

COLLECTIVE ACTION AND SEED PRODUCTION: A PATHWAY FOR WOMEN'S
EMPOWERMENT AND COMMUNITY SEED SECURITY IN INDIA

By

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ABSTRACT

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There exists a wide range of development interventions that aim to 1) empower women and 2) ensure food security for rural smallholder farmers. These types of interventions, implemented separately, have had varied success. The implementation of interventions to achieve both women's empowerment and seed security simultaneously has been researched in a few studies, but the successful achievement of these goals has rarely been observed. This study investigates the impact a layered seed production/self-help group program had on women's empowerment and seed security. The research was conducted in 2 districts in Uttar Pradesh, India using semi-structured interviews of 36 participants. The findings indicate that, through the collective power of self-help groups, women were empowered and seed security was increased for women within the group as well as the greater community through the seed production program. Further, women who participated in the seed production program in addition to their regular self-help group membership, were empowered through additional channels specific to the layered seed production systems. This research indicates that self-help groups can act as a platform for development interventions and integrate well with seed system interventions.

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KEY TO ABBREVIATIONS

BO	Block Organization
NGO	Non-governmental Organization
PPB	Participatory Plant Breeding
PRADAN	Professional Assistance for Development Action
PVS	Participatory Varietal Selection
RGMVP	Rajiv Gandhi Mahila Vikas Pariyojana
SHG	Self-Help Group
SP	Seed Production
SPC	Seed Producer Cooperative
SPP	Seed Production Program
VO	Village Organization

1. Introduction

Access to quality seed is vital for smallholder farmers to maintain food security and can provide improved resilience through disease resistance and yield (Galiè et al., 2017; Jarvis et al., 2011). Yet the access to and availability of preferred, quality seeds for smallholder farmers has numerous barriers, including the timeliness of seed being made available, the varieties being offered, the price of seed, and the exclusive social networks that facilitate seed access (de Boef et al., 2021; Gaffney et al., 2016; Louwaars & de Boef, 2012; Schöley & Padmanabhan, 2016). Many efforts have been made to mitigate these barriers to quality seed, most of which aim to provide improved varieties through the formal, regulated seed sector (Ahmed et al., 2000; Gaffney et al., 2016). However, for a variety of social, economic, and cultural reasons, access to and the use of these varieties remains low among smallholder farmers, especially women (Galiè et al., 2017; Kelkar, 2009). This is problematic, since women in developing countries are responsible for household food production, and food security requires quality seed (Quisumbing et al., 1996). As a response, some development interventions have focused on improving access to quality seed specifically for women (Galiè et al., 2017; Njuguna et al., 2016), but most fall short of their goal as asymmetrical power dynamics shaped by cultural norms favor men and continue to overpower and undermine women's role in agriculture (Njuguna et al., 2016; Raghunathan et al., 2018).

Throughout the literature, women's empowerment is found to be closely linked to agricultural productivity and food security. Women's empowerment is expressed through individual actions, decision-making power, and/or control over resources (Doss, 2013; Kabeer, 2008; Rowlands, 1997), each of which can help ensure food security

(O'Hara & Clement, 2018). Yet it is clear that women often have limited control over these resources and are less involved in agricultural programming, limiting opportunities to improve their well-being and productivity (Jarvis et al., 2011; Schöley & Padmanabhan, 2016; Weltzien et al., 2019). More specifically in plant breeding, methods such as participatory variety selection (PVS) and participatory plant breeding, have been developed to engage farmers in the breeding process, identify suitable varieties, and increase distribution of these preferred varieties (de Boef et al., 2021b; Sperling & Scheidegger, 1995; Witcombe et al., 1996). However, without gender-sensitive intentionality, these programs may exacerbate the gender inequality already present within the participating communities (Brearley & Kramer, 2020; Mudege et al., 2015). Njuguna et al. (2016) found that social factors and work load prevented women from attending events and in the case of Galiè et al. (2017), extension officers and/or researchers only engaged with men, excluding the task-based knowledge of women and the necessary information to develop appropriate varietal traits (Teeken et al., 2021). Recent endeavors in participatory plant breeding have developed tools for better inclusion of women's trait and end-use priorities (Brearley & Kramer, 2020; Mudege et al., 2015; Polar et al., 2021; Weltzien et al., 2019). These types of projects may provide opportunities to expand women's access to preferred seed for increased food security and productivity.

In smallholder systems, women are more likely to access and obtain seed through an informal seed network that is based on relationships and exchange (Galiè et al., 2017; Schöley & Padmanabhan, 2016). In India, there are thousands of interconnected women's self-help groups (SHGs), or collectives of individuals, that engage and tackle

systemic problems together, including increasing access to resources and dismantling hierarchical structures (Buggineni et al., 2013). These groups have the potential to provide an extensive informal network for increasing seed distribution from varieties selected through participatory variety selection (de Boef et al., 2021b; Nichols, 2021). Furthermore, SHGs are generally developed to contribute to the process of women's empowerment through various means, including intrinsic, instrumental, or collective approaches (de Boef et al., 2021). Intrinsic approaches enhance women's awareness of rights, capabilities, and self-efficacy; instrumental approaches contribute to the economic growth of members by increasing access to materials and assets with an aim towards poverty reduction; while collective agency approaches support women through group savings, loans, and action for social justice (de Boef et al., 2021; Malapit et al., 2019; O'Neil et al., 2014). Through any of these strategies, SHGs develop the social capital of their members as women share realities, generate collective savings, and establish a social network (de Boef et al., 2021; Desai & Joshi, 2014; Kondal, 2014). The social capital and collective action generated through SHGs may serve as the scaffolding by which to mitigate the various barriers to seed security still faced by women (de Boef et al., 2021b; Nichols, 2021).

The collective action through which SHGs operate, and their combined intrinsic and instrumental approaches, can bring about some of the most effectual and sustained changes to oppressive societies (Alemu et al., 2018; Kabeer, 2008). The need for both intrinsic and instrumental approaches is apparent, then. Intrinsically, women must be aware of their ability to be empowered and desire to be empowered (Klein, 2014; Özdemir, 2019) and programs need to be implemented to initiate institutional changes

that create opportunity structures for women to exercise their new sense of empowerment (Alsop & Heinsohn, 2005; Gugerty et al., 2019; Mabsout & van Staveren, 2009). Typically, women perceive their own interests, but are hindered by external constraints to act upon these interests (Agarwal, 1997). Formal laws and cultural traditions provide the structure for asymmetrical power (Brearley & Kramer, 2020; Gamage et al., 2016; Katungi et al., 2008), requiring institutional and community level shifts in order to affect change at the individual level (Gugerty et al., 2019; Nichols, 2021). Thus, perceptions of women by male household members must be redefined in order to establish an institutional and sustainable internal change (Mabsout & van Staveren, 2009). In addition, resources are a key component of empowerment (Kabeer 2008) and thus, instrumental interventions may need to work in tandem with intrinsic interventions to provide access to resources to the target individual upon which they can build their agency and exercise their choice. As observed by Siba (2019), some current programs aimed at economically empowering women have not been successful because they fail to give adequate attention to psychological, social, and skill constraints on women actors by offering mere access to financial and human capital. Programs that provided financial capital or access to loans to women saw no impact on women's profits, but programs offered to men that coupled access to loans/microcredit with training regarding business and leadership skills positively impacted men's profits (Siba, 2019). Since only men were able to access these trainings, and thereby actualize their increased access to finances, these programs only further enhanced the financial power of men. These findings support Malhotra & Schuler (2002) claim that access to resources alone cannot bring about empowerment, there must be a shift in power

dynamics within the domains in which the individual is actualizing her choice and control over those resources.

Over the past twenty years, Rajiv Gandhi Mahila Vikas Pariyojana (RGMVP), an NGO based in Uttar Pradesh, India, has been working for poverty reduction, rural development, and women's empowerment by organizing SHGs (Buggineni et al., 2013). The goal of RGMVP is to combine intrinsic and instrumental agency through a multi-leveled structure to have an extended impact on poverty alleviation and women's empowerment (Buggineni et al., 2013; de Boef et al., 2021). The SHGs engage in micro-credit savings and loans managed in small groups of 10-20 women and receive trainings in multiple areas of development such as finances, pre- and post-natal health, nutrition, agriculture, dairy, hygiene, local government, and rights and entitlements (Buggineni et al., 2013). In 2015, a seed production program was layered on top of established RGMVP SHGs, which supported seed production by women farmers who were current members of an SHG (RGMVP, 2017). This program operated instrumentally and intrinsically with the main goals of 1) increasing availability, accessibility, and utilization of quality seed within the community by connecting the social networks of the SHG to public universities and formal sources of modern wheat and rice varieties and 2) enhancing women's empowerment by providing them with meaningful choices in the agricultural sector, increasing their agricultural knowledge, and training them to market seed (RGMVP, 2017).

The purpose of this research was to understand if and how a PVS and seed production program woven into the social structure of SHGs changed seed security and the empowerment and agency of women in the SHG, especially members who had

become seed producers. This research examines the combination of PVS, seed production, and SHG programming, an integrated approach rarely (if at all) implemented, from the perspective of the women SHG members.

My research questions are:

1. What social/cultural changes have come to self-help group members?
 - a. At what level are these changes taking place (individual, household, community)?
 - b. How has women's sense of agency, social capital, and empowerment changed through their participation in the self-help group and the collective action it fosters?
2. How has RGMVP changed seed security?
3. What is the relationship between seed security and any observed changes in a woman's sense of agency, social capital, and empowerment?

Results are presented based on women's perceptions of their experiences in the program and my construction of empowerment identified through the literature and explained in my conceptual framework section. Empowerment for this thesis is understood as a process, and not a particular end. Therefore the ownership of, control over, or observed action in any dimension of empowerment- resources, agency, or achievement- indicates and contributes to an individual's positive trajectory in their process of empowerment.

2. Literature Review

2.1 Seed Security

Though diminutive, seed is a resource as vital to life as water and air. As the principal component of plants and crops, seed supports ecosystems, livestock, and humans. Seed is the first link in the food value chain, therefore seed also ensures food security as farmers are provided with access to and control over relevant, preferred seed (Galiè et al., 2017). The United Nations' Committee on World Food Security defines food security as the physical, social, and economic access to sufficient, safe, and nutritious food that meets food preferences and dietary needs for an active and healthy life (UN, 2015). Food security, then, relies on seed security, which is the access to the appropriate amount and quality of seed at all times by farming households (Bazile, Didier, 2006; Department of Agriculture and Forestry, 1996; McGuire & Sperling, 2011).

More specifically, seed security refers to seed availability, seed access, varietal suitability, and seed quality (FAO, 2016). Seed availability indicates a sufficient quantity of seed provided through all sources at reasonable proximity and appropriate times (Brearley & Kramer, 2020; FAO, 2016; McGuire & Sperling, 2011). Seed access signifies the ability of farmers to obtain seed either through production, cash, barter, or gift, as well as their ability to access information regarding seed and management, and access other resources necessary to obtain seed (Brearley & Kramer, 2020; FAO, 2016; McGuire & Sperling, 2011). Social networks, socio-economic status, and household dynamics of farmers influence seed accessibility (FAO, 2016). Though seed may be available through a myriad of sources, farmers may not be able to access it due

to lack of power or status (FAO, 2016). Varietal suitability refers to the ability of a farmer to obtain seed with preferred traits, which may differ from farmer to farmer (FAO, 2016), by gender, (Weltzien et al. 2019) or may be based on an individual's role in producing, processing, and/or marketing the crop (Teeken et al. 2021). Seed quality entails the attributes of seed that contribute to varietal purity (FAO, 2016). Though seed quality can depend on the opinion and preference of the farmer, there are some objective measurements to determine if the seed will produce a reasonable yield such as physical purity, varietal purity, seed health, moisture content, and germination (FAO, 2016). McGuire and Sperling (2011) combine varietal suitability and seed quality into one factor of seed security- seed utilization. Seed utilization implies seed that is of good quality, meets the needs of farmers, and aligns with their preferences (McGuire & Sperling, 2011).

Seed security is also promoted by diverse cropping systems, which provide a variety of crops throughout different times of the year, supporting surrounding ecosystem diversity and soil health (Pautasso et al., 2012; Thrupp, 2000). Cropping systems that consist of heterogeneous crops and crop varieties contribute to a farmer's seed security by providing access to a greater variety of seeds thereby increasing the likelihood of varietal suitability. Diverse cropping systems also reduce the risk of total crop failure as seen in monoculture systems which suffer from variety specific pests or diseases (Pautasso et al., 2012; Thrupp, 2000). However, in the last few decades the number of crop varieties being grown globally has decreased due to agricultural intensification and a shift in consumer demand (Galiè, 2013). The replacement of diverse local seeds with modern homogenized crop varieties threatens seed security for

smallholder farmers by depleting the genetic resources available to them making their crops more vulnerable to climate change and other stressors (Galiè, 2013; Thrupp, 2000). This trend is additionally concerning for rural subsistence farmers, specifically women, who lack access to the requisite agricultural inputs such as fertilizer and pesticides, and rely on the diversity of crops to provide soil nutrients and pest management to maintain food security (Galiè, 2013; Jarvis et al., 2011). Therefore, it is vital that work is done to ensure that farmers have access to and control over seed that is available, productive in their climate, and yields culturally appropriate crops.

2.1.1 Seed Systems

The channels through which seed is accessed by farmers are referred to as seed systems. Seed systems are the networks made up of various actors that facilitate the availability and accessibility of diverse, improved seed to farmers, and exist in two forms: formal and informal (Puskur et al., 2021). The formal seed sector is made up of corporations, breeders, researchers, and dealers who market modern seed varieties (Louwaars & de Boef, 2012). Within the formal sector is the circulation of certified and modern varieties driven by the market (Puskur et al., 2021). Few if any local varieties are circulated through the formal system; the main focus is on modern varieties of a small number of cash crops, which all must be certified (Schöley & Padmanabhan, 2016). As seen in a plethora of studies, factors such as age, gender, and socio-economic status influence an individual's access to seed through the formal sector, especially as transactions in this arena tend to require cash (Schöley & Padmanabhan, 2016; Weltzien et al., 2019). Therefore, those who are able to participate in the formal

sector, such as researchers, dealers, and wealthier male farmers with access to cash, tend to shape the diversity of seed available through this channel, which results in technologically improved varieties of seed that may not meet the needs and preferences of subsistence or low-input farmers (Gaffney et al., 2016; Louwaars, 2000; Schöley & Padmanabhan, 2016).

The informal system is typically characterized by *in situ* conservation through saving, exchange, and typically non-cash transactions of local varieties and non-certified improved varieties driven by social relations and cultural norms (Schöley & Padmanabhan, 2016). Seed varieties and their diversity are maintained in the informal sector through the natural pathway of genetic evolution as farmers select and breed based on preferred crop traits (Bazile, Didier, 2006; Sthapit et al., 2009). The social network made up of local farmers, neighbors, and family members within the informal sector circulate locally adapted seed varieties as well as knowledge associated with those seeds (Almekinders et al., 1994).

The preservation of seed information impacts farmers' access to and utilization of seed, whether in the formal or informal sector. For example, a study conducted in India found that farmers tended to exclude seed from their farming system if they lack information about the seed characteristics and quality (Schöley & Padmanabhan, 2016). Galiè et al. (2013) discovered that in Ajaz, Syria, women access seed and the associated cultivation information through neighbors and are only introduced to new varieties if a family member or neighbor recommends it. Seed from commercial sources in Ajaz are accompanied by adequate information, but since only men can access commercial sources only men know about those seeds. Women in Ajaz, then learn and

develop new seed information through experience (Galiè, 2013). The results from this study done in Syria reveals that cultural and societal norms, and power/status dynamics influence how seed and its associated information is accessed and used through the social networks of seed systems (Khadka et al., 1994).

2.1.2 Barriers to Seed Security

Barriers to seed security exist in both the formal and informal sectors. Problems facing the informal seed sector can be poor seed quality, shortages during civil unrest and natural disasters, limited varietal improvement, and lack of awareness (Gaffney et al., 2016). Seed quality within the informal system may degrade as varieties are contaminated, recycled, and exchanged among farmers (Gaffney et al., 2016). Due to the heavy reliance on farmer saved seed and social networks, the informal system is particularly impacted by war, civil unrest, and natural disasters (Gaffney et al., 2016). Though varietal improvement can be and usually is mitigated by *in situ* conservation and farmer selection, the informal system may present limited availability of modern varieties and/or farmers may lack awareness of new varieties and therefore struggle to maintain crop productivity in a changing climate (Ahmed et al., 2000; de Boef et al., 2021; Gaffney et al., 2016).

Within the formal sector, where modern varieties are made available, adoption rates of these varieties remain low among smallholder, low-input farmers as they typically lack key, preferred traits, are not made available at appropriate times, and require cash to purchase (de Boef et al., 2021; Gaffney et al., 2016; Louwaars & de Boef, 2012; Schöley & Padmanabhan, 2016). Since seed within the formal sector must

be certified, the production and dissemination process is hindered, which inhibits the timeliness of which seed is made available (Schöley & Padmanabhan, 2016).

Additionally, seed transactions in the formal sector require cash and occur at formal markets, both of which are factors affecting farmers, especially women or other poor farmers, with limited access to credit or transportation (de Boef et al., 2021; Louwaars & de Boef, 2012; Tadesse et al., 2017). Furthermore, the modern varieties of high-value crop seed tend to not meet most needs and preferences of farmers, offer limited diversity, and lack information associated with seed (Louwaars & de Boef, 2012; Tadesse et al., 2017).

Information associated with seed impacts adoption rates as the more information farmers have regarding a new variety seed, the more likely they are to take the risk of adopting it into their farming practices. However, information regarding modern varieties is typically targeted towards men, as these varieties are for crops that tend to better fulfill the goals of men's agricultural production, and women are overlooked due to cultural norms, limited mobility, and restricted decision-making power (Galiè et al., 2017). As seen throughout the literature, extension services tend to be more easily accessed by farmers with resources and social status, who are usually men (Brearley & Kramer, 2020; Kelkar, 2009; Quisumbing et al., 1996). For example, chickpea varietal training activities in Ethiopia were made available to both men and women in the village with the goal of integrating women's voice in the selection process. However, due to a variety of social and cultural norms, women were unable to access and benefit from the training (Njuguna et al., 2016). Improved modern varieties made available through

formal systems or extensions may fail to provide women with seed security (de Boef et al., 2021; Kelkar, 2009; Raghunathan et al., 2018).

Various barriers to seed through the formal system exist to all marginalized, smallholder farmers, and access to information regarding seed presents another barrier, specifically to women. Kabeer (2010) refers to those disadvantages that are experienced by both men and women of a certain race, status, education level etc., but intensified by gender, to the greater detriment of women, as gender-intensified constraints. The social networks in which one operates tend to predicate that individual's access to seed and its associated information (Gaffney et al., 2016; Louwaars & de Boef, 2012; Schöley & Padmanabhan, 2016). Women tend to share and access information through the strong social networks of neighbors and family, and therefore access traditional and local seed varieties (Galiè et al., 2017; Schöley & Padmanabhan, 2016). Conversely, men maintain a more extensive network of external, commercial sources through which they obtain modern varieties of higher-value cash crops and their associated information (Galiè et al., 2017; Schöley & Padmanabhan, 2016). The information shared by women and the channels through which they share it is by no means insufficient, but the lack of linkages with the formal sector can impede the adoption of modern varieties. For example, in Uttar Pradesh, India, women maintain large social networks and do participate in agricultural decision-making, but their connections are mostly with poorer households that may not be useful sources of information about agriculture and are less likely to adopt new varieties (Magnan et al., 2015). Access to seed information is not the only gender-intensified constraint impacting seed security. Farmers' seed preferences, which are shaped by their access to other

resources such as credit, land, and agricultural inputs, are also largely influenced by gender.

Preferred seed, a factor of seed security as varietal suitability, is that which has traits that are relevant and valued by the farmer. These preferences are influenced by the farmer's roles and responsibilities, which are typically shaped by socio-economic status, gender, and other social/cultural norms and dynamics (Bellon et al., 2011; Diallo et al., 2018; Schöley & Padmanabhan, 2016; Teeken et al., 2021; Weltzien et al., 2019). A review by Acevedo et al. (2020) discusses how financial status and farmers' access to resources influence the type of seed farmers are willing and able to adopt. In low-income countries, farmers with more income tend to have more access to information about new variety availability, cultivation, and management. Therefore, farmers with a more expendable income are more willing to try new varieties because they are less concerned with losing their whole crop (Acevedo et al., 2020). Furthermore, as discussed by Weltzien et al. (2019), farmers' varietal preferences are also based on the quality of their field and their access to resources, which is shaped by gender. In West Africa, women's fields have lower fertility, which delays maturity and reduces crop development since they are allocated land at the end of the rotation. So, women, who lack access to manure, prefer tall early sorghum varieties. Similarly, Weltzien et al. (2019) reviewed 39 studies that took place in developing countries that looked at crop trait preference based on gender. When the roles and responsibilities of men and women differed or their crops were grown under different conditions or for different purposes, their trait preferences diverged as well. Typically, women preferred seeds with traits conferring characteristics for easier harvest and productivity on low fertility

soil, while men were concerned with traits associated with crop production and yield (Weltzien et al., 2019). In Nigeria, women tend to prefer food product traits of cassava varieties such as color, taste, and texture while men prioritize productivity related traits such as high yield and disease resistance (Teeken et al., 2021). These studies reveal that men and women in developing countries tend to have varying rights, responsibilities, and livelihood strategies structured by societal norms. Women and men access different social networks for seed and information and have different goals in terms of their production. Women seek to ensure food security for the family while men aim to increase income. These goals influence their seed preference, and therefore the channels through which they access those preferred varieties. Since the formal system generates seed for crops that are profit-focused, women cannot access seed for the staple crops they farm through this channel.

Although there exist shortcomings within both the formal and informal seed systems that hinder seed security, many programs and researchers in developmental agriculture have attempted to implement interventions that integrate the strengths of each sector. Within the formal system, large quantities of modern varieties are produced increasing seed availability through sufficient supply (Ahmed et al., 2000; Louwaars & de Boef, 2012; Tadesse et al., 2017). Seed produced within the informal system meets the varietal preferences of farmers, seed transactions can occur without the need for cash, and seed is efficiently disseminated via social networks (Almekinders et al., 1994; Tadesse et al., 2017). As noted by Schöley and Padmanabhan (2016), the combination of the formal and informal system would allow for a more holistic farming system as farmers can rely on different sources to make up for the weakness of others.

2.1.3 Attempts to Overcome Barriers

There have been multiple attempts to overcome barriers to seed security. These have ranged from introducing improved varieties and/or hybrids, strengthening certain links within the formal and informal system, improving farmers' access to credit, and currently, a dominant approach is integrated seed systems. Gaffney et al. (2016) suggests combining the formal and informal seed sectors through breeding programs to provide hybrid seeds to smallholder farmers in Sub-Saharan Africa. The formal system serves as an institution for research, breeding, marketing, and distributing hybrid and certified seed, while the informal system serves as the channel through which these improved modern varieties become accessible to marginalized smallholder farmers.

Research conducted by Sisay et al. (2017) aims for a similar linkage between the formal and informal sectors through seed producer cooperatives (SPC) in Ethiopia. SPCs engage groups of farmers in community-based seed production with the help of breeding centers, which facilitate the dissemination of improved varieties via informal networks. These SPCs are organized by farmers who have been equipped by research institutes and NGOs to produce and supply quality, diverse seed based on farmers interests to local markets. Members of the SPCs received increased access to markets, agricultural inputs, information, and external connections. However, a main challenge facing this SPC was the heterogeneity of its members. Though diversity of actors is important, within SPCs, cooperative performance benefits more among a demographically homogenous group specifically in terms of seed preference and intended use of seed.

Participatory plant breeding (PPB) and participatory varietal selection (PVS) also combine the formal and informal sectors while focusing on the seed preferences of farmers. Public plant breeding programs aim to increase access to improved and modern varieties, thereby providing a response to climate change and poverty alleviation for smallholder farmers (de Boef et al., 2021). PPB achieves this goal by connecting farmers and breeders to select varieties highly preferred by farmers (Witcombe et al., 1996). In PPB, breeders facilitate the genetic research and provide the results of the breeding selection to seed producers, while farmers participate in the selection of preferred traits to be bred and may even carry out the breeding program on their own fields (Witcombe et al., 1996). PVS involves farmers a little later in the breeding process, but still supports access to improved varieties through the identification of relevant varieties for farmers by linking them to breeders (Witcombe et al., 1996). In PVS a number of varieties are chosen based on farmer-reported preferences, these varieties are then grown in a field alongside other varieties to allow farmers the opportunity to observe the outcome of the different varieties (RGMVP, 2017; Witcombe et al., 1996, 1999). The main goal of PVS is to identify preferred traits among farmers and make farmers aware of different varieties (Sperling & Scheidegger, 1995). However, it is important to not focus on farmers' varietal preferences solely based on gender as that may bolster gender farming roles and responsibilities further exacerbating the gender gap in agriculture (Galiè et al., 2017).

Witcombe et al. (1999) reveals the success of a PVS program in not only the identification, but the spread of a relevant rice variety in India. Farmers in Western India identified a preferred rice variety through a PVS project, which was then spread across

over 100 villages in the span of 3 years. As discovered by Witcombe et al. (1999), farmers accessed this seed initially through the trial and then later by buying from the project, from the project-organized seed pools in the villages, by saving seed, and through the process of sowing, harvesting, and sharing of seed with other farmers. Buying from the project required cash and the appropriate social networks to be closely linked to the program. Through seed multiplication and distribution the seed pools eventually became fully facilitated by the village. Seed multiplication and distribution, an intervention vital for continual seed distribution (Wiggins & Cromwell, 1995) was implemented in tandem with the PVS program, which facilitated the dissemination of seed. The diffusion of seed became even more effective through the farmer-to-farmer exchanges within the informal network. This study indicates the capacity for PVS to identify preferred varieties, but it also reveals the importance of a seed multiplication and distribution system to be layered on top of a PVS program to ensure the dissemination of selected seed varieties (Witcombe et al., 1999).

In India and Bangladesh, through a program implemented by the International Rice Research Institute in collaboration with other extension programs and research institutions, SHG members received seed and training regarding production, seed preservation, and farm management (Cueno, 2014). Women who received these layered interventions expressed experiencing better access to certain varieties, increased knowledge of improved crop management practices and confidence in agricultural decision making, an increase in income and control over it, as well as a change in how they think about themselves, enhanced confidence, and more positive gender relations. Furthermore, interactions with the agricultural scientists and having

access to seeds and trainings ensured their food security and enhanced their social status (Cueno, 2014).

Research done by Njuguna et al. (2016) supports this claim that initial availability of varieties is not enough to ensure adoption and therefore food security. Due to the risk aversion of smallholder farmers, new varieties must be tried and assured that they will grow in particular conditions before farmers are willing to adopt. For example, in Africa, farmers were less willing to adopt bean varieties made available through PVS if the trials were not conducted on-farm with a traditional intercropping system as monocropped station trials may not provide accurate crop performance outcomes. Those farmers who did adopt initially, were quick to return to their traditional varieties when the modern varieties did not prove successful in their conditions (Waldman et al., 2014). Furthermore, chickpea PVS training activities in Ethiopia intended to encourage gender equality among farmers by requiring men farmers to bring their wives to the training. However, due to a variety of social and cultural norms, women remained limited in their access to the PVS trainings and therefore to the seed selection process and seed access (Njuguna et al., 2016) were unable to access and benefit from the training. Therefore, farmers' needs as well as disempowering social/cultural beliefs must be addressed in tandem with PVS in order to ensure women's seed security and sustained empowerment (Cueno, 2014; Njuguna et al., 2016; Witcombe et al., 1999).

PVS and other agriculture extension programs without an explicit goal of increasing women's empowerment are typically more easily accessed by men, and therefore result in varieties and practices that are not valued by female subsistence farmers (Galiè et al., 2017; Mudege et al., 2015; Njuguna et al., 2016). Kelkar (2009)

explains that in Asia, women lack land rights, which leaves them out of trainings and extension programs. If not implemented in conjunction with a goal of women's empowerment, PVS can potentially increase the gender gap in agriculture.

2.1.4 Social Capital

Social networks, formal or informal, provide the road by which information and resources are exchanged, while social capital acts as the gates determining an individual's access to those resources and information (Gilligan et al., 2020; Katungi et al., 2008). Social capital depicts the features of social organizations, such as rules and norms, trust, linkages, and/or networks, that establish reciprocity, cooperation, and coordinated action to achieve mutual benefits as actors gain social support, knowledge, and resources from the network connections, such as those seen in informal seed systems (de Boef et al., 2021a; Gilligan et al., 2020; Katungi et al., 2008; Krishna, 2004; Ostrom & Ahn, 2007). For example, in Benin, Africa, women rice growers experienced empowerment through the adoption of a new rice variety and their organization in groups that facilitated collective action (Schroeder et al., 2013). Self-organized farmer groups for the new rice variety allowed women additional income opportunities, access to resources, and social support as they linked and exchanged with each other (Schroeder et al., 2013). Social capital generated from collective action groups results in group strength as well as individual agency.

There are three forms of social capital, bonding, bridging, and linking (Onyx et al., 2007; Ostrom & Ahn, 2007). Bonding social capital is made up of the dense, multi-functional, localized ties associated with trust (Onyx et al., 2007; Ostrom & Ahn, 2007).

Bonding social capital is necessary for an individual's sense of belonging as the personal networks provide social and emotional support (Onyx et al., 2007). Bridging social capital comprises the network ties outside of the local community, which is helpful for community development (Onyx et al., 2007; Ostrom & Ahn, 2007). However, compared to bonding, bridging social capital is usually made up of weaker ties that bridge strangers and/or acquaintances across varying demographics and geographical distances (Onyx et al., 2007). Bridging social capital allows individuals to access information and resources outside of their immediate community, which can result in empowerment, but also emphasizes the disadvantage of marginalized groups since usually only the elite can access these external networks (Galiè, 2013; Onyx et al., 2007). Linking social capital is made up of the loose vertical, typically hierarchical, connections outside of the community such as the linkage between a village and a governmental agency providing aid (Onyx et al., 2007).

Social capital is viewed as an asset of an individual within a community who, through participation in social networks, experiences an enhanced ability to access and utilize resources, solve problems, increase productivity and/or overcome adversity more than would have been the case on their own (Onyx et al., 2007; Ostrom & Ahn, 2007). Therefore, the more forms of social capital an individual has, the more effective they can be at solving problems and reaching desired goals (Ostrom & Ahn, 2007). There are many examples throughout the literature of men accessing resources and information through multiple channels, which increases their productivity and decision-making power, while women tend to be confined to the exchange of information generated through the social capital of their informal networks of friends and relatives

(Brearley & Kramer, 2020; Galiè, 2013; Katungi et al., 2008). Therefore, when considering interventions that intend to increase access to resources (specifically seed) and knowledge through formal and informal networks, it is important to view the implementation through a gendered lens in order to allow for actualized empowerment (Brearley & Kramer, 2020).

2.2 Empowerment

Empowerment, to be discussed in more detail in the conceptual framework, is a process through which individuals, or groups of individuals, become aware of the hierarchical relationships and dynamics in their life and develop the necessary skills, knowledge, and capacity to overcome those dynamics and exercise control over their lives to achieve their desired outcomes (Kabeer, 2008; Rowlands, 1997). Due to the many social and cultural barriers facing women, empowerment is necessary for them to act upon resources and information to bring about desired outcomes. Interventions that are implemented without attention given to gender rarely bring about the desired outcomes for the women involved. For example, the introduction of an improved rice variety in Uganda without a gender lens burdened women with additional tasks such as bird scaring and weeding (Bergman Lodin et al., 2019). Another extension service in Ethiopia implemented sustainable agricultural practices without sensitization, which resulted again in an increased workload for women (Teklewold et al., 2013). Gender has a monumental influence on farming in developing countries because men and women have unequal access to necessary agricultural resources and decision-making power (Weltzien et al., 2019). Therefore, programs seeking to empower women through

increasing their access to resources must do so by understanding gendered differences within a society.

The empowerment of women is not only important for the women being empowered, but also for her family and her surrounding community. For example, due to women's key role as subsistence farmers, food security is supported by involving women in seed selection and access to preferred seed varieties (Doss, 2002; Galiè, 2013; Kelkar, 2009; Quisumbing et al., 1996). Furthermore, as seen in a study conducted by Nithyanandhan et al. (2015), women tend to spend their income on products beneficial to the household. As women's empowerment was enhanced and their income increased through the activities of a Self-Help Group (SHG), the welfare of the family and overall family income increased as well. Therefore, when women are empowered through training programs and social networks that enhance their knowledge, access to resources, decision-making power, and social capital, the welfare of their families will as well.

Ultimately, empowerment impacts and is impacted by programs that address food insecurity (Galiè et al., 2017). Since women are at the forefront of food security, they must be empowered to perceive themselves as capable, integral actors, and cultural norms, policies, and laws must facilitate their rights, foster opportunities and support their decision-making power (Galiè et al., 2017; Quisumbing et al., 1996). One popular scheme for promoting women's empowerment through such measures is self-help groups.

2.2.1 Self-Help Groups

Self-help groups are a tool used within participatory development to empower women, typically through collective financial activities (Kondal, 2014). SHGs, which are usually formed by NGOs, provide a platform for poor people (usually women) to support each other and access banks, credit, and savings as well as other livelihood programs (Desai & Joshi, 2014; Kabeer, 2010; Kondal, 2014). Members of SHGs build credit and savings as the organization acts as an intermediary between individuals and formal financial institutions (Desai & Joshi, 2014; Kondal, 2014). Members also receive training for some sort of skill/vocation and/or livelihood practice such as healthcare and childcare (Dahal, 2014; Desai & Joshi, 2014; Kabeer, 2010). Finally, SHGs provide a space in which members can engage with each other as well as the broader community (Desai & Joshi, 2014; Kondal, 2014; Nichols, 2021).

Dahal (2014) identified certain activities of SHGs in Nepal that facilitated women's empowerment: frequent meetings, community regulation activities, microcredit, and skill development and capacity building. Through meetings, women's mobility increased, and their social networks were broadened. Meetings also facilitated actions that challenged traditional norms that normally oppressed other members of the community. Through their collective action to challenge social hierarchies throughout the community, SHG members gained respect from community members who benefitted from the SHG's actions. Through microcredit activities of the SHG, in which money is lent at a low interest, and skill development training, members experienced economic empowerment as they had multiple channels through which to access money. This economic empowerment also strengthened women's household decision making

power. Overall, the activities of the SHG in Nepal increased women's self-confidence and self-esteem as they gained knowledge through social participation which made them more independent and respected in their household and community (Dahal, 2014).

Many have recognized the potential of SHGs to serve as a platform for additional developmental interventions (Gugerty et al., 2019; Nichols, 2021). Raghunathan et al. (2018) acted on this notion and aimed to use SHGs across India as a platform for agricultural extension to improve women's access to information, agricultural practices, production diversity, and empowerment in agriculture. This research revealed that SHG members did receive increased access to agricultural information but were unable to operationalize that information as improved practices and production. It was suggested, but not confirmed, that this shortcoming was a result of financial constraints, social norms, and the responsibilities of women resulting in time constraints (Raghunathan et al., 2018).

Research done by Nichols (2021) also noted the capacity of such successful SHGs to serve as a platform for additional developmental programs. In India, the non-governmental organization (NGO) Professional Assistance for Development Actions (PRADAN) has formed a number of SHGs. The greater financial stability and trust with the PRADAN of older, more established SHGs allowed for the implementation of additional programs. Regular and highly attended meetings were a key factor in established SHGs. Meetings offered a space to share information, grow social networks and build social capital. However, SHGs that were less established existed as such because the women did not value the information being presented at meetings and

therefore did not regularly attend, breaking down the opportunities for networking within the group. On the other hand, the more established SHGs more readily accepted and valued the information given at meetings. This was due to their trust in PRADAN to provide them with the knowledge, resources, and skills to produce beneficial outcomes, as they had previously experienced with the loan and saving schemes (Nichols, 2021). This indicates that in order for SHGs to have the capacity to adopt additional programs, there must be bonding social capital within the group as well as linking capital between the group and the implementing organization. Social capital at the group and community level can also influence household relations (Doss, 2013; Katungi et al., 2008) The following conceptual framework section will lay out the definitions and understandings of the process of women's empowerment that inform my thesis' data analysis and results.

3. Conceptual Framework

Intrahousehold dynamics and women's roles and responsibilities within the household impact the choices and decisions they make about agricultural production. In combination with their access to resources and information, these choices and decisions have a direct impact on their potential agricultural productivity. In order to understand more closely the relationship between women's empowerment and agricultural productivity, the decision-making processes within a household should be examined and understood (Doss, 2013). Decision-making within the household is the process of determining who makes decisions, which is influenced by resource allocation and how social and/or gender norms and roles are perceived by household members (Doss, 2013; Gilligan et al., 2020). Households rarely operate as a single entity for production and consumption, rather household decisions are shaped by resource allocation and the familial dynamics therein (Shibata et al., 2020). These factors influence the bargaining model, either cooperative, non-cooperative, or a combination of the two of the house. Within a cooperative model, household members make decisions regarding pooled resources, while within a non-cooperative model, members make individual decisions regarding their own resources, among household members (Doss, 2013). Within multi-member households, the literature typically assumes that there are two key decision-makers, and that bargaining takes place between the husband and wife with other members of the household being unimportant to the bargaining process (Abdullah Yusof & Duasa, 2010; Doss, 2013; Gilligan et al., 2020). However, in developing countries there tend to be households that are not headed by a couple, but the male alone, resulting in non-cooperative bargaining models favoring men (Doss,

2013; Mudege et al., 2015; Njuguna et al., 2016). Household dynamics and the resulting bargaining power and decision-making processes that follow must be understood in order to address gender gaps and empower women.

When someone owns or controls certain factors within the household, such as resources, knowledge, or they are implicitly (for social, economic, or cultural reasons) the decision-maker, this individual has more bargaining power, which positively influences their role in household decision-making (Doss, 2013; Polar et al., 2021; Shibata et al., 2020). Decision-making power is usually seen as an outcome of bargaining power as greater bargaining power gives women more voice within the household decision making process (Doss, 2013). In order to measure the outcomes of women's bargaining power, we must understand their preferences to determine if their preferences are being met through their decision-making power. However, it is difficult to identify those preferences, so the literature typically operates using the "inferential approach" (Thomas, 1990). This approach notes outcomes of a situation in which a woman has greater bargaining power, and then assumes those outcomes to be preferred by the woman since she used her bargaining power to obtain those outcomes (Doss, 2013). Therefore, since such a concept cannot easily be measured, proxies must be identified. However, proxies and indicators of bargaining power usually do not allow us to understand the process and causal relationships of bargaining power (Doss, 2013). As an attempt to demonstrate examples of causal relationships of bargaining power, Doss (2013) discusses three studies that implemented policies intended to improve women's statuses in regards to marriage, inheritance, and financial status after divorce, which resulted in greater bargaining power for the women, as well as other

desired outcomes (Adam et al., 2011; Deininger et al., 2010; Rangel, 2006). Though these studies demonstrate positive outcomes as a result of increased bargaining power among women, there still exists the difficulty of finding direct, causal relationships between certain variables and policies and women's bargaining power (Doss, 2013; Shibata et al., 2020). Since causality cannot be dismissed merely because it cannot be explicitly identified, variables have been recognized as proxies that relate to favorable outcomes and may in fact be causally related to bargaining power.

3.1 Variables of Bargaining Power

The variables of bargaining power that are widely accepted throughout the literature are income and employment, assets, human capital, and other proxies such as social capital and agency (Doss, 2013; Gilligan et al., 2020; Mabsout & van Staveren, 2009; Shibata et al., 2020). Each of these variables can act as a contributing factor towards an actor's increased bargaining power as well as an outcome of that bargaining power, thereby further strengthening their role in the decision-making process (Doss, 2013; Shibata et al., 2020). Throughout the literature, it has also been shown that the more options an individual has for a certain resource, the better their fallback position, and the greater their bargaining power (Alsop & Heinsohn, 2005; Polar et al., 2021; Shibata et al., 2020). Therefore, programs and interventions that provide actors with a greater number of choices have the potential to contribute to her bargaining power. However, these variables must be controlled, not merely accessed, by the individual who possesses them in order for them to impact the actor's bargaining power (Gilligan et al., 2020).

3.1.1 Income and Employment

As noted by Doss (2013) and Mabsout & van Staveren (2009), income and employment in the form of earned income, the potential to earn income, and working outside the home can be a source of increased bargaining power. Income can result directly in bargaining power especially if women are in control of the money they earn since they typically allocate money towards family welfare (Doss, 2013; Nithyanandhan et al., 2015; Quisumbing et al., 1996). The potential to earn an income gives women more options for sources of money and therefore greater bargaining power (de Boef et al., 2021; Doss, 2013). Working outside the home can give social and/or other learned skills that translate to increased bargaining power and provide women with social interactions that may contribute to changes in knowledge or beliefs (Doss, 2013; Galiè et al., 2017; Quisumbing et al., 1996). As discovered through research done by Galiè et al. (2017), women who participated in a PPB program in Syria were able to access new public spheres, which provided discussion and information surrounding farming as well as challenging gender discriminating behaviors. However, employment out of the house may increase overall workload for women as they live under the triple burden and must continue maintaining their household work as well (Baden, 2013; Doss, 2013; Mudege et al., 2015).

3.1.2 Assets

Another contributing factor to a woman's bargaining power is the access to different options of and the eventual control over assets (Doss, 2013; Mabsout & van Staveren, 2009; Shibata et al., 2020). Assets such as land, livestock, agricultural

equipment, businesses, and financial assets provide other sources of income, thereby bettering a woman's fallback position and increasing her bargaining power (Doss, 2013; Kelkar, 2009). However, asset allocation and control usually favors men, thereby limiting the resources with which women can bargain (Katungi et al., 2008; Shibata et al., 2020). When women are able to access and control assets, their bargaining power increases, which can result in the accumulation of more assets further contributing to her bargaining power (Kelkar, 2009; Shibata et al., 2020). For example, Galiè et al. (2017) conclude that women's participation in a PPB program enhances their access to and control over preferred seed, thereby increasing their control over food production and positively impacting their role as respected members within their household and community. Asset access and control, then acts as a feedback loop with bargaining power.

3.1.3 Human Capital, Social Capital, and Voice

Human capital can be a source of bargaining power as a woman's education and skill set, especially in relation to her husband, can provide her with internal resources which can impact the decision-making process (Doss, 2013; Mabsout & van Staveren, 2009; Quisumbing et al., 1996; Raghunathan et al., 2018). For example, through a plant participatory breeding program in Syria, women were able to access public spaces and engage in discussions about farming which strengthened their knowledge about farming and understanding of empowerment and self-determination (Galiè et al., 2017). Through this acquisition of information and experience, women were then observed to challenge traditional gender norms and reconsider their role in household relations (Galiè et al.,

2017). Bargaining-power can also be strengthened through social capital, the social networks that establish reciprocity and trust, as actors gain social support as well as shared knowledge and resources from the network connections, such as those seen in informal seed systems (de Boef et al., 2021; Gilligan et al., 2020; Katungi et al., 2008).

The term voice, typically also referred to as a type of agency, is the ability to articulate needs and interest, as individuals or as a collective, with the understanding that this voice must be heard, listened to, and acted on by the individual as well as others (Agarwal, 2015; Gammage et al., 2016; Mudege et al., 2015). This requires an internal awareness of one's social status, and is highly influenced by the embedded beliefs structured by various institutions (Mabsout & van Staveren, 2009; O'Hara & Clement, 2018). Therefore, agency, in the form of self-confidence and voice, can be a variable contributing to an individual's bargaining power, but can also be seen as a dimension and indicator of empowerment and will be further explained in the coming sections (Doss, 2013; O'Hara & Clement, 2018).

3.1.4 Gendered Institutions

Gendered institutions are understood to be the social norms, beliefs and practices that asymmetrically, and typically in favor of men, influence men's and women's behavior (Mabsout & van Staveren, 2009; Staveren & Ode bode, 2007). These institutions can be influenced by age, fallback position, sex, ethnicity, and a variety of cultural and social norms (Mabsout & van Staveren, 2009; Shibata et al., 2020). An example of this was found in Uganda by Shibata et al. (2020) who confirmed the relationship between certain variables of bargaining power and decision-making

power. Among farming households in Uganda, it was found that land ownership, the source of inputs, and labor contribution all impacted the decision-making power of household members over innovation implementation, control over outputs and generated income, and agricultural management. However, gendered institutions were found to almost nullify the impact that women's labor contribution would have on their decision-making power. It was discovered that husbands rarely seek wives' permission before implementing an agricultural innovation, while women must seek their husbands' permission before introducing innovations. Men explained that they are heads of the households and owners of assets, and therefore do not require permission from other household members for the uptake of innovations (Shibata et al., 2020). Women explained their need for permission was due to the perceived gender roles within the household, that men are seen as the bosses who control the capital and resources necessary for the innovation, and that women require their husbands' labor and insight for the innovation as women do not feel confident in their level of knowledge. Therefore, because of gendered institutions, women had less decision-making power over the resources and generated income from agricultural innovations (Shibata et al., 2020).

As the basis for cultural norms and social structures, gendered institutions can overturn any other variable of women's individual bargaining power. For example, some negative outcomes have been observed in South-Asia when women's access to credit and/or employment increased, men either spent the loan money leaving the woman to pay it back or responded abusively to their wife's new role as a source of income for the household (Rahman, 1999).

3.1.5 Meaningful Choice

In order for bargaining power to be successfully realized as decision-making power, then, gendered institutions must be replaced with more empowering opportunity structures (Alsop & Heinsohn, 2005). Opportunity structures are the socially constructed institutions that structure political, economic, and social interactions based on formal and informal rules or other institutions that shape a person's behavior or decisions (Alsop & Heinsohn, 2005). For example, Polar et al. (2021) discovered that throughout Sub-Saharan Africa, decisions regarding agricultural technology adoption involved individual agency (the resources available to and the preferences of an individual) as well as structural factors. Several participatory plant breeding and participatory varietal selection programs in Sub-Saharan Africa took into consideration the institution of gender, and the deep-seated beliefs and presumptions that accompany it, to provide a more empowering opportunity structure for women farmers based on their varietal preference by raising awareness of traits women prefer and shifting the program to prioritize women's preferences (Polar et al., 2021). Through these institutional shifts, women were presented with meaningful choices in regards to seed varieties.

Meaningful choice involves the existence of choice as well as the perception that there is a choice among options that has value and is available to the actor, so women were presented with varietal selection that fulfilled their trait preferences (Polar et al., 2021). Meaningful choice is in contrast to restricted choice, which is when actors are presented with no options that have value to them and remain under structures that prevent the actor from generating any other better options for themselves (Polar et al., 2021).

Kabeer (2008) describes such choices as strategic, as they shape the direction and quality of the decision-maker's life, and views them as a vital component of empowerment. Strategic choice is in contrast to mundane or non-strategic choices that may not have an influential or empowering effect on a person's life (Kabeer, 2008). Polar et al. (2021) note that meaningful choice alone does not automatically result in empowerment until the proper structures are in place that allow the actor to exert individual agency and generate desired outcomes based on the meaningful choices made available to her. Therefore, meaningful, strategic choices, and the ability to make those choices are a vital aspect, and potential indicator of empowerment (Doss, 2013; Kabeer, 2008; Polar et al., 2021).

3.2 Indicators of Empowerment

Empowerment has been a point of discussion throughout gender and development research. As it gains more attention, more definitions, theories, and beliefs have risen as an attempt to fully understand the word "empowerment." For this paper, empowerment will be understood in the context of disempowerment, as a process that is internally driven, and as the resources, agency, and achievements of an individual working in tandem to provide the basis for future empowerment (Alemu et al., 2018; Kabeer, 2008; Rowlands, 1997).

First, empowerment should be viewed in the context in which there has been disempowerment (Alemu et al., 2018). Kabeer (2008) states that empowerment is the acquisition of power after being disempowered, and her most renowned definition of empowerment is the "process by which those who have been denied the ability to make

strategic life choices acquire such ability.” Similarly, Rowlands (1997) defines empowerment as “the process by which people, organizations or groups who are powerless become aware of the power dynamics at work in their life context, develop the skills and capacity for gaining some reasonable control over their lives, and support the empowerment of others in the community.” It is important to note the emphasis both authors put on the idea that empowerment is a process. Alemu et al. (2018) also recognize empowerment as a continual process with no stationary end goal. Furthermore, this process must be internally desired and led by those seeking empowerment (Alemu et al., 2018). Özdemir, (2019) argues that the internal desire for change is necessary for any sort of empowerment intervention to have a lasting effect.

Once the context of empowerment is understood as a process internally desired by an actor who is disempowered, one can begin to conceptualize the dimensions of strategic choices that provide the base for empowerment and any indicators, measurable or abstract, of empowerment. As previously mentioned, strategic choice is a key aspect and indicator of empowerment (Kabeer, 1999). Rowlands (1997) supports this claim through another definition of empowerment as the process through which an individual is aware of their interests, and the interests of others, and perceives themselves as able and entitled to make decisions, thereby increasing their participation in decision making. Furthermore, Malhotra & Schuler (2002) view empowerment as one’s ability to recognize and act in a way that challenges social norms. However, social norms and other factors that shape strategic choices, and therefore, empowerment, are subject to change based on contexts. Therefore, it is difficult to name universal factors or indicators of empowerment. Kabeer (2008) does, however, describe three

dimensions in which choice, when understood in specific contexts, reveals empowerment. These dimensions are resources, agency, and achievement, and will be further discussed in the following sections (Kabeer, 2008). The Women's Empowerment in Agriculture Index (WEAI) also presents indices by which women's empowerment, agency, and inclusion within the agricultural sector can be measured (Alkire et al., 2013). This index presents 5 key domains of empowerment in agriculture: decisions about agricultural production, access to and decision-making power about productive resources, control of use of income, leadership in the community, and time allocation (Alkire et al., 2013). These domains will be referred to throughout this paper, but the index itself will not be used. As it will be seen, the various indicators of empowerment are similar to the variables of bargaining power previously discussed. This reveals the cyclical nature of these factors and outcomes as empowerment is a process continually being strengthened by previously attained outcomes.

3.2.1 Resources

Resources are those elements, material, human capital, and social capital which people draw upon as they pursue their preferred outcomes (Kabeer 2008). Material resources can be income, credit, equipment, and/or agricultural or other productive assets. The Women's Empowerment in Agriculture Index (WEAI) identifies the access to productive resources, ownership of assets, and access to credit as indicators of empowerment (Alkire et al., 2013). Human capital refers to the typically instrumental assets of an individual such as physical capability, knowledge, and/or skill (Doss, 2013; Kabeer, 2008). These types of assets can help women achieve better outcomes for

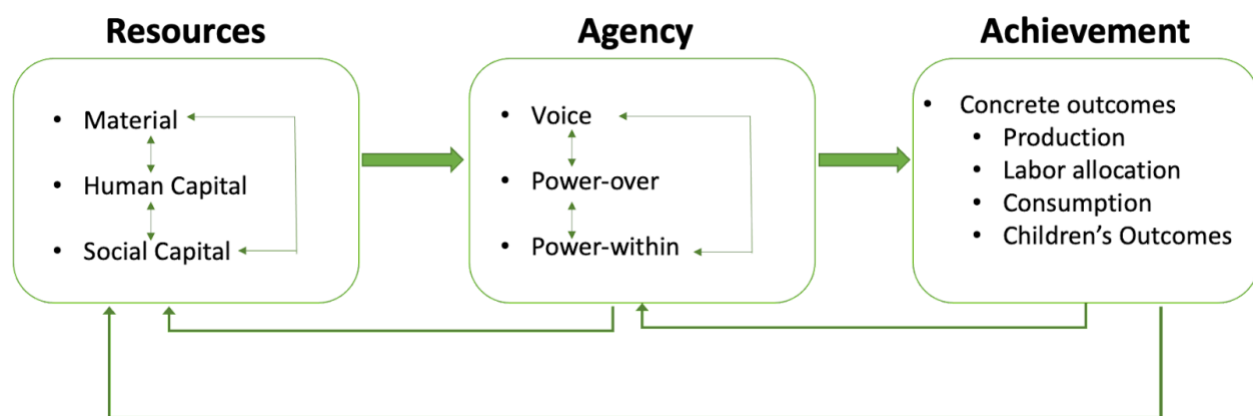
themselves. For example, research in Ethiopia revealed that a higher education level of women positively impacted their bargaining power with their husbands in regards to their participation in chickpea PVS trainings (Njuguna et al., 2016). Finally, social capital is made up of the social norms, trust, relationships, linkages, and networks through which an individual operates and generates empowerment via the coordination and collective efforts of the group (Kabeer, 2008; Krishna & Shrader, 1999). The act of individuals working collectively to achieve a goal is defined as power-with by Rowlands (1997).

Power-with is seen as the amplified voice, power, and capability to achieve goals through the collective action of a group, or more simply, when the whole is greater than the sum of the parts (Alemu et al., 2018; Gammage et al., 2016; Rowlands, 1997).

Power-with can manifest itself in the collective accumulation of material assets. In Malawi, potato farmer groups made up of male and female members acted as “family;” this relationship between group members resulted in increased access to agricultural resources like fertilizer and seed as well as increased social support as members acted jointly with each other (Mudege et al., 2015). Power-with can also be an internal sense of empowerment as individuals share experiences and develop solidarity among other members. For example, women in SHGs in North India found empowerment and inspiration in sharing challenges and stories with other women in their group who suffered from similar circumstances (Mishra, 2021). Furthermore, Mishra (2021) discusses that women sharing their feelings of empowerment with others in the group creates solidarity, courage, and awareness of disempowerment among others which fosters unity, group strength, and the determination to overcome wrongs. This group

strength is then drawn upon by individuals as a source of enhanced social capital through collective action (Mishra, 2021). Therefore, power-with functions as a feed-back loop in that as a person is more strengthened by the power of the group, the group benefits from the strengthened agency and capabilities of the individual (**Figure 1**). Rudyard Kipling (1991) explains this succinctly and memorably in his work, The Jungle Book: “For the strength of the Pack is the Wolf, and the strength of the Wolf is the Pack.” Alemu et al. (2018) explain that SHGs operate under the key point that collective action is the most effective tool in challenging and changing patriarchal societies. This sentiment is further supported by Kabeer's (2008) argument that individual consciousness and empowerment are necessary for social change, but it is the collective action against injustices that are more effective in initiating and establishing sustained changes.

Figure 1. The relationship between the dimensions of choice: resources, agency, and achievement, and the factors therein. Adapted from Kabeer (2008) and Doss (2013).



3.2.2 Agency

Agency is the capacity of an individual to name a choice and act upon it, to use one's voice to express ideas and opinions, and the cognitive elements of an individual that motivate and affect purpose (Alsop & Heinsohn, 2005; Kabeer, 2008). Resources enable or constrain an individual's capacity for agency as an individual's fallback position is shaped by their resources and, if strong, can give power to one's voice (Gammage et al., 2016; Kabeer, 2008). A key component of agency then, is voice, which is an indicator of empowerment identified by WEAI as speaking in public, and as previously mentioned is also a variable of bargaining power (Agarwal, 2015; Alkire et al., 2013; Doss, 2013; O'Hara & Clement, 2018). As an individual uses her voice to increase her bargaining power and thereby strengthen her position in the decision-making process, she is more likely to acquire her desired outcome, which would be the basis for an even stronger voice in the future. Voice can also reveal empowerment when it is used to define, and eventually act upon, one's goals (Alsop & Heinsohn, 2005; Kabeer, 2008). These goals can be conceptualized as the ability to negotiate and influence relationships and decisions therein (Rowlands, 1997). Therefore, the capacity to make decisions, or power-over, is another component of agency.

Power-over, or controlling power, can be in terms of relationships with others or financial, physical, and/or knowledge-based assets (Perezniето & Taylor, 2014; Polar et al., 2021; Rowlands, 1997). For this paper, power-over will refer to the control and decision-making power over assets. Malhotra and Schuler (2002) note that the term empowerment may be encompassed in other terms such as control over resources. Within SHGs in Nepal, members were provided with information regarding access to

loans, which enabled them to carry out various economic activities that increased their self-reliance and self-actualization and therefore their sense of agency, as well as their ability to purchase and invest in other material assets (Dahal, 2014). Their ability to contribute to the household income also enhanced the respect they received from other household members thereby allowing them greater decision-making power (Dahal, 2014). It is obvious then, how vital resources are to this dimension of agency, and how the relationship between resources and agency is bidirectional as resources enable agency and agency may result in the accumulation of more resources (Malhotra & Schuler, 2002).

A more abstract factor of agency, which is closely related to the concept of voice, is an individual's power-within (Kabeer, 2008; Malhotra & Schuler, 2002; Rowlands, 1997). Power-within is the critical consciousness of an individual that strengthens their sense of self-efficacy, self-esteem, and respect towards others, which can shift their attitude towards social norms and enable them to express their voice (Alemu et al., 2018; Jones et al., 2020; Rowlands, 1997). This sense of self-esteem can be generated through one's control over resources, one's sense of self-identity as they are recognized by others within their community, and/or one's personal confidence and capacity to act in accordance with individual goals (Galiè et al., 2017; Kabeer, 2008; Malhotra & Schuler, 2002; Rowlands, 1997). For example, in a study previously mentioned, SHG women in Nepal carried out various social activities that increased awareness and mitigated social and traditional evils (Dahal, 2014). Through these activities, SHG women were respected by community members, resulting in higher self-confidence and self-esteem (Dahal, 2014). The relationship between power-within and power-to is also

cyclical as a woman may feel a greater sense of self-esteem and capability after having more of a voice in the decision-making process, and this enhanced confidence may strengthen her voice to gain greater decision-making power over resources in the future (Kabeer, 2008). Therefore, agency, as a dimension of empowerment, encompasses an individual's sense of self-worth, their capacity to exercise control over resources, and the voice to renegotiate their relationship with others, all of which play a part in reshaping societies to give the disempowered greater control over their lives (Kabeer, 2008; Malhotra & Schuler, 2002; Rowlands, 1997).

3.2.3 Achievement

The third dimension of choice that reveals empowerment identified by Kabeer (2008) is achievement. Achievement is understood as the concrete outcomes of exercised choice, or “power-to” (Kabeer, 2008; Rowlands, 1997). Power-to has been defined in a variety of ways throughout the literature. Rowlands (1997) describes it as the productive powers through which women organize themselves to assert their ability that creates new possibilities and actions, while Jones et al. (2020) explain it as the power to make decisions, control resources, have mobility, and participate in the community. Alsop and Heinsohn (2005) and Perezniето and Taylor (2014) describe power-to as the decision-making power of an individual or group of individuals and their ability to effectively act on those decisions to transform them into desired outcomes. Though slightly different, each author's definition of power-to touches on the key point of actualized choice resulting in desired outcomes. Access to resources, decision-making power, self-confidence, and opportunity structures, as individual entities, present

potential choice and empowerment, but it is not until they work in tandem to actualize goals that empowerment can be achieved (Kabeer, 1999; Malhotra & Schuler, 2002). Agarwal (1997) argues that women do not need to be made aware that they are under social structures of constraint, but they need to be made aware of the actions that can be taken to improve their condition through building self-confidence, providing information, and strengthening their bargaining power. Yet again, a feedback loop can be identified from the relationship between achievement and resources, and achievement and agency. As an individual exercises their power to achieve individual goals, their agency will increase, and if their goals are related to the accumulation of any type of resources, their resource accumulation will increase as well (Kabeer, 2008).

Though achievement is identified as concrete outcomes of the exercised choice of an individual, it still remains difficult to recognize an individual's level of empowerment based on contexts and personal goals and desires. The choice of an individual in one context may result in different concrete outcomes as a similar choice made by an individual in another context. Therefore, indicators of empowerment have been generated throughout the literature to be used in a more universal context. For example, Doss (2013) identifies decision-making power over production, consumption, children's outcomes, and labor allocation as outcomes of empowerment that can be tangibly measured.

Decision-making power over production, especially in the agricultural sector, considers what is being produced, how it will be managed post-harvest, what inputs and techniques will be used to farm the crop, and the allocation of labor among the different parties involved (Doss, 2013). WEAI (2013) identifies similar indicators of empowerment

as input in productive decisions, autonomy in production, and the purchase, sale, or transfer of assets. For example, in Andhra Pradesh, some women who experienced an increase in bargaining power as a result of SHG activities such as increased access to and control over finances, awareness about society, and self-reliance also saw strengthened decision-making power in the agricultural sector as well as in other household activities (Kondal, 2014).

Decision-making power over household consumption deals with how money is being spent (Doss, 2013). This is a good indicator of bargaining power in regards to the decision of what will be purchased, as well as bargaining power in the form of control over money to be spent (Doss, 2013). WEAI (2013) identifies indicators of empowerment similar to Doss' (2013) indicator of consumption as the control over use of income and decisions about credit. The literature has also suggested that when resources, and control over those resources, lie with women, children in the household will be more positively impacted than if that power lies with the head male of the household (Doss, 2013). Research done by Nithyanandhan et al. (2015) supports this claim by discovering that women whose financial development had improved as a result of SHG membership, contributed substantially to the income of their household and development of its members. Therefore, based on the inferential approach, it can be assumed that when children receive benefits from household resources, those resources are more than likely controlled by the woman.

Labor allocation can also be an indicator of achievement as an individual can actualize their choice over what work they are to do and how the earned income is distributed (Doss, 2013). WEAI's (2013) common indicators of empowerment are

workload and leisure as an individual exercises decision-making power over how their time is spent. However, the indicators of time allocation to work and leisure, and what work is done is more difficult to measure, because some women with bargaining power may decide to work outside of the home, while some women without bargaining power may be forced to work outside of the home depending on the context. Household chores and the triple burden of women must also be considered when looking at labor allocation as an outcome of bargaining power (Doss, 2013).

3.2.4 Context Variations

Although there can be universal indicators, it is still vitally important to acknowledge the context in which these indicators are being applied. Social structures, cultural norms, politics etc. heavily influence empowerment variables and indicators, varying greatly across contexts. The scale at which empowerment may occur adds further to this complexity as empowerment in one social sphere may not indicate empowerment in another social sphere (Malhotra & Schuler, 2002). It is important, therefore, to consider the levels at which empowerment is occurring and to note any linkages across dimensions. Agarwal (1997) notes four areas of gender relation contestation: the household, the market, the community, and the State. Therefore, due to the multi-faceted nature of the empowerment process, intervention techniques must also have multi-pronged approaches.

4. Research Setting

4.1 Program Background

4.1.1 Rajiv Gandhi Mahila Vikas Pariyojana (RGMVP)

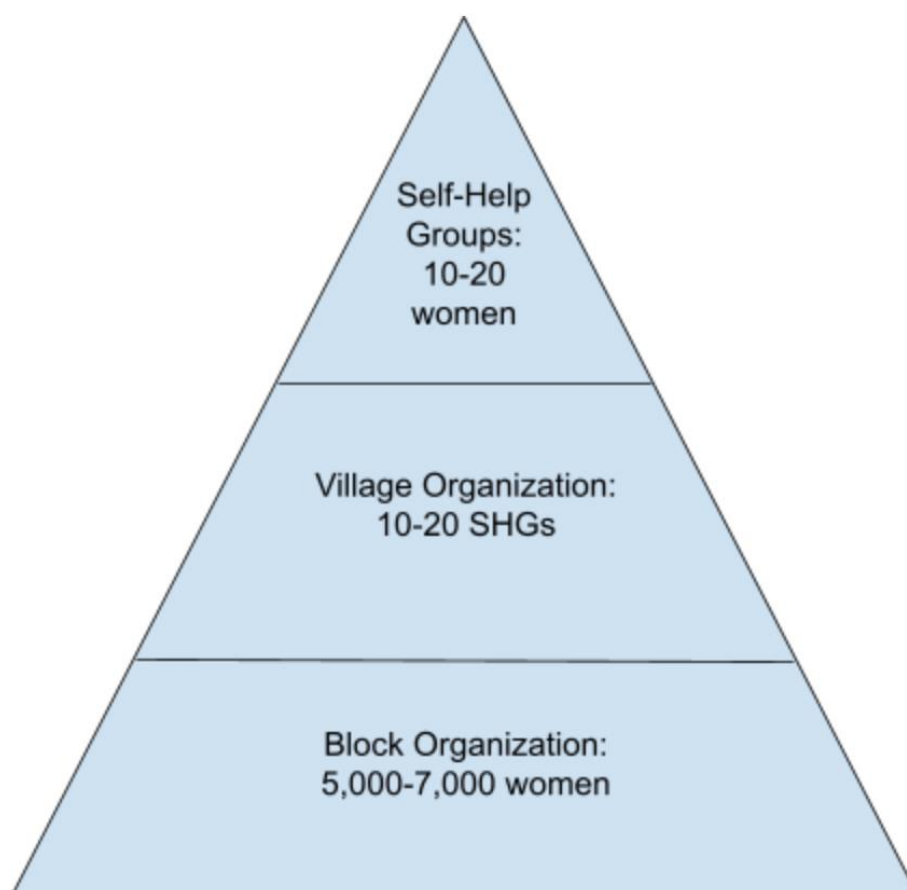
Starting in the 1970s NGOs started developing and supporting SHGs as a way to work towards poverty alleviation and empowerment through shared savings and credit activities among poor communities (Buggineni et al., 2013). In 2002, a non-profit organization, Rajiv Gandhi Mahila Vikas Pariyojana (RGMVP), set out to reduce poverty and empower women via SHGs in Uttar Pradesh, and more specifically in Raebareli, Sultanpur, Lucknow, and Amethi (Buggineni et al., 2013). Women who are a part of the organization participate in micro-credit savings and loan groups, which are managed mostly internally, with support from the three-tier structure (Buggineni et al., 2013). The three-tiered structure of RGMVP SHGs are organized as follows: each SHG is made up of about 10-20 poor women, typically from the same socio-economic group (Buggineni et al., 2013). 10-20 SHGs, or about 150-250 families, come together to form Village Organizations (VOs) (Buggineni et al., 2013). Finally, VOs are federated into Block Organizations (BOs) comprised of 5,000-7,000 women (**Figure 2**) (Buggineni et al., 2013). This three-tiered structure is integral for scaling and extended impact as well as expands members' social networks by connecting them to actors and institutions outside of their village. Refer to de Boef et al. (2021) for further details regarding the three-tiered structure of the RGMVP SHG program.

RGMVP has been established in an area with low scores in the human development index (de Boef et al., 2021). Therefore, the programs offered through RGMVP SHGs focus on financial inclusion, health, nutrition, agriculture, dairy, sanitation

and hygiene, local governance, and rights and entitlements (Buggineni et al., 2013) . Training, workshops, and increased access to resources facilitated by the SHG are offered to help women address the issues in these arenas (Buggineni et al., 2013). Financial inclusion is specifically addressed through a savings scheme in which women contribute money to the SHG as savings until enough is collected to allow for internal lending (Buggineni et al., 2013). As capital continues to grow through member savings, SHGs link to banks to begin microcredit activities (Buggineni et al., 2013). Through the savings scheme and the three-tiered structure, RGMVP has been able to access the most poverty-stricken areas of Uttar Pradesh, and individual women have increased access to money through their membership and contributions to the SHG micro-credit savings group (Buggineni et al., 2013).

An analysis of RGMVP SHGs' impact on women's social status and empowerment revealed that participation in the SHG resulted in the development of women as individuals (Buggineni et al., 2013). Specifically, through their RGMVP SHG membership, women experienced more decision-making power in the household, greater mobility and interactions with others in the community, enhanced awareness of social, economic, and health issues, and greater confidence as they were able to access credit and generate income (Buggineni et al., 2013). This model of SHG holds potential to serve as the platform on which other interventions can be layered (Buggineni et al., 2013).

Figure 2. Three-tiered structure of Rajiv Gandhi Mahila Vikas Pariyojana self-help group program.



4.1.2 Seed Program

In response to this observed potential, a seed production program was layered on top of RGMVP SHGs in 2015 in three regions of Uttar Pradesh: Amethi, Raebareli, and Lucknow (RGMVP, 2017). These regions were chosen because of their high population of marginalized subsistence farmers and RGMVP's heavy involvement in these specific districts (de Boef et al., 2021; RGMVP, 2017). This seed production program was linked to an ongoing project that aimed to increase soil fertility and

cultivation practices through compost production and enhanced farming techniques (de Boef et al., 2021).

Even though these regions rely heavily on subsistence farming of rice and wheat, the seed systems through which farmers procured seed offer limited access to improved, modern wheat and rice varieties (de Boef et al., 2021). Farmers in these areas obtained seed through input dealers, which requires cash and access to the necessary exclusive social networks (RGMVP, 2017). Smallholder farmers in the SHG, then lacked access to the formal seed system due to lack of knowledge about modern varieties and lack of financial resources, as well as because of their gender, as women were not seen as farmers in this society (RGMVP, 2017).

The main objective of the RGMVP seed production program was to increase availability, accessibility, and adoption of preferred, quality seed among women farmers and farmers of the surrounding community through the pre-existing social networks of the SHG (RGMVP, 2017). The expected outcomes of this project were to increase access to quality seed by SHG members, increase the use of improved seed management practices among members, enhance women's empowerment (influenced by WEAI's domains of empowerment), increase members' knowledge on direct consumption of cereals, pulses, and vegetables, and establish a model for strengthening the informal seed system through women's collective and individual action (RGMVP, 2017). To do this, the seed production program focused on nine seed system practices to be layered on top of the pre-existing social networks of the SHG: identify varieties for PVS, conduct PVS, organize field days, select varieties for seed production, facilitate access to foundation seed, support seed production by women

farmers, support group-based quality assurance, support seed storage by women farmers and collective structures, and facilitate seed marketing by women farmers within the three-tiered structure (RGMVP, 2017). SHGs were responsible for selecting women for the seed production program, facilitated the acquisition of necessary materials and credit by seed producing members from the VOs, and ensured access to quality seed by all farming members of the SHG (RGMVP, 2017). VOs took charge in setting up and strengthening the seed production program at the village level (RGMVP, 2017). Specifically, VOs recorded seed production and dissemination activities, organized PVS field days and finalized farmers' choices of preferred varieties, constituted quality assurance committees, and arranged the appropriate finances from the savings corpus to support seed production activities (RGMVP, 2017). BOs identified eligible VOs for the seed production program based on the availability of farming women in the VOs, facilitated women's visits to agricultural universities and seed dissemination throughout the three-tiers as well as beyond the BO, and decided on the source of seed procurement (RGMVP, 2017).

The three-tiered structure of the SHG facilitated the selection of seed producing women, ensured access to foundation seed in order to produce seed, and arranged the transfer of information with universities and research centers (RGMVP, 2017). SHGs selected to participate in the seed production program were chosen based on their level of establishment, as seen through regular meetings, secure savings, and credit that could support the risk of farming new varieties (RGMVP, 2017). Individual women were selected based on their willingness to participate, their direct involvement with farming,

and the quality of their field drainage, while farmers with small landholding were prioritized (RGMVP, 2017).

PVS was included in the program to increase men and women's awareness about new varieties that had been released by research institutions (RGMVP, 2017). The seeds to be selected from during PVS were varieties ignored by other sectors (rice and wheat) and had not yet been made available at local markets (RGMVP, 2017). Through PVS, women were taught about these different varieties and their characteristics and also given the opportunity to choose which varieties would be used in seed production (RGMVP, 2017). Farmers saw improved modern varieties grown alongside locally preferred varieties and their own variety in the same field as a blind test (RGMVP, 2017). Women, who had a limited if any role in agricultural decisions before, were given meaningful choice through PVS as they selected their preferred variety from these field trials based on traits and characteristics (RGMVP, 2017). Their selection informed RGMVP and VOs about which varieties of seed to procure for seed production (RGMVP, 2017). This process enhanced women's role as farmers and decision-makers in the agricultural sector, while also improving their knowledge about rice and wheat seed varieties (de Boef et al., 2021; RGMVP, 2017). The networks and relationships formed through the SHG then provided channels through which seed produced by women and its related information could be accessed (de Boef et al., 2021; RGMVP, 2017). Furthermore, the networks and social capital generated through the collective actions of the SHG provide members with shared information and experiences, trust, and confidence, all of which are important for agricultural adoption (RGMVP, 2017). Within four years, 813 active-SHG member women became trusted,

skilled seed producers, 10,000 small-scale wheat farmers and 37,000 small-scale rice farmers gained access to varieties that had not been available before, and the average age of wheat varieties in use changed from 18 to 6 years (de Boef et al., 2017). The research presented in this paper sets out to investigate, using qualitative interview data, the impacts of this seed program embedded in the social structure of SHGs on seed access, as well as on the empowerment of those participating in the program.

4.2 Context Background

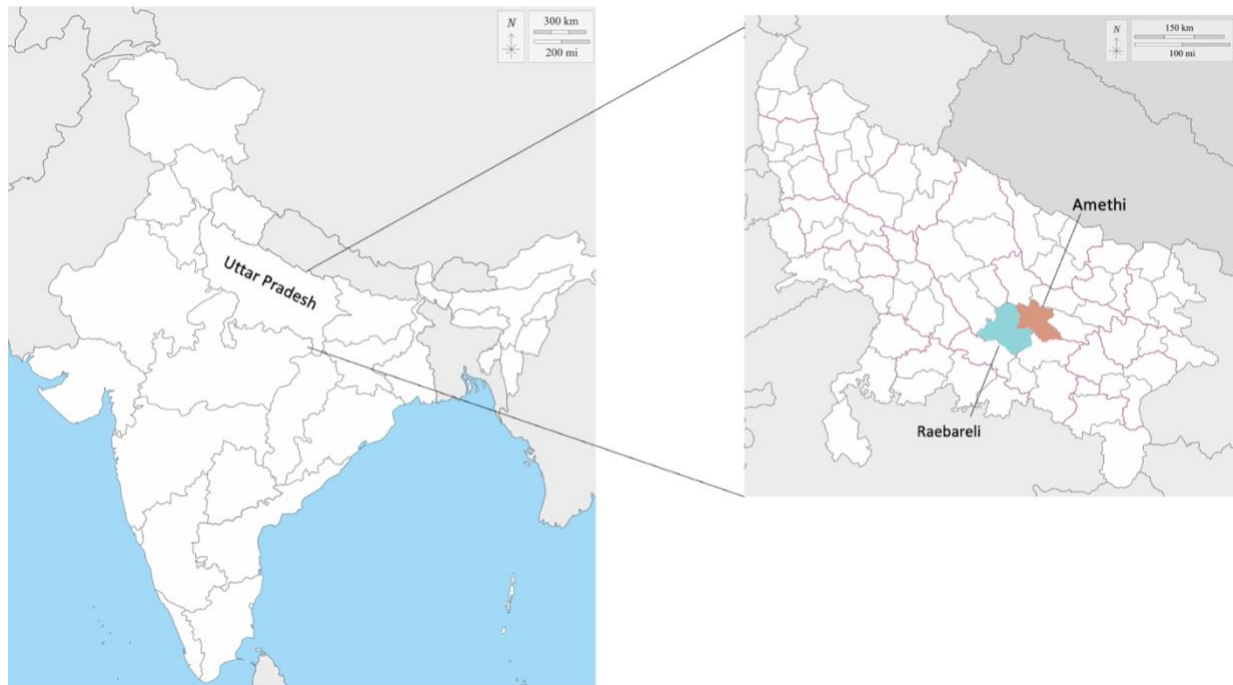
Uttar Pradesh (UP) is one of the largest states by area in India, and the largest by population (Mathur, 2022). As of 2011, there were about 200 million people in UP, 80% of which are Hindus, some are Muslim, and a fraction of a percent are Christians, Buddhists, or other religions (*Uttar Pradesh Population Sex Ratio in Uttar Pradesh Literacy Rate Data 2011-2022*, 2011). There are two distinct regions: the central plains of the Ganges River, or the Gangetic Plains, and the Southern Uplands, or the Vindhya Range (Mathur, 2022). The Gangetic Plains are composed of sediment deposits from the Himalayas which are brought down by the Ganges network (Mathur, 2022). The Vindhya Range is characterized by rocky hills and plateaus (Mathur, 2022).

The two districts focused on in this study, Raebareli and Amethi, are located in the Gangetic Plains. These districts are environmentally similar with summer month (April-June) temperatures around 40-45°C, winter temperatures below 20°C, and an average of 1200mm precipitation in the monsoon season (July-September) (*Programmes and Projects | FAO in India | Food and Agriculture Organization of the United Nations*). The land in this region, as well as most of the state, is fertile due to the

layer of alluvium deposited by the Ganges River from the Himalayas, making Uttar Pradesh a hotspot for agricultural productivity (Mathur, 2022). However, even with the fertile soil, monsoon season, and improved technologies brought to the state by the Green Revolution, most rural farmers' agricultural productivity is still limited by small land plots, lack of infrastructure, and poor access to resources and information (*Uttar Pradesh - Economy*). Furthermore, traditional and cultural discrimination against women farmers, who comprise a majority of the agricultural workforce, has perpetuated the unproductivity of UP's rural farmers (Vyas et al., 2016).

Most of UP's population relies on agriculture for their livelihood, almost 20% of India's food grain, as well as a majority of the country's sugar cane, is produced in the state (Vyas et al., 2016). The major farming systems used are rice-wheat rotational system and mixed systems producing the staple crops of rice (paddy), barley, and wheat, and cash crops such as sugarcane and pulses, specifically pigeonpea (*FAO - Farming Systems*; Vyas et al., 2016).

Figure 3. Map of Uttar Pradesh and the districts Amethi and Raebareli.



4.2.1 Poverty and Inequality

The rural population of UP not only faces challenges in agricultural development, but in living conditions as well (Vyas et al., 2016). Nearly 30% of the population in UP live below the poverty line (*India States Briefs – Uttar Pradesh*; Vyas et al., 2016). Sanitation and water drainage are major issues as 35% of households have toilets and only 10% of households have access to tap water (Vyas et al., 2016) (YIF). This low standard of living has resulted in a high infant mortality rate (57%), poor health of young women and mothers, and low literacy rate among the populace, specifically in females (Vyas et al., 2016). Women's literacy rate in 2011 was only 57% literacy rate compared to a 77% literacy rate for men (*Uttar Pradesh Population Sex Ratio in Uttar Pradesh Literacy Rate Data 2011-2022*, 2011).

It has been suggested that UP's lack of development has been, in part, due to the inequality across genders and castes (Vyas et al., 2016). The unbalanced

population ratio of women to men (912:1000) contributes to the oppression of women as strength comes in numbers, providing women a smaller stage to voice their opinion, make decisions, and participate in the public sector (*CensusInfo India 2011 Population Totals*, 2011). Traditions and cultural norms marginalize women throughout UP. The patriarchal system that dominates households in UP has retained strong traditional gender norms such as the practice of women veiling their faces, Purdah, and arranged marriages (Lowe & McKelway, 2017). Married women, especially suffer affliction since they live under their in-laws (Lowe & McKelway, 2017; Vyas et al., 2016). Women must leave their homes and move to their husband's village upon marriage where they tend to be confined indoors and left responsible for household chores (Lowe & McKelway, 2017). This leaves women very little time, mobility, and resources with which to earn an income, another norm manifested in both men and women believing that husbands should earn a greater income than their wives (Lowe & McKelway, 2017). This cultural belief can also be translated to poor intrahousehold bargaining and decision-making power for women throughout UP (Lowe & McKelway, 2017; Vyas et al., 2016). Rural women in UP, then, are faced with oppression from the caste system and patriarchal system, making their autonomy and empowerment of the utmost importance (Vyas et al., 2016). Women's limited participation in organizations and institutions outside of the house further demonstrate the low status of women in the region.

Women are not the only group facing marginalization, however, as the caste system excludes people based on race and lineage. The caste system in UP follows Hindu tradition: separating people based on lineage or race which determines the individuals' occupation, diet, and social groups ("What Is India's Caste System?," 2019).

Different castes tend to live in different communities and areas which exacerbates the already present privilege and oppression between upper and lower castes (“What Is India’s Caste System?,” 2019). Since about 20% of UP’s population is made up of the “Scheduled Castes” (those in a low-caste Hindu group or outside of the caste system entirely), the caste system serves as a platform for intense hierarchy, oppression, and marginalization (*Untouchable | Definition, Caste, & Facts | Britannica*)

4.2.2 Government

Despite the discrimination and inequality present in UP, the government does have policies in place intended to protect the poor, outcast, and marginalized. The Constitution of India states that “no citizen shall, on grounds only of religion, race, caste, sex, place of birth or any of them, be subject to any disability, liability, restriction or condition with regard to—

- (a) Access to shops, public restaurants, hotels and places of entertainment;
- or
- (b) The use of wells, tanks, bathing ghats, roads and places of public resort maintained wholly or partly out of State funds or dedicated to the use of the general public.” (Part III Article 15)

Furthermore, by accepting the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), India has agreed to implement equality of men and women throughout the legal system, abolish and adopt laws in a way that prohibits discrimination against women, and eliminate discriminatory acts against women. These measures are to be upheld through granting women equal access and

equal opportunity to participate in political and public life (*Text of the Convention on the Elimination of All Forms of Discrimination against Women*, 1979). However, despite these written documents, the informal traditional cultural norms usurp formal laws in most households, communities, and districts throughout UP. The oppressive social and cultural dynamics along with the fertile soil and agricultural potential of Uttar Pradesh make it a target environment in which to work with community members to build equality and empowerment through collective action/self-help programs such as RGMVP.

5. Methods

5.1 Data Collection

For the portion of the research designed to understand the change in women's sense of agency and potential seed security, in-depth semi-structured interviews were conducted. The design of the research and sampling was conducted in collaboration with team members working at RGMVP. These team members, Samarth Singh and Sara Saad, supported in translation of the instruments into culturally appropriate and accurate questions, direct translation (to Krista Isaacs) during the interviews, logistics, and cultural sensitivity while in the villages. Data collection was completed in January, 2020 in Amethi and Raebareli, Uttar Pradesh, India. The sampling frame included the two different districts (Amethi and Raebareli), SHG members that were not seed producers, and SHG members that were seed producers. Over the course of three weeks, a total of 36 interviews were conducted with 18 SHG members and 18 SHG seed producers; 18 of which were from Amethi and 18 of which were from Raebareli (**Table 1**).

The interview guidelines were originally reviewed for understanding and clarity with Singh and Saad and conducted in English with translation. Because the interviews were semi-structured and contained probing and follow-up questions, it was not possible to have a fully translated interview transcript prepared. Both Singh and Saad worked with Isaacs to conduct the interviews. Isaacs asked the question in English, and the translators asked the question in Hindi and translated the answer to Isaacs. Each interview was between 30 and 60 minutes. The recordings had both the English and Hindi translations, enabling us to double check the accuracy of the translations and

meanings. Interviews were transcribed by Aayushi Bana and double checked for accuracy by Isaacs, Lewis, and native Hindi speaker Rabin K.C.

An interview guide (**Appendix A**) was used to direct the conversations, with iterative, but slight, changes as the research progressed. These iterations occurred as either a) questions were deemed inappropriate, difficult or confusing to interviewees, or b) new revelations in the first interviews were poignant and required follow-up in subsequent interviews if they did not occur organically. There was a total of 5 iterations of interview guides with the majority of interviews utilizing the 5th iteration.

The purpose of the interviews was to understand how women's sense of self changed and how she felt her relations in the household and community changed. The interview guides were designed to understand women's experiences since joining the SHG and/or since becoming a seed producer through the SHG. Through general questions such as, "You have been a member of the SHG for x number of years. Tell me more about that. What has your experience been?", we aimed to illicit women's stories and experiences within the SHG and used probing questions related to the farm, family, and community, for elaboration. We asked about changes in their activities since joining the SHG, and when they described changes in income or mobility or the like, we followed up with questions related to if and how that has affected family dynamics, workload, and decision-making. The intention was to understand their experience in their own words and with their own stories, without applying pre-conceived notions of empowerment or agency. With this approach, women's experiences emerged.

Table 1. Distribution of participants based on blocks and membership type.

	SHG only Members	Seed Producing Members
Raebareli	N= 9	N= 9
Amethi	N= 9	N= 9

5.2 Data Analysis

After each interview transcript had been checked for accuracy, thematic analysis was conducted to identify common themes across interviews and overlapping themes within interviews. Themes are common topics or patterns across interviews or within interviews that unify different ideas associated with the research questions (Miles et al., 2018, 73). An initial code book was produced based on both 1) an extensive review of the literature for relevant concepts linked to women's empowerment, social capital, and intra-household dynamics, specifically in the agricultural sector of developing countries, 2) using grounded theory to identify recurring themes that emerged from the data throughout the analysis process. The codebook was reviewed and tested on a sample size of randomly selected interviews by Isaacs and me to check for validity and relevance of codes. Many iterations of the codebook were developed as data were analyzed.

Data analysis took place in MAXQDA software. I coded each interview transcript at least twice in MAXQDA and reviewed and checked each extracted code segment for alignment with the code book at least twice before analyzing the data further to create code summaries. Through data analysis, some themes were found to converge, thereby necessitating the combination of multiple codes and their definitions. This iterative

process continued throughout the data analysis process until a final set of codes was generated to represent recurring themes across all 36 interviews. Overall, 25 themes were identified. Since the codebook was not fully established before data analysis began, but instead was part of data analysis as themes emerged, it will be considered a part of the results.

Code summaries were written for each theme to understand trends, note cross-sectional themes, and compare across seed producing and non-seed producing members. Further analysis of the interrelatedness between summaries and any underlying meanings are extrapolated in the discussion section. MAXQDA and Excel were used to analyze code frequency within and across interviews. These data were used to further analyze the comparison between seed producing and non-seed producing members of the SHG.

5.3 Caveats and Potential Sources for Error

Interviews were conducted in English with a Hindi translator. Recorded interviews were then transcribed by an English-as-a-second-language speaker, who had been practicing English for some time. Some responses may have lost their original meaning over the course of translation and transcription. Secondly, women may have felt inclined to answer in a certain way to please or impress the interviewer. RGMVP has had multiple visitors for funding and promotional activities, thus the women in SHGs may have had some rote responses for visitors. Our purposeful sampling aimed to avoid these scenarios. However, there may have still been informational bias throughout interviews in spite of interviewer's attempts to discuss any persisting challenges.

Furthermore, these results may have the potential to be affected by self-selection bias. Women who are members of the SHG are those women in society who may already have exceptional intra-household dynamics, decision-making power, or agency that allowed initial membership and continued participation. This is even more present for seed producing women as they were selected by the SHG based on their land size and suitable farming conditions, making them more likely to be successful producers and pleased with the RGMVP seed program.

5.4 Ethical Considerations

The method of data collection for this study requires compliance with certain ethical guidelines, such as informed consent, confidentiality, and anonymity (Wiles, 2012, 41). Before each interview, participants were made aware of the purpose of the study, how the information would be used, and their right to withdraw from the interview at any time. Permission was also granted by each participant before any tape recording or photography. In order to uphold confidentiality, anonymity has been applied by redacting any demographic data that would make a participant identifiable such as names and home addresses. Interviews were identified based on numerical pseudonyms. All interview guides and other materials were approved by the Michigan State University Internal Review Board, which deemed the project exempt.

6. Results

6.1 Socio-demographic Characteristics of the Participants

Participants of this study were all women members of SHGs, and half of the participants were also seed producing members. A total of 36 interviews were conducted among SHG only members and seed producing members in Amethi and Raebareli (**Table 1**). Seed producing members were, on average, younger than SHG only members, and had been members of their SHG for a shorter amount of time (**Table 2**). On average, seed producing women had larger land holdings than SHG only members, but a greater number of SHG only members had more than 7 years of education compared to their seed producing counterparts.

Table 2. Socio-demographic characteristics of the participants, average shown for group and range in parentheses.

	SHG only members	Seed producing members
Number of years in the SHG	10.2 (2-24)	8.7 (3-13)
Age (in years)	44.2 (31-60)	40.2 (28-55)
Land owned by family (biswa)	25.1 (0.78 acre)	56.6 (1.75 acre)
School attendance %		
No education	33%	33%
1-2 years	0%	<1%
3-7 years	11%	17%
8+ years	56%	39%

6.2 Emergent Code Book

Since the code book was generated using grounded theory, themes emerged as a process of data analysis (Glaser and Strauss, 1999). Topics frequently discussed among all or most participants were conceptualized as themes. The final codebook contains 25 themes and their definitions (**Appendix B**). This paper refers to 19 of the themes that are relevant to the research questions which are Mobility, Social Networks/External Interactions, New Information, Application of Information, Change in Access of Money, Source, Help Others, Benefits, Change in Intra Household Dynamics, Respect, SHG Self-Sufficiency, Collective Action, Solidarity, Intrinsic Self-Confidence, Self-Confidence, Self-actualization/Voice, Access to Seed and Seed Flow, Agricultural Productivity and Seed Quality, Workload, and Challenges. The definitions of the codes were generated primarily from the responses of the women with some influence from the literature for specific terms such as collective action, self-actualization, and intra-household dynamics.

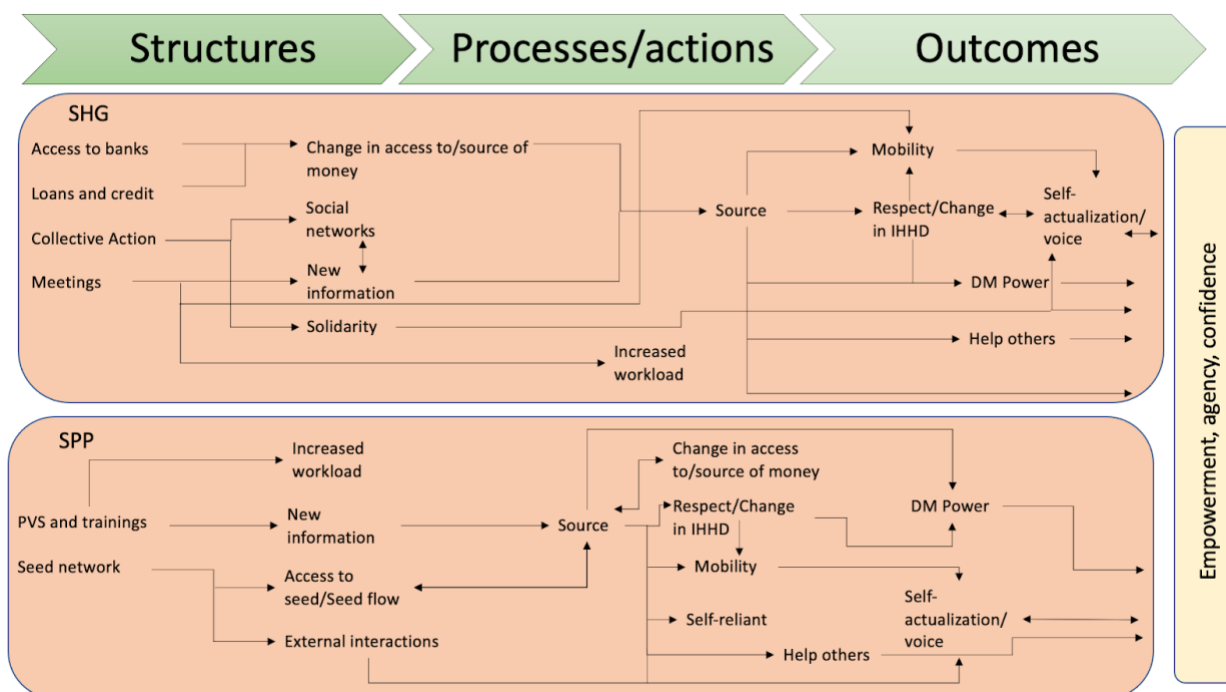
6.3 Concept Map of the Process of Empowerment through the Self-Help Group (SHG) and the Seed Production Program (SPP)

Throughout the results section, women's empowerment is understood as a process, not an ultimate end, and is defined by the literature presented in the Conceptual Framework section, which presents variables of empowerment such as resources, agency, and achievement. Based on this understanding shaped by the literature, the perceptions of the participating women's experiences were then assessed to determine whether or not they experienced some level of empowerment. Since

empowerment is a process, not all variables need to be controlled or acted upon by the individual to achieve empowerment. Instead, if there is an indication that any variable of empowerment has become more present in a woman's life, then it is understood that she experienced positive contributions to her empowerment.

This concept map shows the relationship between the key themes that emerged from the interview data that contributed to the process of women's empowerment (**Figure 4**). The top box shows the structures and processes facilitated by the SHG that contribute to women's empowerment. The bottom box represents the structures and processes of the seed production program that generate women's empowerment for seed producers. It can be seen that most of the linkages are analogous between the SHG and SPP maps. This is because the process of empowerment is similar between both programs: increased access to and control over material, human, and social capital generates various forms of agency, achievement, and the accumulation of other resources, resulting in indicators of empowerment (Doss, 2013; Kabeer, 2008).

Figure 4. Relationship between themes compared between self-help group only members and seed producing members.



Through structures of the SHG such as meetings, saving schemes, and collective action, women described feeling empowered in 3 domains: resources, agency, and achievement. The SHG provided women material resources through access to credit, income, and other assets, human capital through trainings that enhanced their knowledge and skill regarding rights, health, agriculture, and other things, and bonding social capital through the trust and linkages built through the collective efforts of SHG women. Upon the accumulation of resources and through the structures of the SHG, women built their agency as strengthened voice, decision-making power, and sense of self-efficacy and self-worth. As a result of their agency, women experienced shifts in dynamics at the household and community levels usually in the form of greater respect from family and community members, which also further contributed to women's agency. Women experienced

achievement as a result of the resources and agency they gained through the structures and activities of the SHG. Women gained more control over productive activities, especially agriculture. They experienced more power over how their money was spent, which, for many, resulted in benefits for their children and the overall welfare of the family, a key indicator of women's control over income usage. Women also obtained control over the work they do and how they spend their time, which is obvious in their SHG participation, leaving the house for SHG work, and using their time to invest in SHG activities or other interactions they value.

Seed producing women experienced empowerment through those same channels, in addition to empowerment generated through structures of the seed production program such as PVS and the external interactions conducted through the seed network (**Table 3**). Seed producing women, then accessed additional sources of information, money, social networks, and external interactions. Each of which contributed to a secondary source of agency, respect, mobility, self-reliance, capacity to serve as a source of resources, decision-making power, and ultimately empowerment.

Table 3. Quotes from self-help group only and seed producing women representing the three dimensions of empowerment (Kabeer 2008) supported through self-help groups and the layered seed production program.

	Resources	Agency	Achievements
SHG only	"I have joined SHG I have my own money that I save" (Int 2)	"Now even I can talk to anybody, I can also go to a police station and get a complaint registered. I am no more scared of anybody." (Int 7)	"I purchased a cow then I took a loan for my children's education then for my daughter's marriage and later for some medicines and agriculture purposes." (Int 24)
Seed Producer	"Income is coming from seeds production" (Int 15)	"I am getting famous [because of seed production]. More and more people know me now by my name. I talk to everyone now." (Int 1)	"I use [income earned from SP] for agricultural purposes majorly and if we still have it left, then I deposit it with the bank." (Int 17)

6.4 RQ 1a: What social/cultural changes have come to SHG members? At what level are these changes taking place (individual, household, community)?

Most women perceived one or more of four main changes that came to their role in their homes and surrounding communities as a result of their participation in the SHG and the resources generated therein- increased mobility, enhanced knowledge, expanded social networks, and greater access to money, all of which added to or were a result of women's increased workload. Each of these themes contributed to and were strengthened by each other. For example, women described how their mobility increased as a result of their knowledge about how to travel, and how their mobility resulted in more opportunities to access money through the SHG loan system and income-generating activities. Many women also experienced greater social networks as

a result of their enhanced mobility, which further contributed to their information acquisition. Most women also noted social changes at the individual, household, and community level as a result of their change in mobility, information, social networks, and access to money. The social, human, and material capital gained by women through their mobility and social networks resulted in greater perceived agency, strengthened decision-making power, improved outcomes for children and other family members, and increased respect from others.

6.4.1 Resources

6.4.1.1 Workload

"Work has increased also but the burden is less." -SHG only interview 36

All interviewed women except for one discussed a change in their workload since joining the SHG. A majority of these women explained that their workload has increased since they must manage SHG work as well as household work. A few women discussed the impact of time constraints on their time to visit the maternal home, tend to other work, and regular meeting attendance: *"No, [I do not go outside more] I have a lot of household work now so I attend meetings at the village level only."* Some women told of having family members or hired workers to help them with the increased burden load: *"my mother stays at home so she manages all the work at home and I deal with the work outside the home. All of it is managed."* One woman mentioned having less work than when before she joined the SHG due to her family members sharing the workload.

Women almost unanimously described an increase in their workload since joining the SHG, and similarly, almost all women are accepting of the increase of work as it

results in a greater profit: *"The work is more but the benefit and profit are more so, it doesn't matter after making the profit out of it."* However, a few women seemed more phased and burdened by the additional work: *"There is a lot of work. I feel a lot of burden of work."*

6.4.1.2 Mobility

"Places like Rae Bareli, Lalganj where I had never imagined that I'd go; I got a chance to visit them. So now I have been to places for [SHG] meetings." -SHG only interview 25

Most women described their enhanced mobility as a resource, specifically in the form of bonding social capital as they are able to bond with one another once they have used their mobility to travel to meetings, and human capital as they acquire greater knowledge and skills by leaving the house and interacting with others. They also perceived their mobility as a form of achievement, specifically decision-making power over their labor allocation as the choice to do SHG work and use their time to visit others and attend trainings was manifested in the choice to leave the house.

Most women viewed mobility as a result of human and social capital as meetings provided a reason for women to travel as well as information about how to travel.

"Meeting gave us the kind of opportunity to step out of the house. I feel that, to do anything you need to step out of the house and you cannot be inside the house." Almost all women explained that before joining the SHG their ability to go out of the house was limited, or nonexistent. This lack of mobility was attributed to cultural norms, familial

restrictions, and not knowing how to travel: *"Earlier we were not allowed to step out of the house. We used to cover our faces with [the] veil..."*

One hundred percent of women who mentioned a lack of mobility before joining the SHG described experiencing an increase in their mobility since joining the SHG **(Appendix C)**. These women noted how they are now able to leave the house when they decide, fewer restrictions from family members, leaving the house more often, and traveling farther from home: *"...earlier I used to stay at home only...After joining SHG we started going outside...[my family doesn't] stop me from going anywhere."* They also perceived their mobility as a channel through which to accumulate more of those resources, furthering their empowerment.

Meetings, as explained by women, not only "gave the kind of opportunity to step out of the house," but also a source of information about traveling and self-confidence to travel: *"I couldn't go outside alone but now I know how to interact with people and I explored new places."* By leaving the house for meetings, women built upon their human and bonding and bridging social capital as well as their agency to travel which resulted in greater mobility in future circumstances: *"...now since I go for meetings of SHG, I have learned how to travel... So now I go on my own."* Many women also expressed changes at the household and community level in the form of fewer restrictions regarding leaving the house and interacting with community members/administrators:

"...after joining SHG I was able to go to the bank, talk to officials over there and make my own identity. Also, I was able to learn the way of talking and able to step out of my house which was not allowed for women as per traditions."

Most women perceived this cultural shift to be a result of their increase in knowledge and income. However, some women still face barriers to their mobility such as controlling household members and time/work constraints: *"I don't have enough time [to meet anyone in the village]."*

6.4.1.3 Social Network/External Interactions

"In meetings, I like to interact with new people..." -SP interview 4

Because of the structures and activities of the SHG that foster solidarity, collective action, and mobility, many women spoke of feeling more empowered via increased bonding and bridging social capital as their social networks expanded: *"I'm going outside to attend meetings and I get a chance to interact with new people."* The increased social networks described by the women resulted in a sense of confidence: *"[In meetings], I learned how to talk with them, how to sit with them and how to talk with the bank officials because I have never been to a bank."*

Most seed producing women mentioned having an expanded social network and/or more external interactions since joining SHG. These interactions and networks stemmed from their regular SHG activities as well as seed production activities such as seed transactions: *"People from other villages come to take the seeds when they come to know from other people."* Most seed producing members attributed their new social networks and interactions to their increased mobility and respect borne out of their participation in seed production.

Two-thirds of SHG only members discussed having expanded social networks and/or more external interactions since joining the SHG. Women explained that these

new interactions and social networks were initiated at banks, police stations and other administrative offices, and meetings (mentioned by frequency in that order). As one woman describes, as a result of the SHG, *"Now I have made more connections... now I know more people."* SHG only women mentioned external interactions at banks more than seed producing women.

6.4.1.4 New Information

"I learn so much from stepping out of the house to attend meetings and from interacting with so many people out there." -SP interview 21

Most women described meetings and the social networks supported by the SHG as channels for the enhancement of their social and human capital. Women described how through the social networks of SHG meetings, they were exposed to more information about a variety of topics such as how to take out loans and save money, how to travel and speak, livelihood practices such as health and hygiene, and agricultural production: *"After joining I got to know about so many other things."* A common response to this acquisition among the women was to share the new information with others, further strengthening their bonding social capital and that of others: *"Now we know and also impart knowledge to others."* The exchange of information strengthened and was strengthened by the social networks of the SHG as women shared information with each other and felt more united. Many women perceived that this acquisition of information, even if never put into practice, increased their power-within as they felt more capable to participate in certain activities. Many

women also built up their decision-making power within their household and community from their increased human and social capital.

More than 50% of the interviewees who discussed gaining new information were seed producers. Most seed producing women told of learning about seed production, seed varieties and quality, and compost making. Less than half of these seed producing women discussed learning about financial activities such as savings and taking out loans. Though seed producing women did receive financial training through the SHG, this was not a main point of their discussion as they were more focused on their role as seed producers within the SHG. One seed producer recalled that *"no such information or training was given regarding seed production [when she was in SHG but not yet a seed producer]."* This statement was supported by the responses of the SHG only women.

Out of the SHG only women who mentioned gaining new information, over half discussed receiving training for compost making, and none told of training for seed production. Most SHG only women discussed learning information regarding things such as education, maternal health, and *"how to manage livelihoods from day-to-day activities."* One woman mentioned that she has not *"received any information on [farming or newborn baby]."*

6.4.1.5 Application of Information

"Whatever I learned from the meetings about seed production, I start putting all of that into the production." -SP interview 16

When women's human capital was met with agency, they typically experienced empowerment in the form achievement over production, consumption, and labor allocation. women noted the tangible outcomes of this empowerment as increased yield, greater income, and/or enhanced mobility. For example, as some women learned how to make compost, which enhanced their field and crop health and yield, they were less reliant on others for inputs and crops, which increased their confidence through self-reliance: *"Now after joining SHG we have started making our compost...The soil has changed now by using compost and the plant is greener now."*

Most women perceived an increase in earned respect at the household and community level as a result of their productive outcomes, which through the conceptual framework is described as agency (voice, power-over, and power-within). A key outcome of women applying their knowledge was a sense of self-reliance, specifically over accessing money and traveling: *"The most important thing which I have learned is knowledge. I'm now independent and self-sufficient."*

The difference between seed producing and SHG only women was not in their capacity and frequency of knowledge application, but in the type of knowledge they applied and the corresponding outcomes. Most seed producing women discussed applying their agricultural knowledge to prepare seed, implement new farming techniques, and inform and train others on seed production: *"Once a disease attacked the plants in adjacent fields but not to my plants because of the techniques that I learn by way of SHG."* The outcomes of this application of information recognized by the women were improved productivity and seed quality, money being saved through the use of home-made compost, as well as feelings of independence and self-confidence:

"Now we don't have to buy seeds from the market as now we produce our own seeds and also productivity is more. Farming is good now."

The SHG only women told mostly of their application of social information. These women mentioned traveling, interacting with others, and one told of how she held her daughter's wedding without a dowry, a lesson which was learned in the SHG.

6.4.1.6 Change in Access of Money

"[Because of SHG] I have money in my hand." -SHG only interview 36

Most women perceived empowerment via an increase in material capital as they experienced three new sources of income through the SHG: loans, income-generating activities, and saving money through the production of homemade resources. The savings scheme of the SHG facilitated the easy access of money in the form of loans to SHG members: *"...in SHG we can take loans whenever we want and without any risk."*

The collective power and self-sufficiency of the SHG was strengthened as loaned money was typically used to invest in income-generating activities that pay back the loan and provide resources to the individual and organization: *"I took a loan for my husband's small grocery shop and I also purchased buffalo and cow from SHG financial help... I sold my one buffalo and paid off my loan amount."*

Almost all women perceived an improvement in their human capital through SHG meetings that taught them about the loan and saving scheme as well as about activities that can generate income or save money through resource production: *"The family income increased because I learned how to make compost and I saved out of that by not purchasing fertilizers from outside and also the agricultural production helped in*

making out money.” Women noticed greater enhancement of material capital through these income-generating activities. The most notable of these income-generating activities is seed production, which resulted not only in financial capital, but in increased access to productive resources, a key indicator of empowerment identified by WEAI (2013). As a result of this generated income, many women experienced empowerment in the form of achievement- specifically regarding production and consumption- as they often decided over the sale of assets and how generated income was spent.

Although loans through the SHG are easily accessible, seed producing women noticed hindrances with SHG loans: *“...getting money from SHG required to pay 2% interest but money from seeds production was our own money so 2% got saved.”* This fact would be true, then for any income-generating activity, although no SHG only members made note of it even if they were sourcing money from an income-generating activity. Almost all seed producing women also mentioned earning an income from seed production as she sells to SHG members, village members, and saves money by not needing to buy seed, also that income increases as yield increases. Women who know how to produce their own seed and/or compost have yet another source of money as they are able to save money through their home-made compost and seed versus spending money at the market. More seed producing women than SHG only women were able to claim this source of income, but a handful of SHG only women mentioned knowing how to make compost and thereby saving money: *“The family income increased because I learned how to make compost and I saved out of that by not purchasing fertilizers from outside and also the agricultural production helped in making money.”*

One woman described that her income has not significantly changed since her SHG membership, noting that *"SHG doesn't give you double or triple the amount of money that you have deposited."*

6.4.2 Social Mobility

Through the acquisition of resources, enhanced agency, and actualized achievements women developed new roles within their households and communities.

6.4.2.1 Source

"[I] share the information received in SHG with [my family]" -SHG only interview 8

As a result of the human and social capital acquired from the SHG, more than half of the interviewed women expressed a capacity to serve as a source of information and resources to their families and community. Women not only had a greater capacity to serve as a source of information, but they were more frequently approached and consulted by others to serve in this role: *"Even the head of the village asks us about the schemes of our SHG."* Their desire and ability to share information and resources with others indicates empowerment within the dimension of labor allocation as women have the power to use their time and resources as they see necessary. Women told of how their role as a contributing member of society changed dynamics at the household and community level as they are more respected and sought out for help by others: *"...because I am the source of knowledge for them...everyone respects me now. Even my in-laws value me."* These interactions strengthened women's perceived agency through their self-actualization as they became more aware of the knowledge and skills

they have to offer others: *"I feel very happy to know things. We tell these things to others."*

Among seed producing women, these outcomes and experiences were similar, but also enhanced through their role and capacity to serve as a source of seed and seed knowledge: *"I feel good as I'm producing seeds for myself and others also."* This additional channel through which SP women serve as a source is displayed by the fact that 16 out of the 18 SP women discussed being a source, while only 7 of the 16 SHG-only women mentioned the same. Seed producing women also experienced an increase in their agency when people approached them about seed and that the quality and rate of their seed is valued: *"I feel happy to see the quality of crops because of my seeds only crops are growing bigger...[and people] come back [to buy this seed]..."* Through their knowledge and capacity to provide seeds to others, seed producing women achieved greater bridging social capital by serving as a source to a larger population outside of the SHG than SHG only women: *"People from other villages come to take the seeds when they come to know from other people."*

6.4.2.2 Help Others

"After joining SHG our condition changed, now I'm in a condition to help others." -SP interview 11

Some women expressed that, as a result of the positive influence of the solidarity and collective action of the SHG, they were more able to explicitly and intentionally use their role as a service provider to help others: *"I didn't just impart the information, I used to talk to them as well as to what are their problems and how they are facing and how*

can I help. So I used to give them some money." Women's empowerment in the form of control over resources like knowledge, money, and/or seed, promoted women's capacity to help others: *"Earlier I used to buy seeds from the market, but now I'm producing [seed] by myself and I'm also giving it to the village council so everyone is getting benefit from it."* As women helped each other, they gained more bonding social capital and the collective action and solidarity within the SHG was reinforced: *"I feel that I have all this because of SHG and similarly I want the other sisters to learn...[so I share information]."* Helping others indicates empowerment as achievement among women as they actualize their choices regarding how to spend their time and how to use their resources.

Of the women who discussed helping others, 80% of them were seed producers. Some SP women told of how they sell seed at a lower price or even give seed for free, as one woman expressed, *"I also like the fact that I can help poor women by giving those seeds."* Seed producing women also helped others by sharing information regarding seed production/quality/farming techniques/compost making: *"I also helped one SHG member seema in seed production. I also told other members to make compost and those who have more land should definitely make compost."*

6.4.2.3 Benefits

"SHG has a positive impact on my family..." -SHG only interview 13

Members of the SHG were not the only ones to benefit from the activities of the SHG. A majority of women told of how their family members also experienced social and financial benefits as the women used their increase in income to fund weddings,

pay for school, and support the overall wellbeing of the family: *"earlier my children used to go to public school now they are going to private school."* Many women told of how they decide to use part of their increased income specifically for their children's education: *"Now I can arrange money at any time. I have money for education for my children."*

Family members also benefited as women shared the information learned within the SHG with them: *"I teach those things [from seed production and health training] to my children so that they remain healthy."* Women also described how the benefits experienced by their family members contributed to the respect and positive intra-household dynamics women experienced at the household level: *"As my family members were aware of the information given in SHG so they worked hard to achieve good results so it created a healthy environment."* Women's empowerment, as indicated as children's and other family members' positive outcomes, reveals women's control over and use of income and other resources.

6.4.2.4 Change in Intra-Household Dynamics

"After joining SHG our dialect and way of speaking has changed. Earlier a lot of conflicts were there in our family but now as everyone is busy in their work so everyone is happy." -SHG only interview 36

As women's material and human capital and control over resources increased, many experienced a shift in dynamics in the form of respect within their household: *"Now he gives me respect but earlier he used to abuse me and after drinking, he also used to beat me. But now he takes every decision after consulting me. Now he also*

trusts me." This shift resulted in a greater sense of power-within among women as they participated in income-generating activities to provide for their families. Furthermore, many women gained greater agency as their opinion had a greater weight in household decisions, family members began consulting them before making decisions, and unity and cooperation characterized their household relationships: *"[My husband] knows that I understand so many things...so we both decide it and we even go together. He takes me everywhere and I keep the money and I pay it by my hands now."*

Seed producing women spoke more often of positive shifts in intra household dynamics than SHG only women. Over half of the seed producing women attributed this shift to their knowledge and income gained through participation as a seed producer: *"[Because of my knowledge as a seed producer] we are doing the work together. [My husband] helps me with my work as it can't be done alone."* A few seed producing women also noted that family members are *"aware that [she's] doing good work"* by producing seed in the field. One SP woman explained that the respect she received from other community members changed the dynamics with her husband: *"The situation has changed because now he has also seen that I have respect now and [I] talk to people outside."*

A few SHG only women observed changes in their families' interest and willingness to participate and support the women's participation in the SHG: *"Earlier [if] I have to go to any meeting, he was like, you can go on your own but now whenever I have to go anyplace he drops me... sometimes he waits for me outside the meeting and even attends those meetings."*

6.4.2.5 Decision-making Power

"It is because of SHG. Now I make my own decisions." -SP interview 3

Through the change in household dynamics, many women experienced empowerment in the form of greater decision-making power within their household. Some women were consulted more often during the decision-making process, others were able to take decisions on their own: *"My say is also important, earlier I was not asked about my opinion."* This change in decision-making power was a result of women's increased material and human capital and was further bolstered by women's self-actualization and voice: *"But when I started working and joined SHG and started gaining knowledge he started taking my opinion too."* Women experienced strengthened decision-making power in all four dimensions described by Doss (2013), and supported by WEAI (2013): consumption, production, children's outcomes, and labor allocation **(Table 4)**.

Most women explained having greater decision-making power over taking out and using loans than before they were in the SHG. Women indicated that many decisions were made mutually among all household members through household discussions in which the woman's opinion was considered: *"It was an open discussion because everyone sits and decides things even now."* A few made the decision themselves. However, most women explained that men are still responsible for making large purchases.

A majority of the women who discussed decision-making over agriculture were seed producers. SP women told that decisions regarding agriculture were made more collectively by *"everyone in the family"* compared to before their SHG membership, and

that they maintained power over seed related activities. Women attributed this power to the knowledge they have about seed: *"Because I know the benefits of seed production I purchase that thing without informing him."* One woman explained that her decision regarding agricultural resources is made collectively with other SHG members. A few SP women described that they take the decision regarding agriculture as a whole, however one woman said that *"men take the decision regarding [agriculture]."* Very few SHG only women mentioned agriculture decision-making, but of those who did, half mentioned that decisions were made mainly by men or in-laws, and no SHG only members claimed decision-making power over agriculture-related choices.

Decision-making power over leaving the house will be included in this section since women are typically leaving the house for SHG/work-related activities or to spend personal time with their maternal family.

A few women mentioned explicitly that they chose to join the SHG on their own: *"I took this [to join SHG] decision myself."* Some women explained that, as a result of the change in intra household dynamics and increased confidence and respect, labor within the household became more evenly distributed, allowing the woman more time to do work she values. Most women expressed an increase in their ability to leave the house indicating empowerment in the form of resources to leave the house, agency to decide to leave the house, power to bring about the actualized outcome of leaving the house to do the work they want to do: *"I inform my husband that I'm going. If he refuses I still go."*

Table 4. Quotes from self-help group (SHG) only and seed producing (SP) members of RGMVP illustrating the 4 indicators of empowerment described by Doss (2013).

Indicators of empowerment (Doss 2013)	SHG only Members	SP Members
Consumption	"I also used the money for my house and agriculture [and the marriage of my daughter]" (Int 7)	"I decide [how money is spent] and my husband supports my decision." (Int 3)
Labor allocation	"The husband helps me with cooking and washing clothes. My son is 8 years old but he knows to make tea so he makes tea." (Int 25)	"My father and brother come to help me do the lines in the field. And it feels very good that my family members also use the same techniques that I learned to produce and we all work together. " (Int 16)
Children's Outcomes	"Children's education was also funded with the help of SHG only." (Int 13)	"My family income has increased because of seed production and it is helping my children in getting an education." (Int 17)
Production	"I use [home-made products for producing grains]" (Int 27)	"I decide [on the production of seeds]" (Int 4)

6.4.2.6 Respect

"Now I have my identity and now I am not just her wife or a daughter. I have gained my name." -SP interview 1

As a result of women's material, human, and social capital gained through the SHG, many women became more respected at the household and community level: *"[My husband respects me] because I have money now (laughing). He knows that I'm doing good work and I'm also doing savings so he now listens to me and respects me."* Women perceived respect as being listened to, appreciated, trusted, consulted for

decisions, and recognized as individuals: *"I have changed a lot...Because of SHG, I'm now empowered and everyone now respects me wherever I go. People now know me by name."* Women experienced empowerment borne out of this respect as they noticed increases in their agency, specifically confidence and self-actualization.

The SHG only women who mentioned this recognition attributed it to their SHG membership, while SP women attributed gaining recognition and a self-identity to their role as seed producers. For example, one SP woman claims, *"After joining SHG I have my self-identity...Earlier everyone recognized us from our husbands' name but now when you came to our village you asked my address in my name so people now know my name."*

Almost all seed production women also mentioned an additional resource that contributed to the respect they experienced: seed. The respect given by others to SP women was a result of normal SHG activities as well as producing quality seed, earning an income through seed production, and knowing about seed production: *"Moreover many people now know me and they are recognizing my work [as a seed producer] and I'm also gaining respect out of it."* The additional resources of seed and seed knowledge, then seems to have generated greater respect for SP women than SHG only women, as 78% of seed producing women mentioned experiencing respect, compared to 56% SHG only women.

6.5 RQ 1b: How has women's sense of agency, social capital, and empowerment changed through their participation in the SHG and the collective action it fosters?

Individually and as a collective group, women perceived an increase in their social, human, and material capital as a result of the structures of the SHG that foster collective action and solidarity. Women used these resources to build upon their agency and achievement as they became more self-efficacious and acted upon their resources to bring about desired change.

6.5.1 Collective Structures

6.5.1.1 SHG Self-sufficiency

"I feel very good because I am not only giving them help even I'm receiving it." -

SHG only interview 25

The social capital of the SHG, characterized as trust and camaraderie among SHG members and SHG individuals and the organization, allowed the SHG to support its members and the greater community as women shared knowledge and experiences, gave resources to those in need, and helped others with monetary issues through internal mitigation or lending money: *"All the members are united. Everyone does their job."* This camaraderie was developed in part by the security of access to money and the SHG providing a safe place to deposit money: *"No I wasn't [afraid that SHG will run away with my money] because most of the SHG members belonged to my village."* Human, material, and social capital was continually generated by individual women within the SHG as they desired to involve others which contributed to more financial resources, more shared knowledge/information among women, and more expanded social networks: *"We came out of poverty because of SHG. I want every woman should*

be a part of SHG." The camaraderie and other collective activities of the SHG developed trust in and loyalty to the organization in SHG members and their families.

Furthermore, through the networks and linkages of the SHG, the group replaced formal structures as women acquired and contributed resources from and to each other through the networks of the SHG: *"I feel happy as I'm saving money and getting a good quality of seeds [through SHG work], all the members of SHG are benefiting from these activities."* The SHG replaced structures like banks in which women save and loan money together, hired labor as women make compost together, and seed systems that provide others with easily accessible seed.

Many seed producing women noted the function of the SHG as a seed system that enabled transactions that would not be possible in most market-based/cash situations: *"I give it either by the money if they are poor then at a little lower rate. Or we exchange it for double..."* Women explained that seed is typically given or traded for grain among SHG members, and sometimes even with other community members.

One SHG only woman commented on the weakness of this system, however by explaining that she must *"return double the amount of crops in exchange for seeds so it is not so economical for"* her. This same woman expressed issues with the loan system of the SHG: *"Yes we are paying interest on SHG loan but we cannot take our own money from VO and BO."*

6.5.1.2 Collective Action

"All the members are united. Everyone does their job." -SHG only interview 7

Many women experienced empowerment through the camaraderie and collective actions of the SHG, which generated social and human capital, supported women's agency, and facilitated individual achievement regarding production and consumption: *"All the sisters in SHG used to conduct meetings and the register was maintained on how much money was taken out and when it will be deposited back and for what purpose the money is required."* Almost all women mentioned taking actions together such as collective savings, making compost together, overcoming societal wrongs, and sharing experiences: *"SHG will give me a platform where I could share my feelings with other members."* This space fosters a sense of camaraderie and solidarity as women know they are not alone: *"So meeting new people, doing savings and earning and also sharing problems with others makes me feel great."* One woman told of a specific instance in which the collective action of SHG sisters increased her agency and initiated changes at the household level:

"When I joined SHG then other sisters of SHG used to come to my house and they used to tell my husband to stop drinking as his attitude was not good for my reputation which I earned in SHG. So my husband felt embarrassed and he gave up drinking. It's been 5 years since he stopped drinking. Now he gives me respect."

Ultimately, the collective action of the SHG and the social capital it fostered, generated a social network for women in which they received support financially, socially, and emotionally: *"I feel good because during the time of difficulties SHG always helps us. SHG is like my maternal home."*

6.5.1.3 Solidarity

"I feel great to meet people and we share our feelings." -SHG only interview 24

As a form of collective action, a few women spoke of sharing experiences and information with each other through the networks of the SHG facilitated primarily by meetings, which increased their social and human capital:

"Earlier we didn't use to sit together to share our feelings but we recognize each other's problem so that's the unity I'm talking about...When we interact with each other we get to know about each other's problem so I get a sigh of relief that I am not the only one who is in pain."

The solidarity facilitated by the shared experiences and collective action of the women within the SHG also contributed to the process of women's empowerment through increasing their bonding social capital as they were provided with a sense of trust and security within the group: *"I was never afraid because we met our sisters from different SHGs and we used to discuss every bit of our lives. So gradually we all became very open with each other."* Women not only perceived empowerment by interacting with others, but a few women also expressed desires to empower others, specifically through the structure of the SHG: *"I want to see the change in other women's life also as my life is totally changed, now similarly every woman should be empowered."* Through sharing experiences, the confidence of individual members, as well as the unity of the group, was strengthened:

"when meetings are organized and we sit together, we try to solve their problems... now when we have met in meetings and everyone has shared their

own set of problems, helping it each other out by giving money or helping them pay the interest, this brought us together, more."

However, a few women experienced tension in regards to status and challenges that are not overcome by the collective power of the group.

A prevalent cultural norm among the communities in which these SHGs operate is the caste system. Some women, through the solidarity established in the SHG, expressed fighting against such customs:

"In SHG meetings there is no caste-based membership so I used to sit with lower caste members also...In our SHG there is no caste-based discrimination and if any lower caste comes to my house I accept her with open arms so there is no room for caste discrimination in my mind."

One woman described how before the SHG she lived by the caste system: *"Earlier I used to discriminate between Muslims and scheduled caste and there were separate utensils for them. I used to keep utensils away from my kitchen also."* However, since joining the SHG she no longer discriminates:

"When I went to different villages for promoting SHG I used to go to various scheduled caste houses and one lady told me that if you will not drink my house water then how will you feel connected to me? That was the moment when my perception changed...Now I don't discriminate based on caste and religion...Then we eat together with them. I and my husband also eat together. Now there is no discrimination. SHG changes our views."

However, one woman indicated experiencing a lack of solidarity with their sisters based on caste. This seed producing woman desired a background check of women as a way

to classify members based on caste. She expressed the need for homogeneity among groups, because *“as in heterogeneity, there would be discrimination and big fish will eat smaller fish.”*

6.5.2 Agency

6.5.2.1 Intrinsic Self-Confidence

“I have never cared about other persons’ [thoughts about me]. They can think whatever they want to. I was a single parent so I had no option apart from working for my children.” -SHG only interview 7

Some women retained a sense of self-confidence regardless of the SHG. Some of these women had supportive families from the start and attributed their support to their higher level of education.

6.5.2.2 Self-Reliant

“I’m now independent and self-sufficient.” SHG only interview 33

Most women perceived an increase in their agency in the form of greater self-reliance as a result of the human, social, and material capital attained through the SHG. Specifically, women felt more empowered to develop financial, agricultural, and mobile self-reliance as a result of the greater mobility, participation in income- and resource-generating activities, and increased access to information and finances facilitated by the key structures of the SHG (meetings and saving schemes). Through their self-reliance, women perceived greater decision-making power at the household level. The capacity of the SHG to replace formal banks or other formal sources of

money, provided women with financial self-reliance as they now have access to money through the SHG saving scheme or loans: *"earlier we used to go to Mahajan (Local Moneylender) and ask him for the money... But now we take it out from SHG. Now I don't have to ask for money from anybody."* Women's participation in compost making contributed to their financial independence as well as their independence within the agricultural sector as they learned how to make compost, which diminished their reliance on external sources for agricultural inputs: *"SHG has trained us to make compost so now I use compost instead of fertilizers from outside."* Women also expressed self-reliance in terms of their mobility as they have gained knowledge and confidence to travel on their own without the assistance of others: *"I am not dependent on [my husband]. Now I don't have to wait for him to take me to my parent's house. I go on my own."*

Seed producing women additionally noted their self-reliance due to seed production. Many seed producing women perceived themselves as less reliant on others for seed as well as for income since they did not even need to rely on SHG loans because of the income brought in from seed production: *"I don't have to ask for help from anyone. Earlier I used to buy seeds from the market but now I'm producing it by myself."*

Among SHG only members, 3 discussed relying on others to help pay back the loan: *"they help me as I'm not able to repay it on my own."*

6.5.2.3 Self-Confidence

"After joining SHG now we are more confident..." -SP interview 10

Almost all women described their confidence as feeling “good,” “empowered,” “confident,” “motivated,” “proud,” and not being scared. This power-within was strengthened as a result of the structures and activities of the human, material, and social capital generated through the SHG, such as an increased social network, mobility, access to money, collective action, self-reliance, and knowledge: “*I feel motivated now because I am aware of my rights and I can fight for my rights.*” Women also told of how the respect of others, their capacity to help others, and role as a source of resources to others, also contributed to their self-confidence: “*I have learned various things, now I help everyone...I am proud of myself.*” One woman told of a specific instance in which the SHGs collective action fostered individual self-confidence. Members came to stay at her house and meetings were held closer to her house to mitigate poor family relations, which made the woman feel “empowered” and “free” and more able to “go out anywhere.”

There is evidence that seed producing members had greater opportunities through which to grow their self-confidence. 100% of SP women mentioned feelings of self-confidence compared to 72% SHG only women. Seed producing women's additional role as a source of seed and related information may have contributed to their more frequent mention of self-confidence. Many SP women explained that their self-confidence was derived from being known and appreciated by others for their quality seed and having knowledge, but specifically in terms of seed: “*...people are coming to my house to buy seeds. I feel happy that people know me.*”

One SHG only member displayed a lack of self-confidence because she is “not so educated” so she feels “afraid that [she] will not be able to pay back” loans. This

women perceived less impact on her empowerment as a result of her fear and lack of confidence as she accesses fewer resources by not taking out loans from the SHG.

6.5.2.4 Self-actualization/voice

"I speak today in front of people...I have never spoken like now." -SHG only interview 26

Through the programs and solidarity of the SHG women experienced empowerment as strengthened power-within and a more powerful, informed voice: *"[Because of the SHG] I was able to learn the way of talking and able to step out of my house."* As a result of the knowledge gained from SHG trainings, solidarity fostered in the SHG, and the respect gained from others after having successfully applied that knowledge, women became more aware of their capacity to contribute to their community and more empowered to defend their rights and the rights of others:

"Yes now I know my rights and I am enlightened not only for myself I also take stand for my SHG sisters...I also fought for toilets for my SHG sisters and had given the application regarding toilets to [the district] Magistrate [directly]."

Many women also felt more able to voice their knowledge, opinions, and needs regarding these things: *"I used to feel very scared of speaking to other women. I gained confidence and also started speaking in the meeting... [as] we started sharing problems..."* Women's perception of their empowerment shifted as they were able to fulfill their role as a source of information as they gained the knowledge and confidence to speak as well as the awareness of the valuable resources they have to offer: *"Earlier*

I was not capable to take my children to the clinic for vaccinations, now I give awareness to others' children and take them for vaccinations..."

Among seed producers, many women indicated an awareness of the quality of their seed: "...seeds that I produce are very healthy and good in quality," their knowledge regarding seed and farming: "[I] know about the agricultural activities and how things are done," and their valuable role they play in society by providing those resources to others: "I also tell them to produce their seeds as it will similarly help them as it helped me. I encourage them to follow my procedure as farming will improve." Similar to other women, the self-actualization of seed-producing women regarding their role as sources of quality seed and seed associated information stemmed from the knowledge they gained from SHG trainings as well and the respect gained from others as the quality of their seed and productivity of their farm is recognized by other farmers.

6.6 RQ 2: How has RGMVP changed seed security?

The preexisting three-tier and social network structures of RGMVP SHG provided the scaffolding upon which the seed production program could successfully impact seed security. Women told of how SHG meetings and their resulting increased mobility, knowledge, and confidence was supplemented by additional trainings and opportunities for mobility through seed production and PVS sessions (**Figure 5**). Each of these factors created the space for women to engage in and build numerous social networks through which seed access was facilitated: the networks between the SHG and PVS breeders, seed producing women and program leaders, and seed producers and other

members of the SHG/surrounding community. These social networks were facilitated by and resulted in external interactions for seed producing women as they spoke of visiting other villages to learn or teach about seed production and/or sell seed, which extended seed accessibility and availability beyond seed producers' SHG and village. Due to these expanded networks, farmers were able to more easily access seed financially through RGMVP women seed producers, as the women exchanged their seed through the bartering system or sold it at a cheaper rate compared to the market (**Table 5**).

Seed availability was enhanced as indicated by women's explanation of providing seed locally and in a timely manner (**Table 5**). Varietal suitability was supported through the meaningful choice presented in participatory varietal selection program as women selected traits based on their preferences. Many women indicated the suitability of these varieties for their role as subsistence farmers- mentioning the better taste and nutrients of the seed and resulting grains (**Table 5**). Seed quality was maintained through the trainings of the SHG as women were educated on quality assurance and how to produce quality seed. Some seed producing women explained how the quality assurance of seed was supported by the social networks of the SHG as farmers knew who was producing their seed and could see the seed grown out in a field in their village. This trust, as explained by women, contributed to seed flow as farmers were willing to adopt it and tell others about it (**Figure 5**).

Figure 5. Factors influencing seed flow and access within the self-help groups and to the greater community.

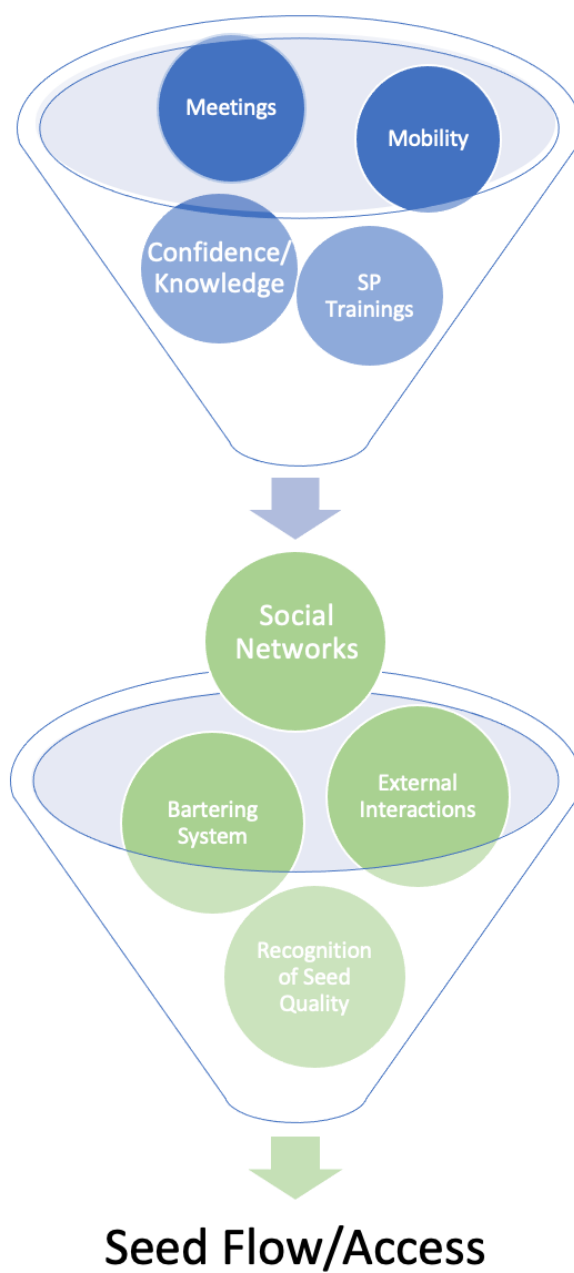


Table 5. Quotes from seed producing women that indicate the fulfillment of the four components of seed security as defined by the FAO (2016) through RGMVP's seed production program.

Component of seed security (FAO, 2016)	Quote from seed-producing woman
Seed Access	"[I sell it]...at a cheaper rate than the market... or otherwise I give it in return for the double [amount of grain]." (Int 16)
Seed Availability	"I'm selling the seeds to the village council and if someone in my village wants to buy it I sell to them." (Int 11)
Varietal Suitability	"The food that my family eats is made up of quality grains and it tastes very good and healthy." (Int 17)
Seed Quality	<ul style="list-style-type: none"> • "Now we get a better seed. We make it ourselves. The seed is uniform and is of one quality one." (Int 3) • "I feel happy to see the quality of crops because of my seeds only crops are growing bigger." (Int 15)

6.6.1 Seed Flow and Access

"In seed production, one can produce their seeds and In SHG seeds were cheaper than the market." -SP interview 15

Many seed producing women explained that their mobility, increased knowledge, and enhanced social networks gained through the SHG provided them with the agency and resources to serve as a source of seed within the SHG and surrounding community, which generated a new seed system within this network. This system contributed to the self-sufficiency of the SHG as money from the collective savings

funds, seed production, and money earned from seed production may be deposited as savings.

Mostly, seed producing women spoke about seed flow and access. These women explained how they used to buy seed from the market, but now produce the seed themselves. One woman mentioned obtaining seed from Allahabad University. Women who circulated their seed identified SHG members, poorer people, and other village members outside of the SHG as their main recipients. Some seed producing women mentioned sharing seed with other villages, other SHGs, the village council, and family members:

“I sell into the block members and also to the members of the group whenever they come asking for it. Not only to the members of my own SHG group but also to the members of other groups... I have sold my seeds outside the group also.”

Most seed producing women told of how they make their seed available from their home or field, and their “*fame*” is spread through the SHG and/or village by word of mouth:

“[Others from outside the SHG] come again and again due to the seed being of good quality.”

Many women, SP and SHG only, explained the two main forms of seed transaction to be monetary or for barter, usually at a 2:1 ratio for grains: *“I sell seeds in exchange for money and sometimes I give seeds in exchange for the crop. If I give them 1kg of seeds then in return I take 2kg of wheat from them.”* This bartering system of seed exchange within the SHG was promoted by and strengthened the self-sufficiency and solidarity of the SHG. Through this form of cashless transaction, seed could be accessed by those with little or no access to cash. Some SP women, as

a result of their solidarity with other SHG members and desire to help others, offered seed at a cheaper rate or even gave seed as a gift to those in need: *“I give it either by the money if they are poor then at a little lower rate.”*

A few SHG only women mentioned getting seed from either the SHG or a nearby village. One SHG only member mentioned that the 2:1 barter system of the SHG was not beneficial for her, *“I had to return double the amount of crops in exchange for seeds so it is not so economical for me,”* indicating a financial barrier to obtaining seed from the SHG.

6.6.2 Agricultural Productivity and Seed Quality

“After using SHG seeds, production is better and we have to use less seeds.” -SHG only Int 33

The quality assurance of seed overseen by the social structure of the SHG resulted in the production of quality seed that increased yield and agricultural productivity: *“After seed production productivity increased 2 times. Earlier it was 3 quintals now its 6 quintals.”* Many seed producing women explained that through social networks and the proceeding information exchange, quality seed was recognized and praised by other SHG women as well as farmers outside of the SHG. As one SP member explains, others in the community noticed the difference in quality and came back time after time because they *“are aware of [the difference between SHG seeds and other seeds].”* Through this recognition, seed flow was enhanced as farmers trusted and valued the seed: *“Our seeds our better as productivity is more and people are more attracted to green trees rather than a dry tree,”* which resulted in adoption and

encouraging others to adopt as well: *"those who have purchased from me has referred my name to other persons."*

6.7 RQ 3: What is the relationship between seed security and any observed changes in a woman's sense of agency, social capital, and empowerment?

By participating in the layered seed production program within RGMVP SHGs, seed producing women positively impacted seed security within their SHGs as well as for the wider community, they also experienced an additional layers of empowerment in the form of resources and agency, social mobility, and contributing to the collective structures of the SHG.

6.7.1 Resources and Agency

Through the seed production program, seed producers received the resources of normal SHG membership, but they also gained and provided additional human, material, and social capital. Through PVS and seed production trainings, SP women gained supplementary knowledge regarding seed, which was used to generate material capital in the form seed itself: *"sir (seed production trainer) told us various techniques on how to produce seeds of good quality...I get a good quality of seeds."*

Seed producing women mentioned having the same access to money through the SHG as SHG only members such as loans and savings. However, they also told of another source of income from seed production. As mentioned by the women, income earned from seed-production is better than a loan because it is their money to keep, there is no interest on it, and it does not have to be paid back. Furthermore, seed

producing women described how they save money as they produce their own seed, and typically compost as well, so they do not have to go to the market or other farmers to buy similar agricultural inputs: *"...the input cost has also reduced and we don't have to spend a lot of money."*

SP women indicated an additional source of bridging social capital as they described their increased capacity and opportunities to interact with many people outside of her family and even outside of her village due to seed production activities and transactions: *"I talk with everyone now. I have been to Kisanganj and other places also and I have interacted with everyone. It's not limited to just villagers."* Some of these external interactions may not have occurred directly, but as some women explained, their *"fame"* was spread and more people began to learn about their seed.

Similar to external interactions, SP women mentioned their ability to establish strong, frequented social networks among community members, SHG members, and other buyers of their seed as a result of seed production: *"I feel happy to see the quality of crops because of my seeds only crops are growing bigger...[and people] come back [to buy this seed]..."* Some of these interactions resulted in multiple transactions over time, or continued contact as the woman traveled to peoples' houses to train them on seed production. As explained by the women, this not only gave them a social network and contributed to their bonding social capital, but also added to their respect and recognition as a source of knowledge within the community.

SP women perceived an increase in their agency as a result of the respect, increased social networks, and enhanced knowledge gained through their role as seed producers. Seed producing women took pride in their work, describing their seeds as

good quality, shiny, healthy, uniform, and “*without adulteration.*” One woman mentioned, “*Women come and sit and praise our seeds to be number 1 in the market.*” SP women gained knowledge about seed and a vital role in the seed system as a producer, which resulted in respect from family and community members, strengthened power and opinions over agricultural decisions, and heightened confidence as they became more knowledgeable, respected, and recognized for their role as seed producers.

As a result of the increased resources and the agency to act upon them, seed producing women told of many concrete outcomes achieved specifically through their role as a seed producer. The production of quality seed and homemade compost not only enhanced women’s sense of self-reliance and provided an additional source of income, but SP women noted that their yield was better. This is an indication of empowerment through decision-making power over production as SP women chose what inputs and techniques to use, which resulted in tangible positive changes: “*Seed production [and]...Line plantation and the use of natural fertilizers and compost helped us to enhance our farming.*” The impact on yield, as explained by SP women, provided them with greater access to and control over income, resulting in empowerment through consumption: “*I don’t have to give my seed production income to anyone and I deposit it in my bank account*” and children’s outcomes **(Table 4)**.

6.7.2 Social Mobility

The additional resource of seed and seed knowledge seems to have brought about greater respect for women: “*I feel better because I have learned so much about seed production...People listen to me, because of this knowledge. I have earned a lot of*

respect at my home also..." Because of their large role as sources of seed and seed-related knowledge, seed producing women told of being approached frequently by others, which resulted in recognition throughout their community *"Earlier everyone recognized us from our husbands' name but now when you came to our village you asked my address in my name so people now know my name."* Furthermore, SP women told of how the quality of their seed and success of their agricultural knowledge gained them greater respect, even outside of their immediate community as other farmers heard of their success: *"People are aware of [the difference between SHG seeds and other seeds]...people respect me and recognize my work."* As seed production increases yield as well as generates income for the family, seed producing women experienced yet a third channel for additional respect. SP women explained that as they gained more respect throughout the community because of their role as seed producers, family members noticed and reciprocated, shifting the dynamics of their household even more than what was experienced through SHG membership alone: *"[I take more decisions in the house because my] husband has seen that [I am] respected in the community and therefore respects [me] too."*

SP women explained a greater capacity to use their time to serve as a source of resources and help others. Seed producing women were presented with more opportunities to serve as a source within their families and communities than SHG only women. This is seen as 89% of SP women discussed being a source, while 40% of SHG only members discussed the same. SHG only women served as a source of money through loans and/or a few income-generating activities and information regarding the SHG saving scheme and/or health, while SP women served as sources of

these resources as well as seed and seed associated information. SHG only members described helping people financially or socially by loaning money or providing solidarity. Seed producing women, however, described giving seed at either a lower rate or for free to those in need as an additional channel through which they help people.

6.7.3 Contribution to Collective Structures

Seed producing women also indicated a greater capacity to contribute resources to their SHG, its individual members, and members of the community. Seed producing women further contributed to the self-sufficiency of the SHG through their participation in SHG-facilitated seed quality assurance and the seed/grain barter system. As mentioned before, the quality assurance of seed lead by the SHG and carried out by seed producing women generated trust between the seed producers and other SHG members/farmers. Seed producers' implementation of the bartering system strengthened the bonding social capital of the SHG as a group and also provided individual members with more material capital.

6.8 Constraints to Empowerment

Though many women described experiencing increases in resources, agency, and achievement, constraints to empowerment still exist. Cultural norms are the main culprit for this shortcoming, however, some structures of the SHG proved to be problematic as well. The patriarchal society that permeates Raebareli and Amethi remains strong even in the face of developmental efforts. This is obvious as some women still mentioned

restrictions to their decision-making power and mobility, both of which are still hindered to some extent by male household members. Women's triple burden also hindered their empowerment by increasing their workload in tandem with SHG work.

The structure and programs of the SHG also proved unsatisfactory to one woman in particular, who expressed her disappointment with the loan and barter system's failure to provide her with the appropriate resources in an economical way.

"I had to return double the amount of crops in exchange for seeds so it is not so economical for me...we are paying interest on SHG loan but we cannot take our own money from VO and BO. We have to buy a register and ink pad which is used in SHG from our pocket and no one reimburses us for that. I have to deposit Rs 500/- at Village office and Rs 50/- to Block office...SHG doesn't give you double or triple the amount of money that you have deposited."

This woman's experiences sheds light on the possible shortcomings of the SHG and seed program.

Other women also noted a problem with the SHG loan system that poses a threat to the solidarity and self-sufficiency of the SHG: *"When some member takes a loan and doesn't pay back then there is a problem as then the group doesn't work efficiently."* A few women also mentioned the need for more programs to have a greater impact on more women: *"There should be more programs in which more women can take part every woman should be part of SHG."*

7. Discussion

Women described the meetings, saving schemes, and social structures of the SHG to be sources of resources, agency, and achievement. Through SHG meetings and the information exchanged therein, women became more knowledgeable, strengthened their bonding social capital, and increased their individual agency through the collective power of the group. The saving schemes and loan system of the SHG provided women with easy access to cash in times of need as well as a secure place to save their money and build up their credit, resulting in agency and self-reliance. Furthermore, the collective actions of the group such as sharing information and experiences fostered a sense of solidarity among the women, which in turn strengthened the unity and power of the group. Women noticed increases in respect and decision-making power within their households and community as a result of their expanded resources and collective strength, which contributed to their sense of self-worth and self-efficacy. Through their confidence, women told of how they felt more empowered to stand up for their rights, do the work they wanted to do, and make decisions that would result in their desired outcomes. Women's empowerment was especially indicated through their decision-making power over agriculture production, how to use loans and income, and their use of resources to generate positive outcomes for their children. When children benefit from increases in family income, it can be inferred that women retain decision-making power over how that income is spent since they typically tend towards supporting their children over other economical or business endeavors (Doss, 2013; Nithyanandhan et al., 2015). Seed producing women experienced the empowering effects of SHG membership as well as additional sources

of empowerment such as increased sources of income, enhanced knowledge, expanded social networks and increased bridging social capital, and a greater capacity to serve as a source of resources to others. The additional layer of the seed program with the SHG resulted in even more benefits for seed producing women.

7.1 Additional Indication of Empowerment

Understanding the process of women's empowerment was based on the indicators presented by Kabeer (2008) and Doss (2013) and women's perception of their experiences. Another method for understanding and determining changes in empowerment is to explicitly ask participants to define and construct the concept themselves (Agarwal, 2015; Malhotra & Schuler, 2002; Narayan-Parker, 2005). In a region 600km NW of this study's site, women were asked in qualitative interviews, "How would you define empowerment?" and "Do you feel empowered?", using a culturally and regionally accepted concept, *Nari shakti* (women's strength) (Mishra, 2021). Their responses revealed similar indicators of empowerment expressed by the women in our study; Mishra (2021) found that they experienced solidarity and collective action as self-reliance, courage, and independence, and although most women initially participated in the SHG for financial reasons, they noticed that the space provided by the organizational structure of the SHG built collective power (Mishra, 2021). This platform to share stories and support others generated a sense of solidarity and bonding social capital, the collective savings and loans within the SHG facilitated feelings of independence and security, and the collective action of the SHG resulted in mobility as women traveled to banks and for meetings, which facilitated networking and

social learning (Mishra, 2021). These themes of solidarity, independence, and social mobility were all described by the women as *Nari shakti* (women's strength) (Mishra, 2021). This research on SHGs conducted by Mishra (2021) further supports our evidence that women were empowered through their participation in the SHG.

Some literature notes the necessity of involving the disempowered in the process of defining empowerment and empowerment indicators, such as seen in Mishra (2021). However, this may not ensure an accurate and/or predictable understanding of empowerment even within the same context. Across cultures, a factor that may contribute to empowerment in one context may result in disempowerment in another context (Krishna, 2004; Mudege et al., 2015). Among individuals, ideas, beliefs, and observed outcomes of empowerment may differ from person to person based on their principles and understanding of the world around them. Although Mishra's (2021) findings are helpful in understanding women's definitions of empowerment in a similar context to ours, we also relied on accepted indicators of empowerment in research and development, laid out in the literature by Doss (2013 and Kabeer (2008). Based on these indicators, there is clear evidence in our research to conclude that women's empowerment increased through their engagement in the SHG and even more so, for the women who became seed producers within the SHG.

7.2 Seed Security and Empowerment through RGMVP Seed Production Program

Two of the expected outcomes of the RGMVP seed production program were to increase access to quality seed by SHG members and enhance the empowerment of SHG members. In a parallel study of the same program, de Boef et al. (2021) showed that by the end of the program, rice and wheat seed produced by the SHGs was

reaching more than 30,000 smallholder farmers, with approximately 800 women (wheat) and 350 women (rice) producing the seed. The average age of wheat decreased by 15 years (de Boef et al., 2021). In the qualitative interviews presented here, women said they have higher quality seed that is affordable and obtainable. PVS provided women with meaningful choice and the ability to produce and circulate suitable seed varieties, while the social networks and three-tiered structure of the SHG provided the foundation for the distribution of the quality seed and the ability to choose preferred varieties (**Table 5**). It was the women themselves who, through their increased bridging social capital, were increasing seed access to others outside of their SHG and even outside of their village by making seed available through decentralized seed production within the SHG social structures. These social structures built on collective action and trust also served as a foundation for the financial accessibility of seeds, either through the bartering system or gifting of seed by women to farmers in need. Due to the locality of the SHG women farmers, seed was also made more available geographically and temporally. Each of these elements of seed security also strengthened the social networks within the SHG. The compilation of this evidence suggests that the RGMVP seed production program achieved the expected outcomes of increased access to quality seed and enhancing women's empowerment process.

7.2.1 Quality Assurance

Regardless of the channel through which seed is procured, seed quality is vital for the success of a seed system as poor quality seed can result in disease, infection, and lower yield (Biemond, 2013; Sperling et al., 2020). Formal seed systems aim to regulate

seed quality and ensure a sufficient supply of quality seed through certification processes that require methodologies that meet international standards for fields, foundation seed, harvesting and processing methods, and disease control (Biemond, 2013). In informal seed systems, quality assurance is regulated by personal relationships between farmers that generate trust as they trade local and traditional varieties (Brearley & Kramer, 2020; Labeyrie et al., 2016). Some programs have implemented intermediate strategies by which to ensure seed quality, such as the production of quality declared seed (Kromann et al., 2016). Quality declared seed is a class of seed that undergoes certain quality assurance tests in conformity with the standards defined by farmers of a given region (Mastenbroek et al., 2021).

The RGMVP seed program capitalized on the strengths of each seed system and integrated formal and informal quality assurance mechanisms through the procurement of foundation seed from the formal sector, specialty training of the SHG seed producers, and trust within the social network of the SHG, a hallmark of seed quality assurance in the informal system. Other research has shown this approach to be successful as well. In Ecuador, quality declared potato seed was produced and disseminated by smallholder farmers by combining the formal system's high-quality source seed and quality control procedures with the informal system's social network and seed saving (Kromann et al., 2016). In the case of RGMVP, the foundation seed used for the seed production program was procured from formal sources in which seed production was under the supervision of breeders and certification agencies (RGMVP, 2017). Once this seed was being produced by women farmers, some VO and BO officers received training regarding quality seed standards that met national seed regulations (RGMVP,

2017). Using this knowledge, these women oversaw other women's field to guarantee proper practices were taking place to ensure seed quality (RGMVP, 2017).

Furthermore, quality assurance was supported by the social networks of the SHGs, as seed producing women produced and became known and respected for high quality seed. This built trust between the seed producers and farmers because they knew from whom they were getting seed, the quality of that seed, and the adaptability of that seed to their area, due to women's purposeful selection during PVS. Other research indicates this trust and information about varieties is vitally important for the adoption of new varieties or the purchase of seed (Schöley & Padmanabhan, 2016). The trust and accessibility of seed associated information facilitated through this seed program not only contributed to farmers' adoption of seed, but also to the bonding and bridging social capital between women producers and their customers.

7.2.2 Meaningful Choice and Varietal Suitability

Through the RGMVP seed production program and PVS, women were empowered through meaningful choice. As discussed in the conceptual framework, meaningful choices are those that bring about desired outcomes for the actor as they involve options that are valuable and accessible to the actor, (Kabeer, 2008; Polar et al., 2021). Women, who had limited if any role in agricultural decisions before, were given meaningful choice and knowledge of varieties through PVS. However, meaningful choice alone does not bring about empowerment, the choice must be actualized (Kabeer, 2008; Polar et al., 2021). The actualization of choice over seed varietal selection and production indicated empowerment in accordance with WEAI's (2013) measurement of empowerment "decisions about agricultural production," which was

supported by the seed production and PVS program. Through seed production, SP women actualized their choice by producing and disseminating their previously chosen varieties. This not only contributed to women's process of empowerment, but also supported the varietal suitability component of seed security (FAO, 2016). As noted earlier, women in developing countries tend to be responsible for ensuring food security for their families, and therefore prefer seed varieties that are easier to harvest, have higher nutritional value, and provide enjoyable textures and tastes (Teeken et al., 2021; Weltzien et al., 2019). The suitability of the chosen varieties was apparent in how positively SHG only and SP women spoke of the quality grains and food that the SHG-produced seeds yielded.

7.3 Integrated Interventions: The Replacement of Formal Institutions

Integrated intervention approaches that cross disciplinary boundaries or consider multiple facets of well-being are complex and do not always achieve the intended goal (Njuguna et al., 2016; Raghunathan et al., 2018). In this case, the integrated approach of RGMVP proved to be successful as a result of its emphasis on collective action and consideration of the cultural, social, and economic context. RGMVP SHGs aimed to integrate both instrumental and intrinsic forms of empowerment through livelihood, health, financial, and agriculture trainings, as well as increasing women's self-confidence by breaking social hierarchies through the acquisition and application of knowledge. The seed production program was intended to be an instrumental intervention but was found to have unintended intrinsic outcomes as well, through the respect, agency, knowledge, and decision-making power gained by the seed producing

women. One of the most important outcomes of this integrated intervention approach was the ability of women to replace formal institutions such as banks and seed systems, through the collective power of the SHGs.

Formal financial institutions fail to provide credit, loan, or other financial services to the poor or low income primarily due to the belief that the poor are incapable of saving nor deserve credit (Henock, 2019). The micro-credit savings and collective loan programs of RGMVP SHGs, however, provided poor women and their families access to loans and credit. Through their collective efforts and solidarity with one another, women were able to build their financial corpus to loan money out to other members in need, thereby replacing their reliance on formal bank institutions or moneylenders.

Similarly, while the seed program was both instrumental and intrinsic in its empowerment of women, it also integrated formal and informal seed systems, generating a system of its own. As an answer to the urgent call throughout the literature (Louwaars & de Boef, 2012; Vaiknoras et al., 2017), the RGMVP seed production program linked the formal and informal sectors by building upon the strengths of both: improved modern varieties and additional varietal choices from the formal sector and the capacity of the informal to promote spatial and temporal availability, affordability, and trusted, social networks through which seed is exchanged. Through this integration, the RGMVP seed production program linked those who would not have usually had a line of contact to the formal system to breeders and universities through PVS, and more broadly through the social networks of the SHG, and also increased the access and availability of previously unknown varieties. Additionally, the seed system provided further financial support through self-sufficiency of the group and the solidarity of the

members as women seed producers provided seed via bartering, lower-than-market prices, and even as gifts. Through these forms of cashless, or less expensive, transactions, seed was accessed by poor women and other farmers who had little or no access to cash. The collective action of the preexisting structure of RGMVP SHGs provided the platform upon which other interventions could be layered, as well as the capacity to support sustainable changes as the collective groups of women worked to build their own institutions in place of formal institutions that tend to exclude them from equitable participation (Buggineni et al., 2013; Gugerty et al., 2019; Kabeer, 2008).

7.4 Caveats

As mentioned in the methods, there are some caveats to these data that reveal a less successful side of the program. Although almost all of the SHG women interviewed for this study expressed positive changes in their personal agency, relationships in their households, and roles in their communities, these women and their responses are the exception within their cultures and societies. This phenomena, in which certain conditions or factors impact how participants respond, resulting in data that deviate from the true value due to the deviation among respondents in the same direction, is referred to as response bias (Lavrakas, 2011). Furthermore, these women may have answered interview questions with positive biases thinking that any negative answers may remove funding and/or support from the program. Even though their responses seem almost entirely positive, they may have been hiding some persisting challenges from the interviewers. When participants in qualitative interviews present their experiences in a way that seems socially acceptable it is referred to as social desirability bias (Bergen &

Labonte, 2020). Additionally, these data were subject to self-selection bias. The ability to join the SHG indicates some level of power and/or positive intra-household dynamics retained by the woman. The participants of this study and their circumstances, then, may have been exceptional to begin with as compared to their non-SHG member counterparts. Those who were able to join RGMVP SHGs had greater advantages that generated a strong foundation upon which positive experiences were had through their SHG participation. This self-selection bias is even more possible among seed producing women, as a) their SHG was chosen to be a part of the RGMVP seed production program based on the quality of the SHG's management and the longevity of the specific SHG, and b) the SHG members chose who would be the seed producer in the group but this could have been biased in terms status within the group, existing resources (land), and/or quality of their farming infrastructure, predisposing them to success within the program.

Although women who were chosen for the seed production program did tend to have greater advantages to be successful producers, not all selected women were successful. As discussed by de Boef et al. (2021), many women's fields were disqualified from the program in the beginning phases due to quality assurance issues. Furthermore, within the seed production program, although SHGs and individual women did perceive greater self-reliance, they still remained reliant on the project management office and BOs to connect them to agricultural universities and provide them with foundation seed for production. This indirect linkage of women to their foundation seed source became problematic when the BOs were unable to procure the appropriate amount or specific varieties of seed from the universities to supply to the SHGs and

individual women producers (de Boef et al, 2021). If the connection between the seed producers and the seed-providing universities was more direct, women could communicate their needs regarding foundation seed volume and variety directly to the sources of seed. This direct linkage could sustain the seed production program even in the absence of the formal organization, RGMVP, mediating the relationship between women and the universities.

Though most data seemed quite positive, there were some negative comments regarding the SHG shared by women. As noted in the results, one woman described her negative experiences with the loan and barter system of the SHG, another woman discussed her uncomfortableness with the mixing of castes within the same SHG, and many women still alluded to persistent oppressive cultural and societal norms such as decision-making power over large decisions and their triple burden as women. Most women explained that decisions about large purchases are still made by men in the household, and some described smaller decisions that were still made either entirely or mostly by males. One such decision regarded women's ability to leave the house. Women who mentioned still experiencing limited mobility attributed it to restrictive, powerful family members and their triple burden, which presents them with time constraints that hinder their mobility.

Women's triple burden also hindered their empowerment by increasing their workload in tandem with SHG work. Though the cultural norms that constrain women to household work regardless of their other responsibilities underlies this issue, the structure of the SHG may exacerbate it. Almost all women expressed experiencing an increase in workload from the additional responsibilities of the SHG on top of

household, and a few women indicated the burden of it. One woman seemed to lack the support necessary, either from her family or the SHG, to carry out the additional responsibilities of the SHG. Similarly, one woman may not have been receiving the appropriate support from the SHG as she explained her experiences regarding loan and seed access through the SHG. Other research has shown that programs implemented with the intention to empower and aid women tend to add to their responsibilities, exacerbate their triple burden (Bergman Lodin et al., 2019; Teklewold et al., 2013), and this research is no exception.

7.5 Next Steps

Though this data shows strong evidence for women's empowerment and seed security and provides a potential model for future developmental work, further research is needed to build the evidence base in the following areas.

1. Although the literature provides somewhat universal indicators of empowerment and the concept of empowerment varies between contexts and individuals, it could have been beneficial to discuss empowerment explicitly with participants. Through this discussion, the imposition of the researchers' beliefs or understandings of what empowerment should look like would be lessened as the participants themselves would define and explain what empowerment means to them and how it is achieved.
2. Since women's empowerment is contingent upon the dynamics of their household, sustainable changes at the individual level would require institutional changes at the household level. Furthermore, since the empowerment of

individuals is in relation to others, specifically members of their household, the involvement of men in the research process may have provided additional insight to the process of empowerment in the context of smallholder farming households in Uttar Pradesh.

3. Though every woman who was interviewed expressed some indication of empowerment, some brought up challenges and shortcomings of the SHG, specifically the increase in workload resulting from SHG participation and the unaffordability of seeds through the barter system. Addressing the issue of women's increased workload would require integrated approaches to 1) change the societal and cultural norms that bind women to household work regardless of their other responsibilities and 2) provide women access to and control over resources through which they can lighten their workload such as transportation and/or money to pay for hired labor.

8. Conclusion

Before joining the SHG, women were restricted to the confines of their house because of cultural and/or familial customs. As told by women, they were rarely allowed to speak and were expected to solely do housework. Decisions were made mostly by the husbands and the women's in-laws. Some women described feeling scared and uncared for. These conditions kept women from experiencing the outside world, doing the work that they wanted to do, and feeling confident, independent, and respected. Since joining the SHG, women have been empowered through greater mobility, decision-making power, access to information and resources, agency, and respect within their households and community. The layering of a seed production program with the SHG further empowered seed producing women as they expanded their social networks, became respected for their provision of quality seed, and contributed to the seed security of their community.

Women's resources, agency, and achievement were positively impacted through the collective action of the SHG, and further strengthened through the meaningful choice presented through PVS and the actualization of that choice through seed production. The results of this research provide an approach and evidence for programs that aim to increase women's empowerment, improve agricultural outcomes, and integrate seed systems. It reveals the potential of integrated intervention approaches for successful women's empowerment and seed security.

PVS gives farmers opportunities to make meaningful choices, however some of the varietal choices presented in PVS still may not fully meet the needs and preferences of farmers. This program could potentially be improved upon by 1) involving farmers in the

breeding process earlier like in PBB 2) engaging breeders more in PVS to better fulfill the needs and preferences of farmers. Either of these modifications could produce more relevant varieties for smallholder women farmers, resulting in greater adoption rates. Meaningful choices could also become more meaningful, and therefore more empowering as farmers are choosing seed that has a greater potential to meet their needs. Public plant breeding increases access to seed, but seed security requires varietal suitability as well. Linking breeders and farmers more closely may further increase seed security among farmers through PVS.

The RGMVP seed production program was carried out in two districts in India, and the number of farmers beyond the participating SHGs who gained increased access to quality seed is noteworthy. Within RGMVP, there are 2 million women members across 40 districts, and across India, there are over 6 million SHGs serving 67 million members. With proper scaling and adaptations, this program could be implemented not only throughout SHGs in India, but even in other collective action groups across the world. With this potential reach, there is a possibility for expanded positive impacts on seed security for poor subsistence farmers, changes in the way women are seen within the agricultural sphere and the community in general, changes in the welfare of poor families change as a result of women's increased income, and/or shifts in women's empowerment and the patriarchal/hierarchical social structure found in developing countries and agriculture. Disempowering social norms and oppressive hierarchies remain in most developing countries. Many steps need to be taken to challenge these norms and establish sustainable, institutional changes, but applying a layered collective action/seed production program may be one small step towards that monumental task.

APPENDICES

APPENDIX A

Interview Guide- Version 5

We are doing a study to understand your experiences in the household and in the SHG. This information will help inform future projects – with the hope to make them better to meet the needs of women in rural areas. So please feel free and open talking with us, there are no right or wrong answers. Your privacy will also be protected. The information provided will not be associated with your name (unless you would like it to be).

KEY QUESTIONS

How does that make you feel?

Why does it make you feel that way?

Was it that way before?

1. So to start off, how did you come to join the SHG?
 - a. Why did you decide to join?
 - b. What did your family think about it?
 - c. How did that make you feel, that your family felt that way?
 - d. Is your family accepting now? How did you overcome that?
 - e. Why were you willing to trust the SHG but your (husband/family) was not?
2. What types of things do you do in the SHG? How is this different from the past?
 - a. (income, leaving house, going to meetings, interacting with people, producing seed)
 - b. What does your spouse think about this?
 - c. Who decides to take out a loan? Who pays it back?
 - d. **(For SHG)** Where do you get your seed? Has it always been like that?
 - e. **(SP)** What types of (additional) things do you do now that you are a Seed Producer? How is this different from when you were just in the SHG? How has being a seed producer changed things for you?
3. **(SHG and SP)** How has being in the SHG (and a SP) affected the following:
 - a. How has this affected your farm? Which agricultural techniques have had the greatest impact for you?
 - b. How has it affected your family?
 - c. You, as an individual? How does this make you feel? When did you start to feel this way? Why?
 - d. How has it affected your relationship with your husband? How does this make you feel?

- e. How have these activities affected your income? Do you sell your seed? To who? Do people outside of the SHG buy your seed? How does this make you feel?
 - f. What happens to the money you make from these earnings?
- 4. Being in the SHG, you were able to take out loans. Now, with the SP you are making an income. Can you tell us more about that? Has that changed things? How?
- 5. So, you have *more or less* activities now that you are member of the SHG and a seed producer.
 - a. What do you think about that?
- 6. Can you tell us how decisions are made in your household? How does this vary for different items?
 - a. minor purchases and major purchases
 - b. farm and farm management
 - c. education for your children
 - d. leaving the house
 - e. going to parent's home

KEY QUESTION: Why can you do those things now?

- 7. What types of difficulties have you had since joining the SHG? We ask, because we want to understand all the aspects of the SHG, both good and bad. So that we can improve these types of programs.
 - a. How did you overcome it?
 - b. What about specifically related to seed production?

APPENDIX B

Coding Table

Table 6. Code Definitions

Code Name	Code Definition
Joining/Barriers	The factors playing into a woman's choice, decision, and ability to join and participate in the SHG. The barriers women faced when joining or continuing SHG membership. Family members' support of SHG membership shifts as they are convinced of woman's SHG membership through information/understanding of money/benefits that come with SHG membership, motivated by external, tangible benefits. The circumstances, relationships, connections, or experiences of the woman that were present before SHG memberships and that have been beneficial.
Self-Sufficiency	When the SHG can act as a closed system, rarely relying on external sources for resources, but instead resources are circulated among members and used to increase the capital of the group. Including trusting SHG.
Collective Action	Courage, agency, and confidence resulting from the power of the group in the form of collective action.
Solidarity	The critical consciousness that comes with social learning as women share experiences and realities. The woman's experiences of subordination are then validated as solidarity is built to learn to reject those experiences and take action to protect and respect themselves and other women.
New Information	Through SHG, the woman has received training and new information on agricultural practices, traveling, speaking/engaging with society as an equal, saving money, and/or other subjects regarding health/livelihood.
Application of New Information	Woman talks about applying what she has learned from the SHG, such as making compost, health, leaving the house, and communicating with others.
Mobility	Woman leaves the house or her immediate community to go to meetings, interact within her village, and/or travel.

Table 6 (cont'd)

Seed Flow and Access	Seed producing woman is producing, giving, selling, and/or storing seed thereby serving as an actor in the local seed network. The woman is responsible for circulating new varieties of quality seeds within the SHG, local markets, and potentially greater external markets. Non-SP SHG members, community members, or others have greater access to quality seed through the SHG.
Agricultural Productivity and Seed Quality	Woman mentions greater yield, agricultural productivity, and healthier crops due to a change in practices such as quality seed, compost, irrigation etc. Woman discusses the quality of seed, whether obtained from the SHG network, the market, or other sources. Healthier crops may also be understood to have greater health benefits for the consumer.
Self-Reliant	Relying on self or the collective action of the SHG for the procurement of money, seed, and/or other agricultural resources. A self-contained acquisition of resources, relying on personal knowledge, not needing to consult others (outside of the SHG).
Change in access of Money	Woman discusses a change in where money was obtained and how easily accessible the money was after joining the SHG. Usually tied to the mention of accessing banks, loans, and collective savings through the SHG. Woman discusses financial actions she is taking as a member of the SHG and ways in which her income is increasing due to SHG membership/activities.
Source	Woman serves as a source of information, aid, or resources within her household and/or community. She mentions that people come to/ask her for resources.
Help Others	Woman expresses a desire to help others, either through gifting seed, providing resources, sharing information, and/or standing up for wrongs committed against other women, especially for others in the SHG.
Intra-Household Dynamics	There is a shift in intra-household dynamics as the woman obtains new knowledge, serves as a source of income for her family, is a successful farmer/seed producer, and/or participates in another activity that is valued by her family and/or community.
Respect	Woman is trusted and respected by family and community members; she is recognized as an individual and is seen as a contributing member of society.

Table 6 (cont'd).

Decision-making power	Woman discusses decision-making process for purchases, agricultural practices, children, traveling, land usage etc. within the household.
Self-Confidence	Woman feels more capable to do things that she wants to do, and realizes that she is more capable, knowledgeable, and/or empowered due to an increase in information and/or control over resources.
Intrinsic Self-Confidence	Woman displayed an internally derived character trait of confidence and motivation before joining/without relying on the SHG.
Self-Actualization/Voice	Woman realizes, expresses, and acts on her needs, ideas, role in society, and services she can offer. Giving voice and action to her self-confidence.
Social Networks/External Interactions	Woman talks about having an expanded social network, including more friends, community members, and/or business contacts. Also, when the woman mentions using her mobility and other forms of agency to contact “higher up” government officials or other key actors within her community.
Benefits	Social or physical benefits gained from SHG membership for women’s family members (i.e. attending school, family members being happy because of SHG success...)
Workload	Woman mentions an increase or decrease in her workload after joining the SHG.
Changes	Statements comparing various aspects of life before and after SHG membership. The woman uses explicit comparative language i.e. “then, now, before, back then.”
Commercial	How the woman is speaking about her SHG membership sounds like a commercial.
Challenges	Woman talks about the difficulties or things that could be improved within the SHG.

APPENDIX C

Mobility Before and After Self-Help Group Membership Quotes

Table 7. Quotes from self-help group only and seed producing women describing their mobility before and after joining the self-help group.

Interview number, Interview type	Before SHG	After SHG
1, SP	"Before joining SHG, I used to stay indoors and also carry a veil in front of my elders."	"I joined SHG and then I was called to Harjanpur Block for the meeting...I can go to Lalganj, I can go to Rae Bareli."
3, SP	"I did not know the outer world. I didn't know how it felt to be outside our home. I didn't know how to travel. "	"[The men in my house] never stop me from going out now."
5, SP	"I did not use to go anywhere "	"...now I go out often."
12, SP	"...earlier I used to stay at home only."	"After joining SHG we started going outside...[my family doesn't] stop me from going anywhere "
16, SP	"Earlier, I was not even allowed to step out."	"now I go to attend the meetings...[and my family] do not stop me from going and attending them"
21, SP	"There was a time when I was not allowed to step out of the house "	"I do it on my own. I just inform my husband [when I have to leave the house]"

Table 7 (cont'd).

22, SP	"Earlier, I used to be inside the house despite being educated..."	"...after joining SHG I was able to go to the bank, talk to officials over there and make my own identity. Also, I was able to learn the way of talking and able to step out of my house which was not allowed for women as per traditions."
23, SP	"Earlier, my husband didn't let us get out of home for marketing and even I felt scared about it "	"...now my husband allows to go with children and make the purchase ourselves"
31, SP	"No [I did not go outside], I did my household work only"	"I inform my husband that I'm going [outside]. If he refuses, I still go"
34, SP	"Before joining SHG I used to do household work only"	"In SHG...I got the opportunity to explore different cities."
35, SP	"Before SHG he didn't allow me to go outside even to my maternal house"	"But now he doesn't have any problem [when I go to my maternal house]."
2, SHG	"Earlier we were not allowed to step out of the house. We used to cover our faces with veil"	"[In SHG] I was also taken to Gujrat to visit other SHGs, how do they function. I met so many women there."
8. SHG	"I did not use to step out of the house...I wasn't allowed to step out of the house"	"I can now go to the market and for meetings. He trusts me and I trust me."
9, SHG	"Earlier I was not even able to speak."	"I have been empowered now. I can go out anywhere. I am free now"
36, SHG	"Before SHG I used to stay at home only and I had no one to share my feelings with...I couldn't go outside alone"	"[Because of SHG] I go outside with confidence and people respect me now"

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