005, and Narayan 2005).

The framework used for this study is described in Figure 1, drawing on the definition developed by Kabeer (1999), as interpreted by Meinzen-Dick et al. (2019). It integrates the following concepts related to empowerment—agency, resources, and achievements—and describes the relationships between these components. Women’s empowerment in this framework is conceptualized as an iterative process

by which individuals improve their ability to make strategic life choices (agency) by utilizing resources, leading to improvements in well-being outcomes (achievements), such as food and nutrition security, and/or economic and social status. Resources expand the range of opportunities for women to make strategic life choices. Similarly, women need agency to be able to access and control resources. This is illustrated by the two-way arrow between resources and agency. This interaction then produces achievements (or lack of achievements) including changes in well-being outcomes for better or worse. This process is iterative whereby well-being outcomes influence women’s access to and control over resources and their level of agency, as shown by the arrows feeding back into these components. The opportunity structure influences all of these components, such as the distribution of resources, the ways in which women exercise agency, and the well-being outcomes they are able to achieve.

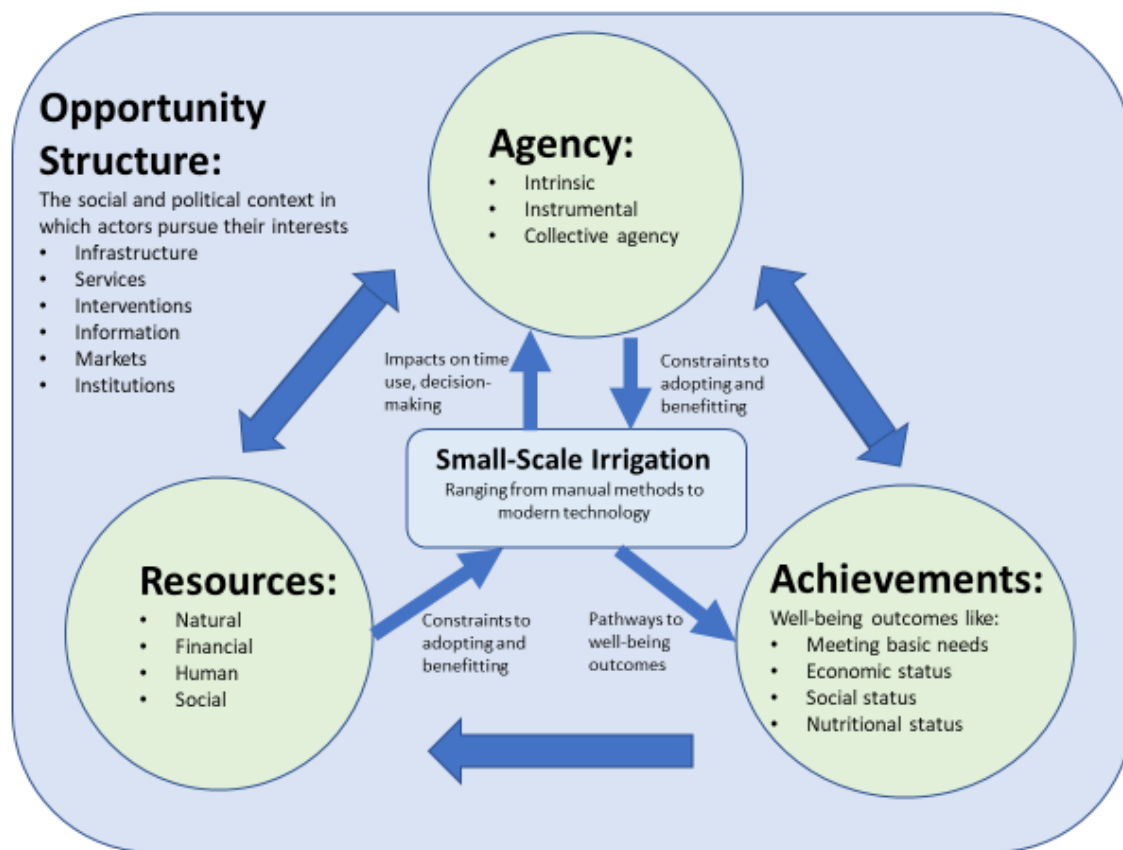


Figure 1: Framework for Small-Scale Irrigation and Women’s Empowerment  
 Source: Adapted from Meinzen-Dick et al. (2019, referencing Kabeer 1999).

This study further adapts this framework to illustrate how the introduction of small-scale irrigation relates to the various components of empowerment. Figure 1 shows that small-scale irrigation interacts with each of the components of empowerment differently. Certain components—namely resources and agency—are needed for women to be able to adopt and utilize small-scale irrigation technologies and practices as shown by the arrows pointing from these components towards small-scale irrigation.



Evidence shows that women face greater resource- and agency-related constraints in adopting irrigation practices and technologies, such as less access to land and to water for irrigation, less access to financial capital, restrictive social norms, lack of access to knowledge and training, and heavier work burdens at home (van Koppen, Hope, and Colenbrander 2012). These constraints not only limit women's ability to adopt irrigation practices and technologies but also limit their ability to benefit from them. For example, women have less influence over decisions related to the use of irrigated crops or the spending of income from the sale of irrigated crops (Theis et al. 2018).

At the same time, irrigation interventions may also contribute to women's agency or disempowerment through changes in their control over agricultural production decisions, income decisions, and time use. Irrigation activities targeted towards women, for example on plots managed by women or on irrigated home gardens, have been shown to increase women's control over irrigated produce and income, and improve nutritional outcomes (Burney et al., 2010; Iannotti, Cunningham, & Ruel, 2009; Olney et al., 2015; Olney, Talukder, Iannotti, Ruel, & Quinn, 2009; van den Bold, Quisumbing, & Gillespie, 2013). Irrigation can also affect women's time in different ways. Irrigation can either relieve their time burden or add to it depending on the type of irrigation technology being applied (e.g., either manual or motor pump). Time allocation may also shift among different family members when technologies are adopted (Theis et al. 2018) which can influence time spent caring for children (Miller and Urdinola 2010, Burger and Esrey 1995, Diaz et al. 1995, Cairncross and Cliff 1987) or engaged in income-generating activities (Koolwal and Van de Walle 2013).

Finally, irrigation may lead to improved outcomes (achievements) for women and their families through several additional pathways: a production pathway, an income pathway, and a water supply pathway (Domènech, 2015; Passarelli, Mekonnen, Bryan, and Ringler 2018). Changes in women's agency are likely to intersect these pathways in critical ways. In terms of the production pathway, women's involvement in agricultural and irrigation decisions will likely have implications for production choices including the types of crops that are planted, and how these crops are used (e.g., sold in the market or consumed at home) given differences in preferences of men and women farmers (Carr 2008).

In terms of the income pathway, women also have different preferences for how income is spent and tend to prioritize food and health care purchases (Gillespie, Harris, & Kadiyala, 2012; Ruth Meinzen-Dick, Behrman, Menon, & Quisumbing, 2012). The extent to which women control income from the sale of irrigated crops could have positive implications for nutrition, health and education investments (Burney et al., 2010; van den Bold, Quisumbing, & Gillespie, 2013). Through the water supply pathway, women tend to prefer multiple use systems at the homestead that provide water for both productive and domestic purposes. This can save time and energy, as well as improve the WASH environment, depending on the quality of water and the way it is managed (Theis et al., 2018; van Koppen et al., 2009). In addition, the extent to which irrigation saves labor—or not—has implications for other well-being outcomes such as health and nutrition outcomes (Pickering and Davis 2012; Steiner-Asiedu et al. 2012), and hygiene practices (Motarjemi et al. 1993, Aiello et al. 2008) and time spent caring for children (Miller and Urdinola 2010, Burger and Esrey 1995, Diaz et al. 1995, Cairncross and Cliff 1987) or engaged in income-generating activities (Koolwal and Van de Walle 2013).

The ways in which these relationships play out are heavily dependent on the social and political context which governs men's and women's behavior and interactions (the opportunity structure in Figure 1). Interventions to promote the use of small-scale irrigation technologies are just an example of many different types of interventions that influence the pathways of empowerment. Other types of interventions may have very different relationships with the components of empowerment. This opportunity structure consists of both formal institutions (including laws, markets, organizational structures, and project interventions) and informal institutions (such as social norms and customs). These institutions influence the distribution of resources and people's ability to exercise agency and improve their well-being. For example, social norms governing men's and women's roles in the household and community might prohibit women from engaging in certain activities, like irrigation using manual pumps (Njuki et al. 2014).

Applying a framework that intertwines the processes of empowerment with interventions aimed at increasing empowerment requires consideration of the local and personal contexts. This includes understanding local definitions and conceptions of empowerment, as well as personal priorities and aspirations. For example, to what extent do women want more autonomy in decision-making or to invest time in agricultural production vs. other livelihood activities? To what extent do women prioritize having greater freedoms or improving their household well-being? These questions can only be answered within local communities. Lessons from a synthesis study suggest that achievements, such as economic status, play a larger role than resources and/or agency in women's empowerment despite the focus of recent research on the importance of agency (Meinzen-Dick et al. 2019). The relative importance of these different components of empowerment are likely to vary depending on the empowerment pathways women chose to take. Moreover, women's empowerment takes place within the context of continuously changing social norms over time, across generations, and across diverse groups of women who may have different notions of and aspirations for empowerment.

Furthermore, the relationship between components of women's empowerment and irrigation also depend on the type of irrigation practices and technologies that are available to women farmers and the extent to which these technologies meet the needs of women, given their specific roles in the household, community, and in agricultural activities (Theis et al. 2018). These relationships also depend on how irrigation interventions are introduced and implemented, including which technologies are selected for dissemination, how farmers are informed about irrigation technologies and techniques, etc. The factors that constrain the adoption of irrigation vary widely and range from lack of access to natural resources to lack of involvement in agricultural decisions (Lefore et al. 2019; Xie et al. 2014); and the ways in which women participate in and benefit from irrigation activities also differ. Gender-sensitive and gender-transformative approaches that address local constraints are needed to ensure that such interventions not only reach, but also benefit women and support their empowerment (Johnson et al. 2016).

In the context of Northern Ghana, there are several pathways through which women could benefit from small-scale irrigation using more modern irrigation technologies, such as motor pumps. First, in all the communities, women are heavily involved in dry season farming activities. Thus, the introduction of motor pumps to these communities would benefit these women (as well as men) involved in dry season

production. Second, existing dry season farming in these communities by and large involves using small buckets to bring water from the source to the fields. This practice limits irrigated area and crops that can be cultivated. Many women expressed interest in diversifying to high-value crops if they would gain access to motor pumps, which would increase income from dry season farming. Third, reliance on traditional methods like buckets for water application is very labor intensive. Thus, motor pumps would decrease the amount of time women spend collecting and applying water to their fields. Fourth, women having greater access to motor pumps and higher income from dry season production could potentially increase their decision-making authority in the household.

This paper applies the framework to examine the relationships between the components of empowerment and irrigation using qualitative data from the Upper East Region of Ghana. This analysis aims to identify critical constraints to women participating and benefitting from irrigation in this context as well as the ways in which irrigation may be a vehicle for women's empowerment. These relationships are placed in the context of local processes of social change, as well as local conceptions and goals for empowerment.

## Study Area, Data, and Methods

The Upper East Region of Ghana is characterized by a single rainfall season typically lasting between May and October, followed by a long dry season (Ministry of Food and Agriculture, 2016). Rainfall varies between 900 and 1,100 mm in a good season (*ibid*). Production in the region is mainly characterized by rainfed, subsistence production of staple crops, including maize, millet, rice, and soy. Irrigated production takes place mainly during the dry season and is dominated by onions, followed by okra, tomato, red pepper, watermelon, and leafy green vegetables (Mekonnen et al. 2019)

Groundwater is the main source of irrigation water for half the irrigators and is usually obtained by hand dug well in the riverbed during the dry season, with irrigated plots typically located close to the water source (*ibid*). Small reservoirs (dams) are another main source of irrigation water for about a quarter of households in the study area, providing easier access to water for households with land near the dam (*ibid*). Most irrigating households obtain and apply water using cans or buckets and very few have access to modern technologies for small-scale irrigation, like motor pumps (*ibid*).

Many households live on the cusp of malnutrition and poverty during the long dry season with few options to improve their well-being, aside from migration to other areas of the country or non-farm employment. Compared to the national average of 5 percent, the incidence of wasting is highest in the Upper East region (at 9 percent), a level that is considered severe by the World Health Organization (GSS, 2015). While calorie availability has increased over time, much of this comes from staple foods, and, therefore, does not represent an improvement in the nutritional quality of diets (Ecker and Van Asselt, 2017). Small-scale irrigation offers the potential to expand production and thus the availability of nutrient-rich foods, such as vegetables, during the lean season, which would have enormous benefits in terms of income, food security, nutrition and health.

Data were collected during four weeks in July and August 2017 in four villages in the Garu-Tempare District of the Upper East Region, Ghana. In two of the four villages (Mongnoori and Yidigu), some

farmers had participated in a small-scale irrigation intervention through which same-sex and mixed-sex groups of farmers, were provided preferential loans to purchase motor pumps. In the other two villages (Akara and Asikiri), some farmers were irrigating using traditional methods (like buckets). All locations selected for the intervention were considered to have a high potential for irrigation based on an ex-ante assessment, using biophysical (slope, surface water access, and groundwater access) and socioeconomic indicators (distance to markets) to create an overall suitability score.

In each village, focus groups on empowerment topics were carried out with groups of approximately 8 men and women separately with a moderator of the same sex as the group members. In villages that participated in the motor pump intervention, 2 additional focus groups were carried out with pump users for a total of 12 focus groups across all villages. Topics discussed included women's roles in the community, participation in community and household decisions, women's mobility, and inheritance and marital patterns. Several questions prompted participants to describe attributes of powerful women in the community and how they are perceived by others. The focus groups contained a mix of irrigating and non-irrigating farmers. In the two villages that received the motor pump intervention, two additional focus groups were conducted separately with men and women farmers selected to receive the motor pumps. Focus groups were guided by a semi-structured protocol that covered empowerment topics, including local perceptions of empowerment, women's mobility, decision-making processes about key production and household decisions, inheritance and marital patterns, and aspirations for women.

In addition to the focus groups on empowerment topics, one seasonal calendar focus group was conducted in each village with a small group of 4-5 knowledgeable farmers (a mix of men and women) to identify key livelihood activities, income, expenditures and other important events throughout the year. It also explored how responsibilities for different crops and livelihood activities are distributed by gender in accordance with local norms, and how seasonal variations affect time use for women and men.

Life history interviews were carried out with six farmers in each village (two men and four women) for a total of 24 interviews. The farmers for the life history interviews were sampled from a household survey conducted in 2015 and included a mix of irrigators and non-irrigators. The life history interviews were semi-structured and aimed at giving space for the respondent to discuss the personal experiences that have shaped their attitudes and beliefs. Interviews followed a chronological structure starting with experiences during childhood and adolescence and moving to adulthood, the present, and aspirations for the future. Throughout the interviews, participants were prompted to discuss key events in their life, such as marriage, becoming a parent, and idiosyncratic shocks, such as illness or death of a family member. The interviews also explored topics, such as gender roles, decision-making, intra-household dynamics, relationships with the community, and perceptions of self. Interviews were led by two researchers with ongoing translation.

In addition, interviews with two market traders were carried out in two different markets: one large market (Basyonde) and one small market (Garu) for a total of four market trader interviews. Interviews focused on the location of sales and physical access to markets, seasonality, price determination, payment methods, gender barriers to market participation, and market characteristics.

Table1: Sample Size by Activity and Gender (number of participants)

	Focus Groups on Empowerment Topics (same sex)	Seasonal Calendar Focus Groups (mixed)	Individual Life History Interviews	Market Trader Interviews	Total
Female	48	10	16	2	76
Male	48	10	8	2	68
Total	96	20	24	4	144

Interviews and focus groups were recorded, transcribed and translated into English. The transcripts were imported into NVIVO and files were classified according to the type (i.e. life history interview, focus group on empowerment topics, market trader interview, or seasonal calendar), gender of the interviewee, age of the interviewee, ethnicity of the interviewee, village, irrigation status, pump status (for the villages where the intervention took place), empowerment score of the interviewee (based on intrahousehold survey data), interviewer, and translator. Quotes provided in the results section note the source of the quote based on village, type (i.e., interview, FGD, etc.), gender, irrigation status and whether they had access to a motor pump through the intervention. Transcripts were analyzed in NVIVO using nodes to tag common themes that emerged from the conversations. Table 1 presents the list of general nodes used and description of how these nodes link to the conceptual framework.

Table 2: Nodes for Qualitative Analysis

Nodes: Main Headings	Description of Topics Covered	Link to Conceptual Framework
Income and expenditure decisions	Ability to control income from various livelihood activities and make expenditure decisions in line with personal needs, priorities, and preferences	Indicator of instrumental agency
Intrahousehold relationships	Characterization of the relationships between adult decision-makers in the household (e.g. level interest alignment and cohesion, respect, unity/discord, domestic violence), family structure, marriage and courtship, parenting and parenthood	Indicator of intrinsic, instrumental, and collective agency
Leadership and community	Characteristics of community leaders and powerful people, decision-making processes at the community level, and changes in community leadership roles of men and women over time	Collective agency, enabling environment
Markets	Ability to access markets and participate in market transactions including selling agricultural products and purchasing agricultural inputs or household goods	Enabling environment
Mobility	Ability to travel freely throughout the community, neighboring communities, to local and distant markets, and other important places	Instrumental agency
Nutrition and health	Decisions on food purchases, food preparation, infant and young child feeding practices, medical decisions, health experiences	Achievements
Other decisions	Decisions about other domestic activities (e.g. cleaning, caring for children, fetching water or energy)	Instrumental agency
Crop production	Decisions regarding land allocation, crop choice, planting, division of labor, input use, harvesting, post-harvesting practices, and sale of crops. Access to information regarding crop production.	Instrumental agency
Irrigation (achievements, agency and resources)	Experiences with accessing resources for irrigation, decisions related to irrigation at the household and group/community levels, and achievements related to irrigation	Irrigation and the intersection with resources, agency and achievements
Psychological aspects	Aspirations, life satisfaction, self-efficacy, self-esteem	Intrinsic agency
Resources	Inputs to agricultural production and other livelihood activities, productive assets, education and human capital, financial resources, natural resources (land, water, energy), infrastructure	Resources and enabling environment
Shocks	Idiosyncratic shocks (e.g. illness, death of family member), conflict, shocks to production, and climate/weather-related shocks	Achievements
Time	Division of labor, work burden related to domestic work, agricultural production activities, irrigation, other livelihood activities, and overall workload	Instrumental agency

## Results

Results are presented on each relationship in the conceptual framework—i.e., between resources and irrigation, agency and irrigation, and achievements and irrigation. While relationships are broken down in the following analysis, the framework emphasizes the continued process and inter-connectedness between these aspects. A final sub-section deals with key characteristics of the opportunity structure and how this relates to the aspects of women’s empowerment.

### Resources-Irrigation

Resources are essential for empowerment. Individuals use these resources to exercise agency leading to achievements (improvements in their well-being). These achievements can lead to an increase in resources through a virtuous circle as the empowerment process proceeds. As shown in the conceptual framework by the two-way arrow, a level of agency is required in order to access and use resources in the first place. The availability of and access to these resources also matter for farmers to be able to adopt practices and technologies for small-scale irrigation.

This section describes how men and women farmers’ access to resources—such as natural resources, human capital, and access to financial resources—contributes to their empowerment and facilitates adoption of irrigation. Often it is a combination of critical resources, in this case land, water, infrastructure and irrigation technologies, that is required for irrigated production. However, not all resources that are critical for empowerment are essential for irrigation adoption (e.g. education). Each type of resource has a different influence on empowerment pathways and the degree to which irrigation plays a role in empowerment.

The responses demonstrate that there are important differences between men and women in terms of their access to and use of these resources. Women are more constrained in their access to essential natural resources, like land and water, labor, and other agricultural inputs (fertilizer, fencing), which limit their ability to benefit from irrigated production. Other resources can create a constraint for both men and women, such as the lack of financial resources (credit) to purchase motor pumps. These differences have considerable implications for the ability of women to adopt and benefit from small-scale irrigation, and their pathway to empowerment.

### *Natural Resources*

Access to enough good quality land and water for irrigation are the most essential inputs to irrigated agricultural production. Many farmers in the Upper East Region stressed the importance of having access to land for their success in farming and the ability to provide for their families. Even more than just having access to land, owning land is considered important for empowerment among both men and women farmers in the Upper East region. Land enables men, in particular, to increase their families’ well-being as this male pump user from Yidigu mentions:

“It can make him strong/powerful [to inherit land]. Because if I am not alive today and somebody inherits my land, if he likes work, he can work and get plenty food. When he gets more food, he can sell some, have some for feeding [the family].” (Yidigu, FGD, men, pump users)

Women's link between land and empowerment is more complicated, however. Due to patrilineal inheritance systems in Northern Ghana, women primarily access land through their land-owning husbands or by borrowing or renting land from other men in the community or family members living nearby. When men die, land is passed on to male children. In this case, widows may still have access to their late husband's land through their children, and have more control if children are too young to manage farming operations. In some cases, control of the land may revert to an older brother or the father. In this case, some women may continue to have access to the land through this male in-law; however, others may return to their birthplace and birth family.

"When your father dies, you don't have anything there. But, when your husband dies, and you have children, if the children inherit the land it is like yours, you can use it" (Mongnoori, FGD, women, no pump).

As a result of population growth, land is becoming increasingly fragmented with sub-divided areas often too small to provide enough food for the family let alone turn a profit. In most households, depending on the size of the land, women are allocated a plot to farm, and in polygynous households, sometimes jointly with their "rival" wives. When the land size for the household is too small, women may not be allocated any land to farm for themselves but will contribute unpaid labor to the household plots.

Renting or "begging" for land is common, but there is typically a price to be paid in cash or in kind for access to the land. However, women, whose husbands do not allocate land to them, are often unable to afford to rent land to cultivate for themselves. Women are sometimes able to obtain land from their father or brothers, if their families are near enough to their husband's home.

"The way it is, if someone's daughter marries you and you have land, you can give her some to farm on. If you don't have and her father's house is not far, she can go there and beg for land and they will give her to farm. If the father's house is far and someone in your community has land, she can go there and beg for a portion of the land to farm on. Some people can rent it to her and others can give it to her free." (Yidigu, FGD, men, no pump)

The lack of land ownership can mean that when women do access land, the resource is of lesser quality than the land of their male counterparts. Some women noted that when they beg for land, they are given lesser quality lands to farm, particularly if they cannot afford to pay to rent better land. Further, when women invest in this land, they risk the owner reclaiming the land once it has increased in its ability to produce. This reinforces a cycle where the agency to make decisions over land can influence women's ability to use that resource to increase their own agency and achievements. In addition, the lack of agency creates a process where women are less able to use that resource for sustained increased well-being over the long-term.

"If you don't have money and go and beg, the land they will give, you will collect but it is just useless land. And when you collect [and cultivate] that land, even what you consume, it will not take you anywhere unless you buy [food] to supplement. ...the one who has his own land, the land that is fertile, he farms on that. And, if you go to him to beg, he gives you the infertile land. If he is a troublemaker, and you get fertilizer to apply, but after knowing that you did apply fertilizer and land is now good, the next rainy season he will come for it. So, you would have thought this time it will help you because you applied fertilizer he has also stopped you from farming there." (Yidigu, FGD, women, pump users)



Having access to water for irrigation can increase yields, lengthen the growing season, and support more diverse crop choices. However, access to this resource was a critical challenge for many in the community, particularly for women who primarily access land through their husbands. In communities where irrigation is more difficult, women's access to dry-season plots was more limited. As irrigable land has a higher value, this can magnify the competition over high quality land, making it more difficult for women to access the land near the water source, thereby limiting their ability to irrigate.

In some parts of Mongnoori, where there is a dam (small reservoir) that is well-maintained, women seemed to have better access to water for irrigation, because there was more water available. Those who own plots located close to the dam and have access to pumps for small-scale irrigation reported having plentiful water for irrigation:

"Our dam, even if we put 100 machines there, we will still have water. [Before] we didn't have the machines and the water in the dam was small. But for past few years when we got the machines and they came to desilt/repair the dam for us, it can contain a lot for water for us to do anything we want to do." (Mongnoori, FGD, women, pump users)

However, even in Mongnoori, both men and women who live far from the dam reported difficulty accessing water for irrigation.

"We, those who are not strong, cannot travel for that distance to work. The people here go to the dams at Basyonde and Zong to farm, which is far. So, we, those who do not have the strength, can't go there." (Mongnoori, FGD, men, no pump)

In other communities, dry season irrigation is done using water from hand-dug wells. Accessing water requires digging a well each irrigation season, which is labor intensive and physically demanding. There is also less water and, therefore, less land near these water sources. Lack of water limits the amount of land people can cultivate during the dry season; and, as a result, husbands may not allocate land to their wives.

"...They [my wives] only help me [with irrigated farming]. If there are people working on the farm, then they will prepare food for them. If it is picking weeds, they do it. And, if I want the crops to be watered, they can fetch the water and water the crops. If all of us want to have our separate plots, it will not be good for us. If we have separate plots and one or all of us did not get the energy to go and work on our plots, the farms will not do well. We also have water problem and if we have different plots and we don't get enough water, it becomes a problem. If we also farm on the same piece, and all of us take the jerricans, we can water and finish in no time." (Yidigu, interview, man, irrigator)

Water is also essential for people to be able to adopt modern irrigation technologies like motor pumps. The pumps could only be used in places where there was enough water for irrigation. "Water was the challenge [for some people to use the pump]. The water was in the rivers, there were some places you could use the machine, other places you couldn't use the machine to get water to those places." (Yidigu, FGD, men, pump users)

### *Other Agricultural Inputs*

Among all the agricultural inputs mentioned as essential for agricultural production, fertilizer was mentioned most often by both men and women as needed for both rainfed and irrigated production. The need for fertilizer was frequently raised in relation to discussions about declining soil fertility leading to lower yields.

“The way our forefathers used to farm it is not like now. In the olden days, we used to farm without applying fertilizers. But, these days, when you do that, the crops will not do well. So, if we get fertilizer it will be good. Even when you apply once and you don’t apply three times, you will get something, but not much as the one who applied three times.” (Mongnoori, FGD, women, pump users)

The need to pay for fertilizer and other agricultural inputs (like renting cattle) also prevented some farmers from renting land as the additional cost inputs or sharing a portion of the harvest would raise the cost of farming to the point where it would not be profitable.

“...If you buy [rent] land and have no money to buy the fertilizer, what will you do with the land? So, you have to think critically before you can go for land, so some men think of those things and refuse.” (Akara, FGD, men)

Farmers’ selection of crops also depends on their ability to purchase fertilizer—farmers often mentioned that they prefer to plant maize but are unable to because they cannot afford to purchase fertilizer. Accessing fertilizer was even more of a challenge for women, leading to lower yields on plots that women manage and driving women to engage in other livelihood activities like shea butter processing and selling firewood.

Women’s lack of fertilizer access also affects their irrigated production. Unequal access to the same resources as men, or a delay in the application of fertilizer, limits women’s relative ability to benefit from small-scale irrigation, and therefore minimize its role in empowerment.

“...When we help them [husbands] and they prepare the land, they will divide into two equal parts and give us our portion. And, when they grow their onions, we too will grow our onions. When they grow pepper, we also grow pepper. But, with the pepper, you need to apply chemicals and fertilizer every week. So, when the men get fertilizer to apply today, we can’t get any to apply today. We will have to wait two or three weeks before we apply. So, the men will apply like three times, and we will apply one. So, the one that doesn’t get enough fertilizer will not do well....” (Mongnoori, FGD, women, pump users)

Another critical asset for dry season irrigation is fencing to prevent livestock from entering and destroying the crops. Fencing is typically built by hand using mud and sticks. Women are often unable to build a fence around the dry season plots that are allocated to them given that it is a physically arduous task requiring significant labor input (hired or family). Men prioritize building fences around their own dry season plots. “Women cannot build the gardens. Women cannot do it because they do not have the strength to mix the mud to build [a fence]. So women can’t build [fences] but men can build. The men can go and build the garden to secure their crops and it will be good for them. But you, the woman, you cannot and the man too will not build for you.” (Akara, interview, woman, irrigator)

Men also acknowledged this constraint: “They [wives] do [irrigate crops] outside our fence. They don’t fence theirs [dry season plots] but we fence ours. Because if they can’t build around [their irrigated plot] and we won’t get the time to build [a fence] for them. Not that we don’t want to build for them, but the fences are not permanent structures where you build once and it stays but they get destroyed, the place is a flood zone so every rainy season it breaks down and we would have to rebuild in dry season before you start the irrigation. So you don’t have the time to build many for yourself and your wives, if not we could have built even for the children” (Asikiri, interview, man, irrigator). The reasons for women’s inability to build fences or hire laborers to build fences for them were unclear. They may have chosen not to invest the time because of too many other responsibilities or because they considered the task too grueling. Depending on the size of the plot, it may not have been profitable for many women to pay hired labor for fence construction.

### *Human Capital*

In addition to education, physical strength and hard work, were often mentioned as an essential part of one’s human capital and as a characteristic of powerful people. “There are some women who have strength/power and their strength is more than men but there are some women who are weak. They want to work but because they don’t have enough strength, they can’t work. The one who has strength, she works hard.” (Akara, FGD, women)

The importance of human capital (including level of education, training, knowledge, skills, and experience) as a resource for empowerment emerged in discussions with farmers about the characteristics of community leaders and powerful people (both men and women). Having experience and knowledge in farming was acknowledged by both men and women farmers as important for success: “[a powerful farmer] in this community...knows more about agriculture and farming and he is a large-scale farmer. He’s older than them and has a lot of experience. He has the most farmland and animals, and he farms a lot” (Mongnoori, interview, man, irrigator)

In addition to having knowledge and experience, providing information, advising people, and having social connections were also considered important attributes of powerful people in leadership positions. “They [the women leaders] are people who are selected, that when there is information, they are able to distribute it well over all the community for everybody to know that this is going to be done.” (Asikiri, FGD, women).

Other personality traits were commonly mentioned as important leadership qualities, including many soft skills, such as patience, respect, and acceptance. “A powerful person is someone who has patience. The one who when you say something to her, she will not get angry, but she will have the patience to explain things to some of us who are unlearned.” (Akara, FGD, women)

Education is viewed as a particularly important resource for exercising intrinsic, instrumental, and collective agency. Education contributed to people’s sense of self-worth and self-efficacy (intrinsic agency). When asked about their schooling, many participants were ashamed that they did not go to school or complete their degrees. Education is also considered essential for people to be able to realize their preferred career paths (i.e. an important resource for instrumental agency) and as a way for people to succeed in their endeavors or as a way for people to escape farming. It was commonly reported that as a child many people aspired to get an education leading to a salaried job as a teacher,

nurse, or government worker. "...If you go to school and you are intelligent, you pass and get good work that will pay you well and you will use that to take care of your family. If I had gone to school and passed, I could have been employed by the government as a teacher or a nurse." (Akara, interview, woman, irrigator)

Many of the respondents were forced to leave school due to an inability of the family to cover school fees, idiosyncratic shocks, such as the death of a parent or health crisis, or the need for children to contribute to farm labor. As a result, many people's aspirations were adjusted to becoming a successful farmer, trader, or for women, marrying someone who could provide for them. "They sent me to school, but I stopped because my mother died. That brought about the marriage. I married early. I [had] wanted to go to school, I was thinking that if I could complete it will be very beneficial to me in terms of being a teacher." (Mongnoori, interview, woman, irrigator)

### *Financial Resources and Productive Assets*

Wealth was considered an essential resource for empowerment, and often used intermittently with the term for power. Conversely, widespread poverty was cited as a reason for the lack of powerful people in the community: "Having money is also part [of being powerful]. If you want to do something and you don't have money where is your power?" (Akara, FGD, women)

Financial services, like credit, are also important for empowerment. Credit is essential for farmers, traders and others to be able to purchase modern irrigation equipment, like motor pumps, and expand their businesses: "We need loans to expand our businesses and machine pumps to draw water for irrigation." (Garu, market trader, interview2)

Financial resources make it possible to purchase or rent larger productive assets, like motor pumps, to intensify agricultural production. Farmers acknowledged that having access to irrigation pumps through the project was helpful for increasing agricultural productivity during the dry season. "...those who used the machine [motor pump] to work, if we say it didn't help us, then we are lying. It has helped us a lot, but our mothers who were not having strength to work in the garden, they wouldn't know whether it helped or not, but we and our husbands work in the garden and it is helping us..." (Mongnoori, FGD, women, pump users).

Some women also reported benefiting directly from engaging in irrigated production, especially when they have access to motor pumps. The pumps increased these women's instrumental agency, by providing additional income to expand their independent production activities. The control over those resources and results empowered women to make additional decisions around inputs and production: "Those who use the machine [motor pump], it helped us to get money. When our husbands gave us land and we see that it is small, we use some of the money to go and buy more land to farm. We also used some of the money to buy seeds and hire 'by day' labor to help us in our farming activities and buying fertilizers." (Mongnoori, FGD, women, pump users).

However, not all women have access to motor pumps and ultimately their husbands decide how the pumps will be used. In this case, the agency to make decisions over productive resources, makes it more difficult for these assets to contribute to women's empowerment directly. Agency creates a distinction between ownership, access, and control of a resource, and therefore the opportunity to use resources

to improve well-being. In turn, the lack of land as a resource makes pumps an ineffective resource for many. Even those women in groups that received motor pumps said they gave them to their husbands to control: “If we get [a pump], we will give it to our husbands and are helping them.... [We] can’t do [our] own [irrigated farming] because we don’t have land.” (Yidigu, FGD, women, pump users). Even though women may not benefit from direct control over productive assets like pumps they may have other indirect benefits. For example, men in the Yidigu focus group mentioned that although they decide how the pump will be used, they take decisions on how to spend income from irrigated production with their wives.

### *Summary Discussion of Resources-Irrigation Linkages*

While the above-mentioned resources are all critical components of empowerment, not all are equally or directly important for small-scale irrigation. Factors that are most important include natural resources (land and water), financial resources/assets, and physical capital. Often a combination of resources, like land, water, technology and inputs, is needed to adopt and sustain irrigated production.

Having access to natural resources is essential for irrigation to provide a pathway to empowerment. Both men and women farmers need access to good quality land located near a water source and adequate water to be able to irrigate but getting access to irrigable land tends to be a much larger challenge for women. When women do have access, it is to poorer quality lands and smaller plots. In communities where dug wells need to be constructed, farmers need adequate labor to dig the wells. Women are not considered physically strong enough to dig the hand-dug wells and rely on their husbands or hired labor to do it. They also lack, more often than men, complementary inputs, such as fertilizer or fencing, needed to protect irrigated plots in the dry season.

Financial resources like capital or credit to invest in irrigation equipment or to rent land near a water source are also important. Both men and women lack access to these financial resources, particularly credit. Even when households do obtain a pump for irrigation (through the iDE program for instance) social norms regarding ownership of assets (in this case pumps) is a barrier for women to be able to use and benefit directly from the pumps.

Education was highlighted as one of the most essential resources for all other aspects of empowerment, including intrinsic, instrumental, and collective agency as well as being an essential achievement in itself. However, general education is less likely to be a pathway for irrigation uptake. Rather, discussions and interviews suggested that educated members of the community are likely to seek pathways out of agricultural production toward salaried employment. That said, people in these communities have very limited experience with modern irrigation technology. Therefore, more information, training, and experience on irrigation could increase adoption of improved irrigation equipment. This could then increase the benefits of irrigation and its potential contribution to empowerment.

### *Agency-Irrigation*

As described in the conceptual framework, there are several types of agency: intrinsic agency, instrumental agency, and collective agency. Intrinsic agency indicates ones’ sense of power within, e.g. their sense of self-esteem and self-efficacy. Instrumental agency represents an individual’s freedom to achieve their goals through their own actions and choices. Finally, collective agency describes the ability to jointly accomplish desired goals either as a family or as a member of a group or other institution.

While the qualitative protocols were not designed to elicit discussion on the ways in which people in the community or household may wield power over others (i.e. coercive agency), which is typically considered a more negative type of agency, the topic did come up during the conversations.

### *Intrinsic agency*

The focus group discussions and interviews with farmers indicate that intrinsic agency varies according to individuals' personal circumstances, access to resources (e.g. assets, income), and experience with idiosyncratic shocks (such as illnesses). While the conceptual framework distinguishes between intrinsic agency and achievements, discussions revealed that for many farmers in the Upper East region, the sense of intrinsic agency is intertwined with their economic and social well-being (achievements). On the one hand, those who have achieved relative wealth, those who are in a position to help others, and those who are educated or knowledgeable have a higher sense of intrinsic agency. Overall, the findings suggest that achievement of personal goals can improve life satisfaction, thereby increasing intrinsic motivation.

A woman from Asikiri who was shy during the interview, brightened when describing her success in trading: "I am a good person. I am also a trader. That is the only thing I can do and they [people in the community] will talk about.... The way I sell my oil people feel like selling some. Yes [I have had success]. It has helped me. It will be well and good for me in future. In the future, I will be healthy and my children will get salaries" (Asikiri, interview, woman, irrigator). Further, many women and men had the notion that if you had the ability to work hard that you would be successful and achieve your goals. Men from Yidigu praised women who maintain a dry season garden, describing them as proud people: "Some people will see them [women who irrigate on their own] as proud women." (Yidigu, FGD, men, pump users).

On the other hand, men and women who are not able meet their own basic needs and those who are unable to work due to injury or illness feel a sense of shame and fatalism about the future. The working poor feel a sense of despair that they are unable to improve their living situation despite their best efforts: "We and our wives are just managing because of the suffering. We are just doing our best to make ends meet due to poverty. We do anything we can to earn a living: dig wells, fell trees and any job possible. Sometimes we go to work and come back so tired that they cannot even bathe and they also haven't eaten to satisfaction." (Asikiri, FGD, men)

Life satisfaction is also associated with major turning points in one's life and stages of the life cycle. Many respondents, both men and women, noted being happy and carefree in childhood but feeling burdened as an adult to care for their families.

"It [my life] changed in the sense that after I got married, I stopped thinking childish [things] because I know I now have responsibilities. Before I married, any money I got, I used to buy clothing. But after marriage, I then thought—now I am an adult and have to change to behave like one. So, any money I get, I have to buy things for the home, take care of the home, and be thinking about how to educate my children." (Akara, interview, woman, irrigator)

Others perceived marriage and becoming a parent as positively influencing their life satisfaction: “I was really excited [to have my first child]! When it happened, I had to limit the number of hours I spent with friends outside to be with my child and wife” (Akara, interview, man, irrigator).

Life satisfaction for men is sometimes tied up with local notions about masculinity. “When I married, I didn’t know I could conceive a child, but now I know that I am also a man. In this community too, if you don’t have children and you die, you will not be remembered. So, I am happy that I have children and that I will be remembered when I am no more.” (Akara, interview, man, irrigator)

Lack of intrinsic agency hinders women’s ability to irrigate. Particularly in communities where irrigation is only possible by hand-dug wells, women perceive that they are not physically strong enough to dig a well for irrigation. “We do onion farming, but women are not strong enough to water the onions.... We dig down very deep to fetch water and women can’t dig that deep because they are not strong enough.... I mean they don’t have the energy to dig and fetch water from the pit” (Asikiri, interview, woman, irrigator). While both men and women acknowledge that digging wells is grueling work, the perception that women are not strong enough may also be influenced by cultural norms about gender appropriate work, rather than a lack of strength on the part of the women.

### *Instrumental Agency*

Participants defined the ability of farmers to exercise instrumental agency by several factors including their ability to participate in and influence production (and other livelihood) decisions, their control over income and/or participation in spending decisions, and their ability to engage freely in livelihood or social activities that benefit them. As with other forms of agency, the relationship to resources and achievements shapes the extent to which agency translates into empowerment. It is also important to place the findings on the relationship between irrigation and instrumental agency (e.g. women’s production decisions and control over income) in the context of ongoing social change.

There were a range of opinions regarding joint decision-making that often intersected with the age of the respondent and household composition (i.e., the number of wives and the size of the compound). The general trend was towards women participating more in decision-making about important household matters, ranging from production to health care decisions. There was acknowledgement among many men that women should play an important role in decision-making to accomplish household goals.

“As we have said from 15 years ago to now, we and our wives are united and take decisions together. We have seen that issues regarding hunger or money or school fees [have improved]. It is not like the way our fathers were—taking their decisions alone. They and their wives used to suffer. Now because we are united with our wives and taking decisions together, the suffering has reduced” (Yidigu, FGD, men).

Some women, however, pointed out that they cannot take decisions autonomously: “I always have to ask permission [from my husband] before [making decisions]... He cannot say something and you disagree. Anything he says, you have to do it for him.” (Akara, interview, woman, irrigator)

### *Production Decisions*

While men still dominate decision making around production, both men and women acknowledged women's greater participation and input into farming decisions compared to the past. These decisions range from decisions around labor, such as assisting husbands on household plots or cultivating their own plots of land, to trading the output that they produce and engaging in other entrepreneurial activities. Control over one's time and production further support achievements of well-being, and result from access to resources.

In general, women work on the main rainy season plots, which are predominantly controlled by men, and then also cultivate their own plots of land, which their husbands allocate to them. Work on men's plots generally takes priority over women's: "If there is work to be done on his farm, he can say you should come and work there so that you go and do your own work when his is done. So, you have to leave yours and go there" (Asikiri, FGD, women). The prioritization of men's production activities may also hinder women from investing in the plots they control, including building fences or hiring labor to dig wells for dry season cultivation.

Interviews and focus groups with both men and women indicate that women participate in decisions on the main household plots. Men across all the villages agreed that joint decision-making related to production is ideal and that both husbands and wives contribute to the same goals of providing food and income for the family. Men also perceive that deciding jointly and coming to an agreement about production decisions will have better results.

"I used to work more alone and whether you are right or wrong, it will affect the output but now I do not think through issues alone, my wives help. There are changes with some of us who discuss issues with our wives. I have a brother who does not have any discussions with his wife and when you see their work on the farm, it is pathetic." (Akara, FGD, men)

Further, the men expressed that not taking decisions together results in worse outcomes. "When you are in the house and you don't take decisions together, things would not go well.... I can sow and it will be well but because of the disunity [crops] won't yield well" (Mongnoori, FGD, men, pump users).

Even though many men acknowledged the value of joint decision-making, men and women both view women's participation in decision-making as an advisory role. In general, men are regarded as the final decision-makers about rainy season production and sale of harvest, which is the largest source of income for the household. "The woman will bring different ideas before you make your final decision.... Most of us always want our decision to be final because we are the landlords, but others too agree with the woman's decision." (Mongnoori, FGD, men, no pump)

Lack of productive resources controlled by women also contributes to men's greater power in production decision-making. "A woman cannot just decide that 'this is what I want to do' and not tell her husband or landlord.... It is the men who are the ones who will release their bullocks to you to plough... Also, you don't have land to farm so you must inform them." (Asikiri, FGD, women)

One woman from Akara reported taking a risk by disagreeing with what her husband had decided along with her rival wife. Her account suggests that if the decision had not turned out well, there would have been (unspecified) repercussions from her husband.



“During times of cultivating maize sometimes we wanted to plant late millet and my husband objected to it.... [He] insisted we cultivate early millet. We refused and we planted the late millet. And, when the crops started to germinate, he saw that we had planted the late millet and he questioned us. In that season we had the best of late millet like never before. They were well grown and big in size.... We took the hard decision and we had a bumper harvest. And we told him, ‘look when you said we should plant early millet, if we had done that will we get this?’ We think that because it yielded well, he did not say anything or do anything to us. But if it had not, he wouldn’t have spared us” (Akara, FGD, women).

Men also expressed displeasure at their wives not carrying out their decisions. “You have to advise her to know that what she has done is not good and that she should not repeat it next time. Why should I tell you to do something and you refuse and went somewhere? Is she trying to say that she is wiser than me or what?” (Mongnoori, FGD, men, no pump).

There were mixed experiences related to the plots that women cultivate themselves. Some women report that they control decisions and income from these plots. Others acknowledged that their husbands direct their work on these plots, from deciding which crops should be planted to what is done with crops produced. Results from the interviews and focus groups with men reaffirmed the idea that there is variation within families about who takes decisions on the plots allocated to women. In one instance, men in Mongnoori acknowledged letting women decide for themselves how to manage the plots they control: “If you give her a portion of land to sow, that one she can decide on her own what types of crops to plant.” (Mongnoori, FGD, men, pump users).

Some men and women view women cultivating their own plots as a risk mitigating measure, which supports men’s decision to allocate plots to their wives and women’s labor on those fields. In this case, the food crops women produce are sometimes saved as a backup for when the harvest from the main rainfed plots is exhausted or if there is a crop failure.

“[On] my husband’s plots, I work a small portion, my rival [wife] works a small portion, and my husband too. That is, each of us works on a small section of my husband’s plot. My husband thought that if we work individually and one of ours yields well, we will get something to feed [the family] with. But, if we work together and everything fails, then we lose. That is why he divided it for us.” (Akara, interview, woman, non-irrigator)

Acknowledging the achievements that can come from women’s direct participation production also extended to allocating land to women for irrigated farming: “The man will plant the onions or tomatoes and give her a portion to take care of [during the dry season]. If it is good, it is for all of us” (Mongnoori, FGD, men, pump users).

When it comes to large purchases, like motor pumps, men tend to make the decision but acknowledge that their wives should be informed and consulted as a sign of respect, as a farmer in Yidigu illustrates: “I decided with my wife to buy a pump. There are times there is always a lot water and using the jerricans you will get tired. But if we get the pump to work faster, it is better. That is why we decided to get it. It is always difficult watering. I do most of the work myself and I realized that I get exhausted day by day watering with the jerricans. So, I told them it is better if we get the pump in order to lessen the work and they saw the wisdom in it and agreed. [I asked my wives about buying the pump first] because I work with them and it doesn’t show respect if you don’t tell them. It would be a surprise to them [if I

bought a pump and didn't tell them] and show that we are not united. We work together and we live for each other.” (Yidigu, interview, man, irrigator).

Men tend to make decisions about the output from irrigated plots (whether sold or consumed) except in the case of plots allocated for women to manage. For irrigated plots that the men manage, women are still responsible for taking the crops to market for sale when directed by their husbands: “If he wants to sell, he will tell you ‘my vegetables, I want to sell them.’ So, when the time for selling is up, he will tell the harvesting time for the vegetables is due and I will harvest and go and sell.” (Mongnoori, FGD, women, no pump)

While many men favored women’s increased involvement in irrigated production, as well as their financial contribution to the household, some expressed negative opinions about women’s autonomy in dry season production. Interviews suggest that the discomfort is more with women’s control over income, rather than their autonomy in production decisions.

“When the women do the work in the dry season, some time ago, the men will transplant the crops, water them and then the women will harvest them and sell them so that the money will be for both of them. But recently, most of the women are wild, that they do not want to do that again. They will plant with their husbands and also they will go out and get another plot and plant for only themselves.” (Akara, FGD, men).

#### *Control over Income*

Similar to agricultural production decisions, the overall trend emerging from the interviews and focus group discussions was towards woman having increased ability to earn their own income and greater control over spending decisions, despite the expressed reluctance of some men. Discussions and interviews revealed considerable variation in the ways in which households make spending decisions and in the degree of knowledge that husbands and wives have about the earnings of their spouse.

In general, the income that men and women control is often used for different things. While women now tend to have greater income-earning opportunities and control over income through their own agricultural and other livelihood activities than they did in the past, this is accompanied by greater expectations about women’s financial contribution to meet household food, education, health, and other basic needs. Women are often responsible for food expenditures and paying school fees from the money that they earn. Women tend to control these expenditure decisions, whereas other expenditure decisions are made jointly or led by men.

“There have been some changes over the years, some women work and also support the home; and when their husbands do not have enough money, they can complement them. There are some times [when] your children have to go to school and they will need some school supplies, such as books, or they have to pay their school fees. Women can support the family in such areas, especially, when the man does not have enough to pay for the fees. If we want progress for the family, we need to support with our money. On the other side, if the woman does not have enough, the man can give her money to do what she wants to do. When the man has [money], he will take care of the children. But truly, women handle most of the bills for the education of their children compared to men” (Akara, FGD, women).

Some men supported women earning income from their own plots to take care of their own and their children's expenses, in particular by allocating land for women to produce crops. The same was also true for irrigated plots that women manage during the dry season: "Yes they [my wives] do have their own plot as well. When my wives and I cultivate eight acres of land we use it for consumption, but I have also given each of them one acre each to cultivate the crops they are interested in and sell their produce for income for themselves" (Mongnoori, interview, man, irrigator).

It was also reported that women have a stake in spending decisions on income earned from the sale of irrigated crops, especially when they have provided labor to produce those crops: "The one who worked on the garden owns the money [from the sale of irrigated crops]." (Mongnoori, FGD, men, pump users).

However, as with production, husbands are the final decision-makers: "The man will be charge of the money [from the sale of irrigated crops] but he will decide with the wife how it will be spent" (Mongnoori FGD men).

Women also have control over income earned through other livelihood activities, like trading, pito brewing [local alcoholic beverage], shea butter processing, dawadawa (local spice) making and trading, and fuelwood production. Some women prefer earning their income through these activities, rather than sharing income earned through farming with their husbands: "I would prefer the hair dressing. If it is the hair dressing, the proceeds would be for me but with the sale of the pepper, I will share with my husband. It is solely for the husband and I am doing the selling.... it is for my husband [that I sell pepper]. We both take care of the pepper and when it is matured, we harvest and I sell them" (Basyonde, market trader, interview).

Just as families reduce risk by separating production across plots that men and women control separately, some families split income to save it for later expenses: "When you are united, the man will get money and come and tell you, 'my wife, collect my money and hide it for me' and you will do that and anytime he has a use for it he will come and collect it" (Mongnoori, FGD, women, no pump).

Often, both men and women invest the income they earn from various livelihood activities back into farming, as this is viewed as the most essential livelihood activity for the family. Women are often asked by their husbands to contribute to agricultural inputs he has decided to purchase. However, women's contributions to the purchase of an asset do not necessarily translate into increased decision-making power over how that resource is used or by whom. For example, women in Mongnoori mentioned: "If the man is not having a plough, he can take decisions alone as to how to get one and only ask you to contribute money to buy. Or if the man has only one bullock and needs another to be able to plough, he can also take a decision and we can say we will contribute for him to hire a cow and add to his" (Mongnoori, FGD, women, pump users).

Women's increasing earnings and financial contribution changes power dynamics in the home. When prompted, different opinions were expressed about women who have money, specifically those with more money than their husbands. While in general women tend to have fewer financial resources than men, both men and women acknowledged that there are cases where women earn more than their husbands. Some people (both men and women) explained that these women are blessed by God for their hard work. "I think is the grace or blessing of God [for a woman to have more money than her husband]. Someone could be young or old but [if] she is persistent and hardworking, God will bless her effort and she will progress in her business. She can get more than her husband" (Akara, FGD, women).

Some men seem relieved that women can reduce their financial burden, and some expect women to cover some household expenditures like school fees, and food. “If my wife is rich, it will be good for me. If I want, she will help me. The children that we bring forth, she will take care of them. If I am in a very difficult situation such that I can’t come out, she will help me.” (Yidigu, FGD, men, no pump).

A woman from Akara noted that she is able to earn income for herself only because her husband does not earn enough: “Yes he [husband] does [allow me to do trading or other activities]. Now because, if I am going to do labor work, or trade or anything, it is because he doesn’t have enough to support me and, therefore, he will allow me to do it. If he had money to give me, he would have prevented me from doing those works.” (Akara, interview, woman, irrigator)

Some men went further—considering the income their wives earned as their own: “It’s not a problem [if the woman has money]. If she has money, it is my money. She can use it to look after the children in school fees and feeding. It can also be a problem but after looking after house with her money, some men will expect her to give him money too” (Asikiri, FGD, men).

However, some men are uncomfortable with women’s increasing contribution and see it as a threat to their role as household head and provider, especially if the woman earned more money than her spouse. “[If a woman has more money than the man] in our Kusaug tradition, there will be a problem when you talk, she will not mind you. And if you do not take care, she can even beat you.” (Mongnoori, men, FGD, no pump)

Women also had mixed feelings about growing expectations for their contribution. Some felt that it was a burden to have the responsibility to bring in income when they do not have the means to earn enough. Others wanted to have more independence and felt pride in their ability to provide for their family. One woman from Akara described the pressure placed on her to provide for her family: “My father farmed a lot and had large stock of food and so looking for food to feed the family was not the job of my mothers and my father also supported his children's education. But now everything is on me. My husband is not able to support” (Akara, interview, woman, irrigator).

### *Mobility*

Women’s ability to move freely throughout their communities and society is another measure of women’s instrumental agency (power to). In the Upper East Region of Ghana, women largely have freedom of movement with a few exceptions related to migration, visiting family in their home village, and attending burials.

Temporary migration to Kumasi was reported as a very common livelihood strategy, particularly for young adults and teenagers looking to build savings (often for marriage). Mostly men reported engaging in this strategy of moving to Kumasi for several years in their youth. Several respondents described being called back to their village to support ailing family members or due to a death in the family or because they were not as successful in earning income in Kumasi as they hoped. While a few women also had spent time working there as agricultural laborers, women are also less likely to migrate as far as men for seasonal employment—typically to Kumasi. Rather, they often engage in “by day” labor on local farms when they need to earn extra income to meet basic needs.

Some women also mentioned wanting to visit family in their home village, particularly during the time of year (dry season) when memorials (funerals) take place in the community. These were described as

community events where members of the community who passed away that year would be remembered. Often, family or work obligations would prevent women from participating in these events.

Market participation is often the reason for women's movement. Women have access to markets as part of their livelihood activities and gendered responsibilities. Women often lead in market engagement for the household, including selling crops, buying food and other necessities, and selling other products, such as shea nuts or butter, firewood or charcoal, or pito ingredients or brew. However, men dominate certain market activities, such as the trading of livestock. "In the market here, the women have different work they do, and the men too. I do not know much about the work the men do. I know some trade in animals, such as fowls, sheep, cattle and goats. Some of the women process rice and dawadawa. Others sell cooked rice and oil" (Basyonde, woman, market trader interview1).

Because women dominate local market sales of crops, men do not want to be perceived as engaging in women's activities. As such, men are reluctant to travel to the market with their wives: "Mostly women [are traders]. I only see that more women sell but I do not know why more women are selling....He [my husband] does not agree to come to the market. He harvests them [peppers] and tells me to bring them to the market....He explains that selling of things to other people is for women [and] I agree" (Basyonde, interview, market trader2).

Although women dominate petty trading in the market they do not trade in bulk or typically have access to more distant markets like Kumasi, which is over a day's travel. Time and domestic responsibilities were some constraints that kept women from traveling far. Men from Mongnoori also mentioned that women's lack of financial resources prevents them from selling in larger markets further away: "All the women in this community do not have the financial strength to go to Kumasi to buy or sell things. They only go to the small market in this community." (Mongnoori, FGD, men, pump users).

Another reason for women's mobility is to fetch water for domestic consumption from the borehole. In communities where there are too few boreholes, women have to travel to obtain water. Discussions suggest that irrigation may increase women's mobility, particularly if they must travel far from the home to irrigate plots of land located near dams or the riverbed. "Here, we don't have irrigation dams to do dry season farming. Because of that we normally go to a distant place to get land to farm. In that case, they [women] may move." (Mongnoori, FGD, men, pump users).

#### *Time*

Women in the Upper East Region have a heavy workload with domestic responsibilities, farming, and other livelihood activities. "If we want to count all that we do here, we won't finish, why, we the young ladies, we have work and it is so much, but we don't have the strength to do all. But we have a lot of work. Why do I say that? We trade, we farm, we garden.... They say we are women and we are hardworking. As I sit here, I farm, there is no trading that I don't do, I have a bar, sell drinks, garden I do." (Mongnoori, FGD, women, pump users)

Some women, however, acknowledged that men also sometimes help with childcare and cooking when the wife is away or unavailable. "I know with the changes, sometimes you may be out of the house for work and you may leave the children with their father. If he knows that there is soup, he can heat/cook the food and serve the children. There are some foods the men can easily prepare and some of them would do that for the children in the absence of the woman. For example, some men can cook jollof

[rice with sauce] for the children, some men can also prepare TZ [Tuo Zaafi, a local dish of maize or millet and cassava] and they will prepare for the children.” (Akara, FGD, women)

Men and women had mixed opinions about men who help their wives with domestic work—some viewed them as good husbands while others (primarily men but also some women) disagreed that this was appropriate behavior for men. These views create social pressure for men not to engage in such activities. Men focus group participants in Yidigu felt that men who helped their wives would be mocked: “They will give the woman’s name to the man and the man’s name to the woman, that is they are making fun of you [men who help their wives at home]” (Yidigu, FGD, men, pump users).

There was also some indication that norms about men’s and women’s roles were changing—just as women engage more in productive activities, some men accept that they should assist with domestic responsibilities: “Those days if a man was found helping the wife, that man was seen as a useless person. But [now] we have reached a stage where we have to help because when you are doing your work, the woman will help.... So when you see someone helping the wife, it is not that the person is useless but he wants to help the wife so that it will be good.” (Mongnoori, FGD, men)

Managing water for domestic and productive purposes is a time-consuming activity in which women are heavily involved. In some communities, there is limited access to water sources (e.g. too few boreholes) and collecting water for domestic use can be onerous: “There is usually a lot of traffic to fetch the water because there is only one borehole. If there were several boreholes, we could go and come home quickly to attend to other work. Sometimes you get there and there are cattle and you have to wait until they pump enough for them before you can fetch water.” (Akara, FGD, women).

The responsibility for collecting domestic water falls primarily on women, however, some men reported helping their wives on occasion and several people mentioned that children are also tasked with fetching water: “A woman can say to her children, go and fetch water from the borehole for me and let me gather the ingredients for the food because the sun is setting....There is also the situation where the woman doesn’t have children. As a man, you can help the woman if she is overwhelmed.” (Asikiri, FGD, men)

Irrigated production takes place during the dry season (lasting 4 months) and women play a large role in watering crops using traditional, labor-intensive methods. Because crops must be watered continuously during this period, irrigated production prevents people from engaging in other activities or travel: “The garden work, it can prevent you from travelling. If you had a journey to make, the garden can prevent you from making that journey. You know the garden work it wants all your time, you [must be] there working.” (Yidigu, FGD, men, pump users)

Depending on the source of water (dam or dug well) and the irrigation technology available, the time it takes to irrigate varies dramatically. Farmers who use traditional methods view irrigation as a physically exhausting activity: “We use the jerricans and fetch the water to sprinkle on the crops. We have been suffering because we use manpower. We use the cans to go and fetch water and come back and go and fetch water and so forth” (Yidigu, FGD, men, pump users).

Because irrigation requires digging a well by hand in some communities—a very labor-intensive task—it is often considered to be too difficult for women: “It is men [that do garden work] and the women are assisting...garden work is very tedious work” (Mongnoori, FGD, men, no pump). However, the burden

falls on women to do dry season irrigation when the husband is unable: “You can have a wife and you don’t have the strength to engage in garden work or you are an old man and the woman has some strength, the woman has to go to the garden to do some small [contribution] to take care of the family” (Mongnoori, FGD, men, pump users).

The physical labor requirements may also prevent participation from older women or women who are disabled or unwell: “It [irrigated gardens] is helping us a lot. There is time. It has only blocked our mothers [from participating] because they can’t work.” (Mongnoori, FGD, women, pump users)

Many men also considered it as sparing their wives, if they don’t have to engage in irrigated production: “My wife can help in the garden, especially in transplanting. But if it is watering the plants, women because they carry children or are pregnant, it is dangerous to go to the well and back, so I don’t allow my wife to help. I do most of this myself.” (Akara, interview, man, irrigator)

Even though it is tedious, some women want to have the opportunity to engage in dry season farming because of the benefits: “I can’t say no [to farming my own dry season plot]. I thought that if I do it, it will help me and that is why I accept it. So looking at the benefits, I wouldn’t say no.” (Akara, interview woman, irrigator).

Despite the effort required to engage in irrigated production, it is considered preferable to other dry season income-earning activities like making and selling charcoal because of the benefits: “In the dry season you burn charcoal and other things. When you do the garden, you can get something from it to feed your family, so you will not produce the charcoal again, you will also get vegetables so you will not use money to go and buy vegetables, except fish.” (Yidigu, FGD, women, no pump)

While irrigating with traditional methods is considered burdensome, having access to pumps saves women’s time watering or allows them to leave irrigating to their husbands. “Your husband farms [in gardens] and you water and thank God associations have come and we can now get access to machines [pumps] and the men will use them to irrigate. So, now we only observe and they irrigate.” (Mongnoori, FGD, women, pump users).

Men also consider it a relief to have access to modern irrigation technology: “Well, its help was in the fact that we used manpower before, but when we collected the pumps, we were no longer using manpower and that was helpful. So, if there is water, you don’t get tired as you did” (Yidigu, FGD, men, pump users).

### *Collective Agency*

During interviews and focus groups, both men and women placed considerable value on collective agency, whether it be through working together as a family unit or participating in groups at the community level. Working together enables women to make strategic choices, leading to better well-being outcomes or achievements.

While much of the discussions centered around participation in groups, respondents also highlighted the importance of working together as a family. Sometimes co-wives support each other to relieve the financial burden: “...[T]he school fees could come and I go to my rival [wife] here and she will help me to settle it and if God blesses and I get it, I will return it to her” (Asikiri, FGD, women). Others expect that

their grown children will support them to make ends meet, especially when they reach old age: “We anticipate that our children that we have sent to school, when they become well off one day, they should remember and always send us food items since we cannot farm by then. Our children should also give us money to buy fertilizer to apply to our maize. In this case, we will be able to have a good harvest and peace of mind. We will get to eat and look nice. When you have good health and you are satisfied too, you will look nice” (Mongnoori, FGD, women, pump users).

Participating in groups and meetings was considered such an important activity that women participants in one focus group in Mongnoori sang a song about the importance of coming to meetings. As one woman explained: “It is better because, before we formed the group, anytime you needed help and you will move from one person to another, sharing your problem, they will refuse to help. But after forming the group, anytime you need help, they don’t refuse, they help.” (Akara, interview, woman, irrigator)

Social capital among women is valuable because it is assumed that men may not be willing to assist women who are not their wives, but women will help each other: “In this community, it is the men who can help but they think of their family first. It is my fellow women who can help and my hope is in them. I also hope for the future of my family. For the men, when they see you suffering, they are concerned with their own households. It is only the women who can help.” (Akara, interview, woman, irrigator)

Working together gives women freedom to engage in income-earning activities independent of their husbands: “For decisions [women take independently], they do to help each other on their farms. They have organized groups. They organize themselves into groups and go to each other’s farms in turns. Those things, because it is women’s work, they will not inform us or seek permission” (Asikiri, FGD, men)

Several women in Akara suggested that education as a resource has contributed to women’s sense of communal agency: “Some years back, women used to be afraid and it was difficult to stand before others and we thought it was because we knew nothing. In recent times, we also recognize that we are all important and we are human beings and whichever meeting or people we meet we can feel confident in interacting with them and we can discuss and take decisions together. That has brought a lot of changes to us” (Akara, FGD, women).

Communal agency also supports the accessing of important resources. Most groups are savings and loan groups (susu groups), which enable people to save for school fees, medical needs, agricultural inputs, such as fertilizer, or simply to buy food to smooth consumption. “Yes, I belong to only one group. It is a ‘susu’ group [savings and loan group]. We have a box and we meet every week to put some money in. If you have 1 or 2 GHS, you put it in and anytime you need money to do something you approach the group and tell them, they will give you the money to do whatever you want to do.” (Akara, interview, woman, irrigator)

However, savings through the susu group are not enough to enable adoption of modern irrigation technologies, such as motor pumps, for either men or women: “That money is not always enough [to buy a pump]. With savings contribution at the end of the year the highest we can get is GHS 300 to 400.” (Mongnoori, interview, man, irrigator)

Other groups in the communities also support farmers and traders in their livelihood activities. For example, a market trader in Garu described how forming a group assisted his business: “We [15 onion



sellers] had a meeting and decided to get a very enclosed place so that when it is raining, the rain would not wet our goods.” (Garu, market trader, interview 2)

Groups also facilitate communal farming—which is particularly helpful for women trying to access land. “I belong to one [group]. It is a group where we grow soya beans. We plant [soya] on a common plot. We used to save some money and later decided to use the money to grow the soya and sell and share the proceeds” (Akara, interview, woman, non-irrigator).

Groups can facilitate linking social capital and ties to government or NGO resources outside the community. Those group members with contacts to outside organizations or government agencies that bring new projects to the community are considered to be leaders. “Our leaders told us that as we live here and there is no assistance from anywhere, we should come together and contact government or NGOs to come and help, you have to contact someone and that person too will contact another, so we should work together with the government and the government will help us.” (Mongnoori, FGD, women, pump users).

Similarly, men in Yidigu reported that women lobby local elected officials for new boreholes: “...we have our district and it is in Garu and we are not getting water to drink. Our women can meet and discuss about the water situation, and they will elect a few to add to the queen mother and they will go and talk to the district assembly and they will come and construct a borehole for us. When we were children the women could not do much. Now it is better, but it has not gone far [enough] yet” (Yidigu, FGD, men, no pump).

Groups connected to outside organizations also introduce new skills and information to the communities: “We have many groups in this community and I was a member of one—the soap making group. I learned how to make soap, but I don’t have money to start on my own [business].” (Akara, interview, woman, irrigator)

Joining a group requires resources that may be prohibitive for many poor members of the community. With susu groups, the expectation is that each member contributes savings on a regular basis, which some people are unable to do. “When they started, I was not part because I didn’t have anything. But when I started the shea butter extraction, I can get some money to save so I joined [the group]” (Akara, interview, woman, non-irrigator).

While many of the susu groups are mixed-gender, men and women also have same-sex groups where they deal with different issues. “There are issues that men meet to discuss, and, in such meetings, women are not supposed to go there. Similarly, women also have their meetings where they discuss only issues affecting them. Men are not supposed to be there.... The youth hold their meetings, while the old people too hold their meetings” (Akara, interview, man, irrigator).

Even when women participate in same-sex groups, group activities sometimes require the approval of husbands. As women in Akara reported, “If I see that an organization like that comes to help us with our water issues, I have to talk to my husband first and tell him of the benefit of the proposed activities of the organization and we will then decide” (Akara, FGD, women).

Several women and men noted that one of the issues women are more concerned with relates to water for domestic purposes. Men in Mongnoori reported that women are more likely to attend meetings related to water issues and to maintain domestic water infrastructure like boreholes: "...if you have only one borehole like we do and when it spoils, all those who fetch water there will contribute money and get someone to come and repair it. So, when there is confusion, then it is that someone refuses to pay. The women are usually in charge of collecting the money for the repair" (Mongnoori, FGD, men, pump users).

In addition to managing domestic water supply, collective agency also facilitates the purchase, use, and maintenance of irrigation equipment. This is because purchasing and maintaining pumps is costly and difficult for individual farmers or farm households. Generally, arrangements for sharing or renting modern irrigation equipment are not currently available in the communities. However, some women in Akara reported that "...[pumps] are available but for renting. [Some] people buy them....Others come together as a group to buy and use them on their farms" (Akara FGD women).

Groups also facilitate maintenance of the pumps: "We always agree. Everybody uses it [the pump] and when there are damages, the group decides how much everyone should pay, and it is repaired, and we pay." (Akara, FGD, women).

However, in some groups, farmers struggled to pay for repairs to a broken pump: "There are two spoilt ones [pumps] and it is those ones that the people said they want but they don't have money to pay. As I sit here, I am a poor man. If I got it, I would have wanted [it], but because I can't get money to purchase it, I have to leave it. If we were having money, we would have collected and repaired them [broken pumps], but we don't have [money]" (Mongnoori, FGD, men, pump users).

Groups created to share pumps also facilitate labor sharing: "He will come with the bicycle and take it [the pump] and ask you to help him on his farm. We helped each other. If one person is going to do it, one has to help him, when it comes to you too, he will help you" (Yidigu, FGD, men, pump users).

However, sharing the pump was sometimes difficult, particularly when farmers in the same group were not located near each other. "If the farms were not far from each other, it was easy [to share the pump] but if they were [far], then it became difficult." (Mongnoori, FGD, men, pump users)

Men in Mongnoori also indicated that moving the pump to group members that lived farther away was more difficult for women: "Some of our group members are staying at far places, so, we were finding it difficult carrying the machines from one place to another, more especially [because] there were women among us. So, if the number [of group members] can be reduced and it will help and we do our work, it would've brought some change to the women" (Mongnoori, FGD, men, pump users).

### Summary of Agency-Irrigation Linkages

The linkages between the different types of agency and irrigation are complex, as are the pathways to empowerment. Not only does the relationship go both ways—i.e. irrigation affects agency and agency influences whether an individual irrigates—the direction of the effects varies depending on the factors of agency. For example, women's increasing role in agricultural production decisions and control over income (instrumental agency) and increasing involvement in groups (collective agency) may lead to an

increase in their ability to adopt small-scale irrigation, while their heavy time burden (instrumental agency) may prohibit them from engaging in the practice. Conversely, adoption of modern irrigation equipment, like motor pumps, may increase agency by freeing women's time to engage in other livelihood activities while also decreasing women's decision-making role in and control over income from irrigated production.

The results of this study indicate that women's agency is generally increasing in the study areas, with more involvement in income-earning activities, including agricultural production. Women also contribute a larger share of household income and have more control over spending decisions—particularly in the realms of food, other frequent household expenditures, and children's school fees. They are also increasingly involved in groups which facilitate their access to financial resources, information and training, and resources from outside groups. Unlike in other contexts, women do not have limited mobility to engage in livelihood activities. Rather, heavy workloads with both domestic and productive activities can limit women's ability to travel to more distant places or expand their business activities.

In this context, many women are engaged in irrigated production during the dry season. Those women who are involved do report direct benefits, such as control over income from the irrigated plots they manage, and indirect benefits, including greater income and food security for the household. Access to motor pumps provides even greater benefits by reducing the labor burden of irrigation and increasing income from irrigated production. In many cases, women reported that the introduction of motor pumps freed up their time from engaging in irrigated production and allowed them to invest time in other livelihood activities. In this case, an increase in women's agency from irrigation led to their movement out of irrigated agriculture.

### Achievements-Irrigation

Achievements are an essential part of the pathway to empowerment. They are the result of women (and men) utilizing resources and exercising agency, and they also contribute to future resources and agency, especially one's sense of intrinsic agency. Achievements can include a wide range of well-being outcomes, such as good health and nutrition, financial security, food security, and social status. These achievements are defined within local contexts, as goals and aspirations vary. In the context of Northern Ghana, farmers emphasized particular achievements when discussing what is required to be a powerful leader in the community, as well as those related to their own personal goals and hopes.

Personal achievements include economic status, education, and success in farming/food security—all of which are strongly linked and contribute to one's social status in the community. In general, the achievements people discussed were related to being able to meet basic needs, like food security, adequate income, and being able to ensure children's education. The achievements of leaders in the community were described as a higher level of financial security, education, social connections and leadership qualities that enabled them to help others in the community. Such descriptions provide an understanding of what members of the community can aspire to achieve. In both cases, at the personal or family level as well as at the community level, many of the achievements people described related to doing things for others. That is, many men and women discussed goals related to educating their children rather than themselves.

Irrigation, particularly with modern technology, has the potential to further well-being achievements through increases in income from irrigated production, greater availability of nutritious foods, greater resilience to climate shocks, such as drought, and an increase in women's agency among other pathways.

### *Financial Well-Being*

Increasing one's economic status is an achievement that most participants emphasized. Depending on the initial state of economic well-being, the goals ranged from being able to meet basic needs to being able to support others. People who can't meet basic needs are considered "pathetic" and "suffering," while those who are able to help others are considered powerful and influential leaders.

A woman in Asikiri expressed the ability to meet basic needs as an achievement: "The [powerful] person is not poor, the person is not suffering, that person has everything and doesn't lack anything...[I need] things [like] food to feed my children, dresses and sandals for them to wear, good health etc. Because I cannot get these things, that is why my life is not good." (Asikiri, interview, woman, irrigator).

The potential achievements of men and women differ. Being wealthy and owning assets, such as cattle, were described as characteristics of powerful men, while women who can take care of themselves are deemed powerful: "If one has wealth (money), owns cattle together with motorbikes and belongs to him... a woman who [is powerful] has money to cater to her needs without thinking about her husband's money and doing good works" (Mongnoori, interview, man, irrigator).

Several respondents expressed that engaging in irrigated production increased household income. The greater financial security and resources as a result of irrigation leads to other achievements: "Those doing the garden, they get benefits. They have more benefit than those not engaged in gardens because if you worked in the rainy season and I also worked in the rainy season, we are all the same and if I work in the dry season and you don't work, and I get 10 million or 20 million from the garden, if I take 5 million or 10 million and pay my child's school fees, or I buy a motorbike, will he be my co-equal? So there is difference" (Yidigu, FGD, men, pump users).

Similarly, a woman in Akara mentioned other benefits from the increased wealth due to irrigation: "Yes, there is change [since the children started growing onions]. Some have married and are able to pay the bride prices of their wives from the sales of onions. Proceeds from sales of onions are also used to buy food for the household and for cultural activities" (Akara interview, woman, non-irrigator).

Money from irrigated production also helps farmers invest in their children's education and farm inputs: "It has changed a lot [being able to farm in the dry season]. It has changed our lives because when I do the irrigation, I get more money to pay my children's school fees and get some vegetables for household consumption and we also use some of the monies to purchase fertilizer" (Mongnoori, interview, man, irrigator).

### *Helping Others*

Beyond improvements in one's own financial security, respondents stressed that being able to support others in the community was an important achievement. A sign of an empowered person, in this case, is a leader who uses the resources and agency that result in one's own achievements to improve the well-being of others. In some cases, wives may be given to families of men who are particularly generous, a form of traditional marriage that is still commonly practiced.

Women were also considered to be leaders if they could help other women in the community: “Those people [women leaders], if you don’t have [money] and you go to her, she can help you with something small” (Yidigu, FGD, women, no pump).

Men also value the contribution of these women leaders. A man from Akara mentioned: “These women [leaders] see everybody’s problem as their own and try to help. When they travel to other communities and see something that they think will help their community. They try their best to bring it here. There are also women who want their colleagues to be like them and will try to pull them along by helping or seeking help for them from other sources. That is why I think those women so are powerful.” (Akara, interview, man, irrigator).

Helping others also entails the ability to bring people together to solve problems and lead community development efforts to improve the well-being of the community more broadly: “That woman [leader] is someone who is interested in promoting development and unity in the community and who seeks the welfare of fellow women. She will tell us let’s do this and it will be good for us” (Mongnoori, FGD, women, no pump).

A woman in Akara gave an example of how women who share information and knowledge contribute to improve the well-being of others in the community and are, therefore, valued as leaders: “I already talked about nutrition, hand washing, how to prepare food, the kind of water to use when cooking, the kind of food to give to babies, etc. It is through those women [powerful women] that we learn. When they go to Garu and learn it, they come back and teach us. Since then, some common ailments are not seen again” (Akara, interview, woman, irrigator).

Local leaders know and accept their responsibility to help others. One community leader from Asikiri noted that “To be powerful one has to accept and know and follow the needs of the people.”

### *Education and Raising Successful Children*

Increasingly, meeting basic needs also means having the ability to invest in children’s education. Because of the importance attributed to education as an avenue for empowerment. It also creates more opportunities for agency, leadership, as well as provides an escape from poverty, educating one’s children is considered essential: “Gone were the days, when you give birth to children and you don’t take them to school. These days when you do that education authorities will take you on. If you don’t do the family planning and giving birth almost every year, you can’t take care of all of them through school, unless you do that and reduce the childbearing and be able to cater for them in school.” (Mongnoori, FGD, women, pump users)

While education is a critical resource for empowerment, through the interviews and discussions, education also emerged as an important achievement that enables members of the community to reach a higher social status. It is now considered important for both boys and girls to receive an education and both men and women feel responsible for ensuring that they can afford to send their children to school. Conversely, people who are unable to educate their children can feel stigmatized: “Powerful people who have money would look after their kids to go to school to become empowered people in the society. But those who don’t look after their children and help others are an insult to the people” (Yidigu, interview, woman, non-irrigator).

One father discussed the negative consequences of not being able to send all his children to school: “I thought becoming a father would bring happiness, but it was not easy. I could not take all the kids to school. I wanted all my children to be in school so that they would get jobs, but now almost all my children have run away to do illegal mining” (Yidigu, interview, man, irrigator).

Irrigation helps some women achieve the goals of paying their children’s school fees: “It is a good thing [for women to do garden work]. Those women are helping to take care of the house, like [paying for] children’s school fees” (Mongnoori, FGD, men, pump users).

While most people discussed the importance of providing education for their children, many respondents also pointed to how being educated confers a level of leadership and respect in the community. One woman from Akara mentioned that group leaders were often chosen because they are educated: “We have [group] leaders. We choose some of them to be writing and keep the records; some of them also keep the money. And they became those kinds of people because they can read and write. They are educated” (Akara, interview, woman, irrigator).

It was expressed that not only does education lead to individual empowerment, but that it also empowers the entire community—that people have become enlightened, which has increased the sense of communal empowerment and achievement: “If the number of educated people in the community increases, it will benefit us. If they are many, they will bring a lot of interventions and advise us. They can also speak for us” (Akara, interview, man, irrigator).

#### *Irrigation Contributes to Achievements*

Success in farming, including in irrigated production, is viewed as an important achievement. Engaging in irrigated production increases the social status for both men and women as it demonstrates that a person is hardworking. In particular, women who do dry season production are respected by both men and women in the community as hardworking contributors to their family’s well-being. Women in the focus group in Akara described them as “good women.” Men also value the contribution of these hardworking women: “They [women who do dry season garden work] are women who are hard working. They are hardworking and look beautiful. The women who are not working in the garden they are not like them” (Mongnoori, FGD, men, no pump).

Irrigation also provides resources for families to afford school fees and medical expenses, which support health outcomes as achievements: “Some [crops irrigated with pumps] were sold and others consumed. Part of the money [from the sale of irrigated crops] was used to pay school fees and your child might not feel well, and you could send him or her to the hospital” (Mongnoori, FGD, men, pump users).

Irrigation brings greater food security by increasing the stability of food supply over the course of the year: “If you don’t work in the garden, you will sell the food crops you harvested during the rainy and you will be in hunger” (Mongnoori, FGD, men, pump users). Women also use irrigated vegetables that they produce for household consumption, which provides nutrition benefits: “Because we also plant vegetables, if we are in need of vegetables, we don’t go to buy again, we will get the vegetables and go to do by day [wage farming] and use it [the earnings] to buy ingredients to cook soup.” (Mongnoori, FGD, women, no pump).

Given that households consume a portion of what they grow, having access to modern irrigation equipment, like pumps, can improve diet quality: “We farmed different crops [when we got the pump], we plant onion, tomatoes, pepper, okra, garden eggs, and vegetables” (Yidigu, FGD, men, pump users).

### Opportunity Structure

As shown in the conceptual framework, the relationship between the components of empowerment and irrigation are influenced by the opportunity structure—the political, social, and environmental context in which irrigation is practiced. Key themes which emerged during discussions and interview with farmers include the importance of formal and informal institutions, which influence farming practices, social relations, and the distribution of resources in the communities; infrastructure which improve access to services, such as access to education and medical care; and different types of shocks and stressors.

### *Institutions*

The influence of outside groups (such as NGOs and others) has had a profound effect on the communities. Many participants in the focus groups and interviews described a process of “enlightenment” brought about by outsiders bringing education, farming knowledge, and agricultural inputs and technology. The narrative explained by many farmers was that considerable changes have occurred in their communities as a result of these groups, which has led to greater development of the community and empowerment of women: “Because of education and the coming of the white men and the fact that these days women are now given the opportunity to go to school, all these have changed our way of life.” (Mongnoori, FGD, women, pump users).

Participants recognized that NGOs targeting women in the community have improved their status by providing resources (trainings and technology), and supporting collective agency: “Their numbers [of influential women] have increased over the years. An NGO came to our community and they needed a lot of women to teach them some trade and skills. They really brought development into this community. They had several meetings with our women. The NGO gave the women milling machines and other machines to work with. It was very efficient in a way that even those who could not afford the cost of repairs were helped to repair their machines.” (Akara, FGD, men)

Men also acknowledged the benefit of receiving agricultural information from outside NGOs: “My father used to farm and I also grew up to farm. I learned it [new strategies and practices] from NGOs that come to our aid. In terms of fertilizer distribution, initially we didn’t know the use of fertilizer on maize would result in high yield, but now we are educated on the use of fertilizer and we now apply it on our maize for higher yields....[name of extension officer] helped us a lot in terms of good agriculture practices, he advises us and also gives us direction to go to the agriculture office to buy certified, different variety of seeds that gives us high yield” (Mongnoori, interview, man, irrigator).

There was also some mention of support from government agencies “In the last two years, we had some challenges with farmers using inappropriate weedicides and killing crops. So the MOFA [Ministry of Food and Agriculture] people came and we [traders] followed them to the farms [to learn] how to use and apply the chemical so that when they [farmers] need the chemicals and we sell products to them, they would know how to apply them to their crops. If they want to buy the weedicide and the chemicals for applying to their rice farm, they sometimes do not know how to apply them. They end up destroying their crops. When they come to the shop and you ask them what they are going to use the chemicals for

they might be offended so we took advantage of their [MOFA] coming and joined them to educate the farmers and also sell our products.” (Garu, market trader, interview 1)

Despite most farmers recognizing positive changes in their communities with support of outside organizations, several also pointed out remaining institutional challenges, like lack of access to markets: “We are not close to market, if we had a market here, we could have stopped the charcoal burning and would be trading in the market; in this case we could take our profit and use it to buy the soap and ingredients to cook. That is the kind of help we want” (Yidigu, FGD, women, pump users).

It also became clear through the discussions that the proliferation of NGOs throughout the region has created a culture of dependence on foreign aid. Many farmers asked questions about what new development projects or aid was coming and some asked for specific developments and investments. Most requests were for new infrastructure investments like additional boreholes (noted especially by women), dams for irrigation, roads, or medical clinics.

Institutions also include informal norms that govern people’s behavior. Despite many positive changes, some social norms remain that contribute to social inequality—none more so than the inheritance norms that are so strongly entrenched in the communities, limiting women’s access to land and property. Even though several respondents suggested that changes in inheritance norms would be better, none thought that any changes were likely to happen. There were some differences between men and women’s opinions of inheritance laws. Most men accepted the current land inheritance system as good “in our community we haven’t seen any problem [with the way land is inherited]” (Yidigu, FGD, men, pump users).

However, a few men mentioned it would be good if inheritance laws were changed, while acknowledging these changes are unlikely to be realized: “your female child, because she is married somewhere you will say she no longer part of you so she cannot inherit your land. It is not good, but we cannot change it because it was started by our ancestors.” (Mongnoori, FGD, men, no pump).

Many women expressed their desire to be able to inherit lands “Like if your father has died and you the daughter could inherit land, and your father is no more and has land and it is changed such that when your father dies, the daughters that are there, they should give them some. If we get something like that [change in inheritance norms] we will like it. We would have liked it of course. We would have wanted it but it cannot be” (Yidigu, FGD, women, pump users).

Other women accepted the inheritance system as it is: “it is God who said women cannot inherit land...God said if you are a woman and your father dies, then your brothers should inherit the land” (Mongnoori, FGD, women, no pump).

Tenure concerns with renting out land were also mentioned: “After mother and father died, the farming activities continued but we could not manage to cultivate all the lands and left some plots fallow. We were afraid of losing the land if we rented it” (Yidigu interview, woman, non-irrigator).

### *Intra-Household Dynamics*

Changing social norms also influence changes in intra-household dynamics. Discussions revealed that women now contribute more to their family’s well-being rather than being solely dependent on their husbands: “These days during the dry season, when you have a good relationship with your husband, you can ask for his permission and go somewhere to work for money. When you come back you can



help the man to take care of the house and children. In this case, you are helping the man. But those days [in the past], the women didn't know that. Even if they had, they wouldn't help, they were always looking up to the man for everything." (Mongnoori, FGD, women, no pump)

In addition to women engaging independently in income-earning activities, changing attitudes about childbearing, reproductive health, and marriage have eased their domestic burden and contributed to greater "unity" in the household. As one focus group participant in Yidigu put it: "I will use myself for some examples, my mother's children, we are 11, those days the way they were giving birth, if we want to give birth like that, we can't look after them [our children]" (Yidigu, FGD, men, pump users).

While some women described having co-wives as helpful, others described difficult dynamics at home when their husbands had many wives. Therefore, for some women, the trend towards smaller families and fewer wives is welcome: "...[Men marrying] many wives is a punishment for the women. Our forefathers didn't know this and married many wives but now the trend is changing." (Mongnoori, FGD, women, pump users).

Another woman from the same focus group said that men used to marry more women because they had more resources and families would collect cattle as dowry. She explained that the attitude towards women and daughters is changing for the better: "[Previously], they had the animals to give and they were collecting, but now when they marry your daughter, you only want them to take good care of her and not cattle" (Mongnoori, FGD, women, pump users).

### *Infrastructure*

Just as changes in formal and informal institutions are creating opportunities for community development and women's empowerment, improvements in infrastructure also bring positive changes. These improvements include greater access to education and medical facilities (and the services they provide) as well as water infrastructure, electricity, and roads.

"We as women knew nothing, and in those years, back even if you wanted to travel to or make a call to Kumasi, you had to go to Bolga to access transport to the place. But now there are transport facilities, electricity, and other amenities in our community. We used to hear that there was electricity elsewhere but now we have it. It means there are developmental changes." (Akara, FGD, women)

Despite improvements, the level of development of infrastructure was not uniform throughout the communities, and farmers noted many needed areas for improvement and investment. For example, the availability of water infrastructure like dams and boreholes varied across communities. The presence of a dam strongly influenced the degree to which women (and men) can engage in irrigation: "If there is a dam, it will help because the rivers we use usually dry out after Christmas so if there are dams it will help in our irrigation. If you don't beg the men and they dig [a well] for you, you the woman you can't dig a well and use the cans to fetch the water to come and irrigate the onions for it to do well but if there is a dam, it will help us, the women." (Asikiri, FGD, women)

Availability of infrastructure (boreholes) to collect domestic water was another major concern of many women: "It [an additional borehole] will give us peace and also bring about development of the community and also bring a relief to us because carrying it [water] is suffering. If I go to the borehole twice, I get tired but if the borehole is closer, I can easily fetch [water] anytime I want" (Mongnoori, FGD, women, no pump).

Similarly, medical clinics were not easily accessible from all of the study villages. “In this, our community, we do not have clinics whereby we can attend when we are sick or are not well. So if they build a hospital in this community, we, those who are weak and cannot go far, when we are sick or a child is not well, we can go there, it will help us a lot” (Mongnoori FGD, women, pump users).

Infrastructure also enables other livelihood activities that have benefits for nutritional outcomes: “Yes, good health and good food to eat [would make life better]. Our food is our TZ, which we eat. We try to make sure that maize and ingredients for food are good. In other places, they can go fishing because they have a dam to catch fish for nutrition, but we don’t have it here. We need good roads to be able to link ourselves to other communities. For instance, when it rains our roads are not good” (Asikiri, interview, man, irrigator).

Access to schools also varied, but there was a much stronger perception that schools are becoming generally more available. This, along with changes in social norms about girls schooling, enables more families to send both their boys and girls to school. One man in Mongnoori described how it used to be difficult to go to school because there was no school located in the community: “At the time [when I was a child], knowledge was limited and my father didn’t tell us about school. The only school at that time was in Garu-Tempene and it was very far, and those who used to go managed it. They walked and went” (Mongnoori, interview, man, irrigator).

#### *Vulnerability to Shocks*

Vulnerability to shocks was another common theme that emerged through the discussions and interviews. Many respondents had experienced numerous traumas and idiosyncratic shocks (e.g. illnesses or deaths in the family) that had devastating consequences for their lives and livelihoods. They also experience many hardships and live under very precarious conditions to the extent that another shock would be disastrous for their well-being.

The difficulties following the loss of a spouse were described by several respondents. One woman explained: “Since the demise of my husband, it has been very difficult because what three people can do, one person cannot do it. When my husband was there, if there was any issue, I would contribute 50 percent and he would make up [the difference]. But now all the children depend on me. My rival is too old now, she can’t do anything anymore” (Asikiri, woman, interview, non-irrigator).

Not only is this loss difficult for the surviving spouse but for the children as well. Many people described how they were pulled out of school or called back from Kumasi or forced to marry early because of the death (or illness) of a parent. One woman explained her early marriage as the direct result of losing her parents: “Because I was an orphan, I needed someone to take care of me, so I got married at an early age. As such, it was 9 years after the marriage that I gave birth” (Mongnoori, interview, women, non-irrigator).

Illnesses also have significant impacts on families’ livelihoods and well-being. Several women described taking on a greater burden when their husbands fell sick: “Three years ago [my husband got sick].... [It was a] stroke. My husband [used to] farm both in the dry and rainy season but since then, he has not been able to do any of those [things]. And he used to drive the tricycle. He used it to take people around

but when he fell sick, we had to sell it to take care of him. Now we [respondent and rival wife] do all the farm work ourselves” (Asikiri, interview, woman, irrigator).

Illnesses also place a burden on children: “Five years ago, I had an accident on my way to Garu to visit my daughter and broke a bone; so I stayed at home for three years doing nothing. Yes, the [medical] bill was about 1,700 GHS. I didn’t have health insurance. I was not able to repair it [the motor bike]. [Because of the accident] my son had to drop out of school to go and work because I was not able to take care of them [the children]” (Yidigu, interview, man, irrigator).

Such idiosyncratic shocks change the trajectory of family members’ lives. One respondent stressed the privilege of being raised by two parents: “Some women had both parents before marriage, so as they grow, any money they get they buy livestock and get rich and become empowered” (Yidigu, interview, woman, non-irrigator).

While not as commonly mentioned, some farmers expressed concern about their vulnerability to climate shocks and long-term climate changes. With regard to shocks, farmers in Mongnoori described how shocks interrupt their farming activities: “Sometimes, there may be flooding on your garden and you may not be able to work” (Mongnoori, FGD, men, pump users). Other farmers noticed changes in the timing of rainfall and in the prevalence of pests: “There have been changes in seasonal variations. At first it used to rain in March, but now it rains in June. There used not to be army worms eating the crops but now there are” (Yidigu, interview, woman, irrigator).

One man in Yidigu specifically pointed to his concern about long-term climate change and how this influences his life choices: “Due to climate change, it might not rain in the future and the work will not be there. So I thought that if I give birth to many children, I will punish them. So I have made up my mind not to give birth to more children...I have known these [things about the weather changing] from experience on the farm. The way it used to rain, it is not raining like that [anymore]. At first when we plant maize, we could determine when it will rain. But now, it might not start early and may not also rain at the end of the season” (Yidigu, interview, man, irrigator).

## Conclusions and Implications for the Design and Implementation of Irrigation Projects

The results of this study provide insights into the roles and status of men and women in the Upper East Region of Ghana, local notions of the empowerment process, and how irrigation may influence the pathways to empowerment in this context. Discussions revealed that empowerment processes take place within a context of rapidly evolving social norms and patterns, due in large part to an increase in access to education and changes in perceptions of the importance of education, which then place increasing strain on household budgets as families struggle to afford the education expenses of their children. As a result of this change, many families, particularly younger families, are making different decisions about marriage, family size, livelihood choices, and reproductive health.

One major change is that both men and women are now expected to contribute to household expenditures, including education, which has increased women’s economic role in the family and in their communities. The extent to which this change in the expectations of women is considered empowering depends largely on the woman’s ability to meet these expectations. On the one hand, many women reported a sense of empowerment from earning income, providing for their families, and

participating more in household decisions. On the other hand, many women felt burdened by the additional responsibility, particularly if they were not able to meet the needs of their family. That is, the women who are successful grow in stature both in the household and community but those who struggle are “suffering” and feel that people in the community view them as “pathetic.” There was also a reluctance, expressed by some women, to take on larger roles in household decision-making, out of fear that they would be held (and feel) responsible if the decision did not result in a good outcome. These findings have implications for measurement of women’s agency—that increasing participation in production decision-making and control over income, for example, may not always be considered empowering by all women. Further exploration of these issues with an intersectional lens would provide even greater insights into how these changes in indicators of women’s agency may be experienced by different women (e.g. married vs. widowed, young vs. old, educated vs non-educated, etc.).

Similarly, men also had differing views of and experiences with social change. Many men expressed relief at sharing the financial (and agricultural labor) burden of the household with their wives and supported their wives’ contribution by providing them with small plots of land for them to manage. Several participants also reported spreading risk by using income earned from men’s and women’s different livelihood activities and crops harvested from different plots for different purposes. At the same time, some men expressed that women who become too successful would be viewed as threatening to men’s role as the household head and final decision-maker. In some cases, when men can provide enough to meet their family’s needs, they take more decisions on their own, marry additional wives, and control more what the women do, such as preventing women from seeking work as a day laborer or engaging in petty trading.

Changes are occurring not only within households but within the community at large, where women are forming groups and taking on leadership roles. Being viewed as a leader requires a certain social status based on economic achievements and education, which enable some women to be in a position to help others; and having personality traits, such as patience, that are considered essential for effective leadership. Men are largely accepting of women’s leadership in the community and most men viewed this as a benefit to their communities. Women leaders are viewed as a vehicle for women to address the issues that concern them most through groups. To some extent, intra-household relations and women’s bargaining power at home seems somewhat separate from women’s leadership in the community. That is, women with agency at the community level may have less within the household and vice versa. Further research is needed to explore the relationship between women’s agency in different spaces.

The results provided several insights about the potential for small-scale irrigation to offer a pathway for women’s empowerment. The findings showed that women did not necessarily benefit in expected ways, such as through control over the motor pumps as a productive asset, but rather through more unexpected ways, such as reduced labor burden in agriculture, particularly irrigated production. Because social norms typically prohibit women from owning large assets, like livestock or pumps, even when women acquired motor pumps through groups, they considered their husband to have control over the asset. However, when motor pumps became available, many women felt relieved that they could stop engaging in irrigated production to do other, more preferred livelihood activities.

The results also pointed to serious resource constraints that limit the extent to which women can participate in irrigated production. Specifically, women can only access land for irrigated cultivation through their husbands and, therefore, have less control over the decision on whether to produce irrigated crops. They also have more limited access to water for irrigation, especially in villages where water scarcity concerns were more prominent, accessing irrigable land was more difficult, and obtaining water for irrigation was labor intensive. These challenges will only intensify as pressure due to population growth leads to greater land fragmentation and natural resource scarcity. The fact that women face significant resource constraints to engaging in and benefiting from irrigated production and the fact that many preferred to engage in other livelihood activities, suggests that women perceive greater benefits and pathways to empowerment through these alternative livelihoods.

However, when women do engage in irrigation, they reported directly benefiting from engaging in this activity, including through control over income from the plots they cultivate themselves. There was no evidence that engaging in irrigated production directly increased women's decision-making role in the household. This may occur only indirectly, however, to the extent that engaging in irrigation increases women's control over income and contribution to household expenditures. As opportunities for irrigated cultivation expand, through investments in irrigation infrastructure, diffusion of technologies for small-scale irrigation, and group-based and service-based approaches to scaling irrigation, the constraints, needs and preferences of women should factor into the design and implementation of these interventions. Such gender sensitive approaches are needed to ensure that those women who choose to engage in irrigated production have the opportunity to participate and reap the benefits of their work.

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