Anjini Kochar
Stuti Tripathi
Francis Rathinam
Pooja Sengupta
Priyanka Dubey

Promoting women's groups for facilitating market linkages in Bihar, India

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About this working paper

This paper, *Promoting women's groups for facilitating market linkages in Bihar, India,* discusses the findings from a survey of the Women's Advancement in Rural Development and Agriculture (WARDA) project that aims to economically empower smallholder women farmers and increase their agricultural income through market-led interventions. This paper has been copyedited and formatted for publication by 3ie.

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Anjini Kochar
Stanford University

Stuti Tripathi
International initiative for Impact Evaluation (3ie)

Francis Rathinam
3ie

Pooja Sengupta
3ie

Priyanka Dubey
3ie

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Acknowledgements

Summary

This report discusses findings from a 2018 survey of household members of agricultural producer groups (PGs) covered by the Women's Advancement in Rural Development and Agriculture (WARDA) project. WARDA's stated aim was to economically empower smallholder women farmers and increase their agricultural incomes by linking them to farmer producer companies (FPCs) and, thereby, to larger agricultural markets, while simultaneously building their and participating government institutions' productive capacities. While WARDA's scope extended to several crops and geographic locations, this study focuses on maize interventions undertaken in Purnea district in Bihar state.

We surveyed members of WARDA PGs ('treatment' PGs) and other PGs constituted by the state government under its rural livelihoods programme, JEEViKA, but not covered by WARDA PGs ('control' PGs). The survey was conducted three years after WARDA had been initiated in the region (2015). This survey, in conjunction with an endline survey, was intended to provide an impact evaluation of the project. However, the project ended in early 2019, so our analysis uses data only from the one survey that was conducted.

The survey year was characterised by minimal sales by treatment PG members to the FPCs for a variety of reasons discussed in this report. As a consequence, we ignore any analysis of the effect of the project on agricultural sales and income, concentrating primarily on its effect on women's empowerment. Such effects are likely because, despite the lack of sales through FPCs in the survey year, the project and JEEViKA staff worked intensively with women in treatment PGs to increase their information on agricultural and marketing practices. For PGs formed in the early years of the project, such involvement occurred over several years.

Our study reveals very low levels of women's empowerment among PG members. We use extensive data on indicators of women's empowerment to develop indices that reflect participation and decision-making abilities across several dimensions: economic, mobility and domestic. The survey also enables the construction of an index of dietary diversity for women. All these indices reveal strikingly low levels of empowerment, even though more than half of the women in our survey report engagement in an income-earning activity as their primary occupation. For example, women are only minimally involved in decisions regarding loans, despite the fact that 82 per cent of them report having a bank account in their own name.

Our descriptive analysis suggests several explanations. One relates to hours of work. Measures of women's empowerment by age closely replicate the 'inverse U' relationship of their hours of work to age, suggesting the importance of their contribution to household income to women's empowerment. Although, as previously noted, most women report participating in economic activities, their hours of work in such activities fall far short of those of men: at their peak, women reported doing approximately 95 hours of work (in the month prior to the survey), while, for the same period, men reported working 40 *additional* hours per month (a total of 135 hours). Men are generally the primary earners, which is widely believed to explain their greater decision-making authority, particularly as it relates to income decisions.

However, regression evidence we provide of a positive impact of the project on women's participation and decision-making in income-earning activities suggests that initiatives such as WARDA can significantly enhance women's economic roles. We report causal estimates of the project's impact on women's empowerment, based on a difference-in-difference regression that compares differences in outcomes across target and non-target members of treatment PGs to this same difference in control PGs.

We find that the project significantly increased women's economic empowerment, but not their mobility or their involvement in decisions regarding household expenditures. There is also some evidence that the project caused a *decline* in the diversity of women's food intake. Supplementary regressions on hours of work provide one explanation: While the project increased women's hours of work in income-earning occupations, this increase came at the cost of a reduction of time spent in household work, assuming, time spent cooking and perhaps visiting the market and other components of the mobility index. The project had no effect on men's hours of work, suggesting an increase in women's *relative* contribution to household income.

It is particularly noteworthy that these effects were obtained even in a year when treatment PGs reported negligible sales to FPCs. If women had greater influence over sales, and if income from sales had been deposited in their bank accounts, as was intended under WARDA, the results would likely have been even larger.

Our descriptive analysis also reveals significant heterogeneity in women's empowerment across dimensions related to villages' economic geography. While there are known large differences in women's empowerment across agro-economic zones, we suggest differences in empowerment across villages within the same block, perhaps even neighbouring villages, related to patterns of geographic concentration of village populations and the degree of caste-based residential segregation across village hamlets. For example, extensive segregation reduces women's empowerment, in part because it affects PGs' caste composition.

Such factors may explain the minimal impacts of the project that we find for 'non-target' members, those with marginal or no agricultural land holdings. This finding does *not* suggest that interaction with large members does not have an effect on smaller farmers. In fact, we report evidence that such positive spillover effects *do* exist. Instead, it reflects the composition of PGs and the fact that extensive residential segregation implies that landless women are generally in PGs with a high proportion of other landless women. As a consequence, on average, positive spillovers from large landowners benefit only a small number of landless people.

Our study suggests a couple of areas for further research: (1) the relationship between hours of work and women's empowerment, and (2) the heterogeneity in the effect of hours of work across different dimensions of women's empowerment. It also indicates the value of a study comparing the benefits of different types of community institutions, such as PGs characterised by a large and 'mixed' membership and the more homogenous and smaller self-help groups. By extension, this implies the need for greater evidence on the impact of different attributes of collective institutions and their determinants. Finally, although we provide evidence of the effect of WARDA on one component of nutrition (i.e. diversity in food intake), our findings in this area convey the importance of research that

examines the effect of women's empowerment on other outcomes, including other measures of nutrition and well-being. Our research suggests that such effects may not always be positive, underscoring the importance of this line of research.

An important area for future research—hinted at in our data, but that we were not able to explore further due to data limitations—relates to the importance of the quality of 'lower-level' institutions such as self-help groups and village organisations for the success of 'higher-level' PGs. The finding that members of early PGs were characterised by higher levels of empowerment across all dimensions indicates this effect, because early PGs were formed by drawing on the membership of well-functioning lower-level institutions.

This may have helped PGs because of the members' greater experience in working as a collective, but also because well-functioning lower-level institutions provide a level of security that could promote members' willingness to undertake agricultural investments and invest in riskier income-enhancing activities. If this is borne out, it has obvious important policy implications. It implies that the success of a new generation of policies that focus on PGs and other livelihood-enhancing institutions might require continued attention to the quality of the self-help groups these higher-level institutions build on.

Turning to other policy implications, the finding that WARDA enhanced women's participation in income-earning activities and their role in income decisions is important and deserves attention in discussions of policies that seek to enlarge women's economic roles. These improvements were realised despite the relatively small number of PG members involved in agricultural production at scale, and hence the project's limited reach. This suggests the potential for significantly greater impact in projects that target more widespread activities, such as non-agricultural enterprises. Our research does indicate, however, that the overall magnitude of benefits depends on the composition and size of collective institutions, conveying the importance of attention to these features in the design of any policy.

Our finding that the impact of the project on women's empowerment was lower in 'older' PGs is also important for policy, although it should be corroborated by longitudinal data that can measure women's empowerment at different points in time. Should it hold up, it suggests difficulties in scaling up projects, particularly in terms of staffing. It also indicates potential weaknesses in terms of the sustainability of the project and the ability of PGs to operate without continuous 'hand-holding' support. As previously noted, further research on these points would necessitate longitudinal data.

Finally, we note that despite the overall positive effect of projects that enhance women's employment outside the home, negative externalities may well exist, because such increases necessarily require compensating reductions in other activities. Keeping track of such changes may enable action that reduces negative consequences, such as a complementary focus on policies that reduce the amount of time required for domestic work. The government's promotion of access to liquefied petroleum gas cylinders is one example of such policies.

Contents

List of figures and tables

List of acronyms

A-WEAI   Abbreviated Women's Empowerment in Agriculture Index

CBO   Community-based organisation

FAO   Food and Agriculture Organization of the United Nations

FPC   Farmer producer company

MIS   Management information system

PG   Producer group

SC   Scheduled caste

SEW   Skilled extension worker

Sigma IRB   Sigma Institutional Review Board

ST   Scheduled tribe

SHG   Self-help group

SRNO   Social Research Network Organization

USAID   United States Agency for International Development

VO   Village organisation

VRP   Village resource person

WARDA   Women's Advancement in Rural Development and Agriculture (project)

1. Introduction

This study discusses findings from a 2018 survey of self-help group (SHG) members in rural Bihar promoted by JEEViKA. JEEVIKA is a government-promoted body charged with implementing the Government of India's flagship programme for promoting women's livelihoods under the National Rural Livelihoods Mission—the programme to link the rural poor to financial services and sustainable livelihood solutions using a group-based approach.[1] JEEViKA mobilises women from poor households—especially from scheduled caste/scheduled tribe (SC/ST) households—into women's SHGs, which are in turn, federated into village organisations (VOs) and cluster-level federations.

Building on its outreach of the SHG programme (Datta et al. 2015), JEEViKA recognised that improving women's incomes required helping them to benefit from economies of scale in procuring inputs and getting better prices for their outputs, and that this was best done by forming village-level producer groups (PGs) with a membership of 80 to 120 women. These PGs would be linked to farmer producer companies (FPCs). JEEViKA accordingly promoted a few existing FPCs that were registered in 2009. However, these FPCs failed to demonstrate profitability.

To galvanise the promotion and functioning of these PGs and revitalise the FPCs, the Bill & Melinda Gates Foundation extended technical support to JEEViKA through TechnoServe, as part of the *Woman's Advancement in Rural Development and Agriculture* (WARDA) project.

WARDA's stated aim is to economically empower smallholder women farmers and increase their agricultural income through market-led interventions by: (1) establishing and supporting women-owned FPCs; (2) building women's capacity in agricultural households; and (3) strengthening both the enabling environment through greater private sector participation and existing government institutions (WARDA Exemplar 2018).

In 2015, TechnoServe began work with one FPC under the WARDA project.[2] The project was initiated in Purnea district in Bihar state to strengthen the participation of smallholder farmers in the maize value chain through the Aranyak FPC and later, spread to Katihar district. WARDA had a two-pronged approach:

1. By aggregating the outputs of small and marginal farm households and providing them with training and knowledge of post-harvest practices that could enhance the quality of their marketed crops, the project attempted to help these farms overcome their lack of scale and improve their income from agriculture.

2. By working through women's PGs, the project also focused on increasing women's knowledge of, and involvement in, agriculture and their resulting contribution to household incomes. The model required that the income earned through the sale of crops to the FPC be deposited directly into the women's bank accounts, ensuring that any enhancement in women's involvement in income-generating activities translated into women's greater control of household income. By simultaneously targeting increases in women's contribution to

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[1] Our accompanying process evaluation report details the role of JEEViKA.

[2] At inception, the project was named *Technical Assistance for Developing and Supporting Prouder Organizations through NRLM [National Rural Livelihoods Mission] in Bihar*.

household income and their greater control over income, the project sought to empower women to gain more control over their lives.

WARDA belongs to a new generation of projects that work to improve the livelihoods of small and marginal farmers through collective organisations, such as PGs. An assessment of the project is of significant value, because it can aid in the design of such projects. The baseline assessment was conducted between August and September 2018. This report analyses the data collected during that survey.

2. Existing evidence

Women's low level of autonomy and lack of involvement in household decisions about income, as well as a large number of indicators that suggest discrimination against women and girls have long been characteristics of much of India. To the extent that these characteristics are linked to low levels of economic development, the sustained period of high-income growth in the country since the 1990s provides the promise of enhancing women's empowerment, typically defined as an improvement in women's ability to make their own decisions regarding the constituents of development, such as health, education, earning opportunities, rights and political participation (Duflo 2012). Encouragingly, India's 2018 *Economic Survey,* using data from demographic and health surveys between 1980 and 2016, reported significant improvement in women's decision making abilities and education levels. The latest survey round (2016) revealed that more than 70 per cent of women were involved in decisions about their health, large household purchases and visits to family and relatives.

However, a decline in the labour force participation rates of women between the ages of 15 and 49 was of significant concern. The demographic and health surveys revealed that labour force participation rates dropped from 36% in 2005–06 to 24% in 2015–16, a period during which India's gross domestic product (GDP) growth rate was approximately 7% a year. This is of concern because a large volume of literature in economics argues that women's bargaining power within the household does not depend on total household income but on the income they control, and consequently, their contribution to household income (Bourguignon and Chiappori 1992; Browning et al.1994; Lundberg and Pollak 1993; McElroy and Horney 1981).

Casual empiricism based on the Indian experience has long supported the hypothesis that increases in household income may be insufficient to improve women's bargaining power and that women's labour force participation could be critical in this regard. Noting the significantly greater gender discrimination found in northern India than in the south, Bardhan (1974) ascribes it to regional differences in women's participation in agriculture. He goes further, relating differences in rural women's labour force participation to regional variation in cropping patterns. Specifically, while wheat is the dominant crop in states such as Punjab and Haryana, the cultivation of rice is far more prevalent in the south. Bardhan argues that, perhaps due to technological differences, rice production requires more labour in post-harvest operations. These operations can be undertaken in the house, allowing women in rice-growing regions to combine domestic responsibilities with work. This enhances their contribution to household income, increasing their bargaining power.

Existing research supports the hypothesis that the availability of jobs where women have a comparative advantage positively affects a range of measures of women's empowerment, such as educational spending differences between girls and boys, survival rates for girls and women's participation in economic decision-making. Qian (2008) reports such effects in tea-growing counties of China, arguing that women have a comparative advantage in harvesting operations associated with this crop. Heath and Mobarak (2015) report positive effects on girls' education from improved low-skilled employment opportunities caused by the opening of garment factories in Bangladesh; and Jensen (2012) finds positive impacts on age at marriage and first birth of women in villages in India that were randomly assigned to business process outsourcing recruiters.

If income-earning employment determines bargaining power, does the large decline in women's labour force participation rates in India imply a reduction in their bargaining power over time? The primary explanation offered for the decline in women's labour force participation is the increase in female education. This is the hypothesis underlying seminal work by Goldin (1995) that notes a U-shaped relationship between women's hours of work and their education.

Starting from low levels of schooling, improvements in educational attainment result in a decline in hours of work as more educated women turn away from manual work associated with agriculture, but are unable to join other sectors due to a lack of suitable employment opportunities available for women with middling levels of education. At higher levels, an improvement in employment opportunities results in women's hours of work increasing with education. Within India, the U-shaped relationship has been evoked to explain the decline in women's employment in the past decade (Government of India 2018). Researchers have argued that the lack of diversification of the Indian economy and women's inability to find suitable jobs in the non-agricultural sector underlie this decline (Kapsos, Silberman and Bourmpoula 2014).

Goldin's (1995) hypothesis relating the decline in hours of work to increased education, thus, reflects a stigma against or an aversion to manual fieldwork as schooling levels increase and a lack of 'suitable' jobs for educated women. This stigma is likely to be even stronger in India, given the strength of norms that ascribe low socio-economic status to manual work (Weiner 1990). This, in turn, would imply that the decline in hours of work may commence at lower levels of schooling and be more protracted than in other countries.

This shift to the right may be even larger in rural areas where opportunities for non-manual jobs are particularly limited, explaining the persistence of the negative relationship between hours of work and education even as levels of schooling have improved significantly. Much of rural India has, in fact, been characterised not just by a lack of non-manual jobs but also a scarcity of manual jobs in the non-agricultural sector. The inadequate growth of both skilled and unskilled non-farm jobs contributes to the problem, because it inhibits the sectoral shift of the male population from agriculture to non-agriculture.

The continued dependence of rural men on agriculture for their livelihoods underlies the rapid decline in farm size that the economy has witnessed. This decline has been the largest in low-income states associated with high fertility and lack of non-farm employment. In Bihar, data from the latest agricultural census reveal that 74 per cent of land holdings in the state were less than 0.5 hectares (1.24 acres) in size and 91 per

cent were less than 1 hectare (2.47 acres) (Government of India 2016). These percentages have steadily fallen over time: in 1995–96, 60 per cent of agricultural holdings in the state were smaller than 0.5 hectares and 80 per cent were less than 1 hectare. The average size of holdings, already very small in 1995–96 (0.75 hectares/1.85 acres), had declined to only 0.39 hectares (0.96 acres) by 2010–11 and has since remained at this level (ibid.). In turn, the decline in farm size reduces farm employment opportunities for women.

Reduced opportunities for employment in the local village economy disproportionately affect women. Men can compensate for lack of local jobs within the village by commuting to employment in neighbouring towns, should such towns exist, or by seasonal and short-term migration to more distant towns. For women, such job-related mobility is constrained by a number of factors, including: (1) their role as primary care givers for children and the elderly and, more generally, in domestic production; (2) the increased desire to keep children in schools, which reduces women's ability to accompany their husbands during short migrations for employment purposes; and (3) social norms that inhibit women's employment in any work outside the home, even in their village of residence. It is worth noting that men's choices may further restrict opportunities for women. If men migrate seasonally, women are more likely to remain close to the home, not just due to a positive income effect attributable to remittances from migrants but also because women's responsibility within the domestic sphere may increase.[3]

If the decline in women's labour force participation in India reflects improvements in their schooling, does the positive relationship between labour force participation and women's empowerment suggest that improvements in education may lower female bargaining power? Such a conclusion would be at odds with a large volume of empirical literature that establishes a positive relationship between women's education and a variety of gender outcomes; and argues that this, in turn, reflects a positive relationship between education and bargaining power (Thomas 1990, 1994). In India, however, there is evidence that this relationship could be negative. Research by Das Gupta (1987) on Punjab shows that sex ratios fall with women's education. She argues that this results from preferences for girls that fall more rapidly with maternal education than for boys.

Opening up a role for preferences is, however, equivalent to arguments that relate outcomes to social norms. The confounding effect of social norms and stigma makes it difficult to interpret correlations between women's education and bargaining power. These norms apply differently to women of different ages, wealth groups and education levels. Thus, if increased education reduces women's workforce participation and empowerment, this may very well reflect social norms that become more binding as education levels increase. Similarly, declining labour force participation rates among young women likely reflects social norms that apply both by age and by levels of schooling, despite younger cohorts today having far higher levels of schooling than they did in previous years.[4]

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[3] For example, they may be required to spend more time caring for livestock without help from their husbands and to look after farms, even if they are leased out.

[4] Eswaran, Ramaswami and Wadha (2013) examine the role of caste (SC/ST, other backward castes, and general castes), education and land ownership in explaining women's hours of work. They report a negative effect on education, which increases with land ownership. In some of their specifications, the negative effect of education is slightly smaller among higher castes.

What are the policies available for enhancing women's employment and consequently, empowerment within this context? The first set of policies relates to agricultural productivity. Although an earlier literature argued that smaller farms were characterised by higher productivity, recent research attests that the inability of small farms to exploit economies of scale in farm production places them at a severe disadvantage (Foster and Rosenzweig 2011). Economies of scale in agriculture exist as a consequence of the greater productivity associated with farm mechanisation, but also because of the significant fixed costs that must be borne to access larger markets and inputs such as credit and information. Unable to bear large, fixed costs, small farms typically sell their produce to village traders who offer significantly lower prices than those that would be available were farmers able to trade in national markets.

Aggregating the output of small farms, through PGs, may provide one method of enhancing farm productivity. Such aggregation also makes it possible to lower the fixed costs associated with training farmers on both improved agricultural practices and post-harvest operations and marketing methods. To the extent that this increases the time required for post-harvest activities, it creates the potential to increase women's role in agriculture—such activities do not require physical labour or engagement outside the farm and are, therefore, less likely to conflict with social norms regarding work that is suitable for women to engage in. This approach may be particularly well-suited to addressing social norms that inhibit women's workforce participation as household wealth increases.

Working within community-based organisations (CBOs) such as PGs may confer additional advantages in that they provide a means for changing social norms. Changing views about what jobs are regarded as socially acceptable for women is hard to do at individual level; it requires collective action. Women are more likely to work if their neighbours and peers are also working; men are more likely to accept such changes if other households in the village view it as acceptable.

Accumulated empirical evidence suggests that SHGs provide a means for initiating such change. While evidence on the impact of SHGs and microfinance institutions on income and livelihoods is mixed, some of it suggests a positive impact on measures of women's empowerment (Desai and Joshi 2013; Prennushi and Gupta 2014; and the review article by Brody et al. 2015). However, the evidence of declining job rates indicates that improving women's engagement in income-earning activities will not automatically follow from their participation in CBOs. It would appear that groups with an explicit objective of improving incomes, such as PGs, are likely to be more successful in this regard.

This view is supported by evidence on an alternative policy that seeks to reduce poverty for ultra-poor households through a graduation approach that combines a grant for a productive asset with a large number of complementary interventions, including weekly consumption support in initial periods, training (such as training in life skills and women's legal, social and political rights) and access to credit, healthcare and other services. Evaluations of these programmes (Banerjee et al. 2015) generally find large and significant improvements in consumption, food security, asset holdings and savings. However, identified short-run effects on women's empowerment and physical health failed to persist after the first year.

3. Project description and implementation

WARDA started maize operations in the Damdaha block of Purnea district, the block where the FPC office was located. The choice of Damdaha district as a starting point was made in consultation with JEEViKA and the World Bank, following a market assessment study conducted to understand the feasibility of the project in this block.

The key achievement of WARDA lay in disrupting traditional value chains and substituting them with a system that allowed more direct participation of smallholder women farmers in the market through women-owned and managed FPCs. As mentioned above, JEEViKA-promoted FPCs were either defunct or faced massive losses in the absence of clear mandates and well-crafted business plans. This meant that despite being shareholders in FPCs, it was business as usual for farmers who continued to sell their produce to village traders or intermediaries.

The traditional value chain involved PG members selling their produce to middlemen, who underpaid farmers by resorting to practices such as *dhalta*.[5] Aggregators would purchase all produce at a uniform rate without differentiating for quality of grain and bargain for extra units of produce per transaction. This combination of unorganised trade consisting of multiple market intermediaries with weighing and grading malpractice significantly reduced the final price farmers got for their produce.

Figure 1: Traditional maize value chain
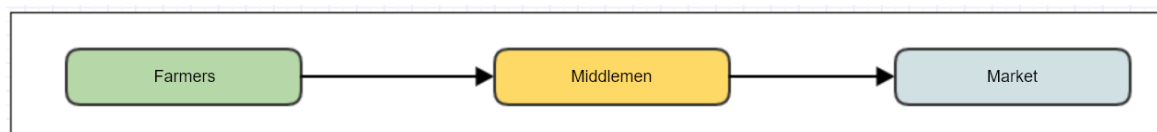
It is important to note that the practice of selling agricultural produce to middlemen is motivated by factors that are more complex than convenience and are entrenched in the context. The middlemen are often also the village moneylenders the farmers depend on for credit, especially during sowing and harvesting. Consequently, upsetting this relationship has wider socio-economic ramifications. Responding to the contextual complexities, TechnoServe, therefore, simultaneously worked on a range of activities motivated by the larger aim of establishing a sustainable value chain that hinged on a financially viable FPC.

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[5] *Dhalta* is a local practice of village middlemen to *arbitrarily* bargain for extra units of produce per transaction, citing poor quality of produce and/or losses that they would incur in handling and transportation of maize to the local *mandis(markets)*. Village middlemen do not distinguish between different qualities of maize being sold by the farmers and offer an aggregate price for the entire lot. Additionally, TechnoServe field officials report that the weight and measure instruments used by village middlemen are locally made and generally calibrated in their favour.

Figure 2: TechnoServe-facilitated maize value chain
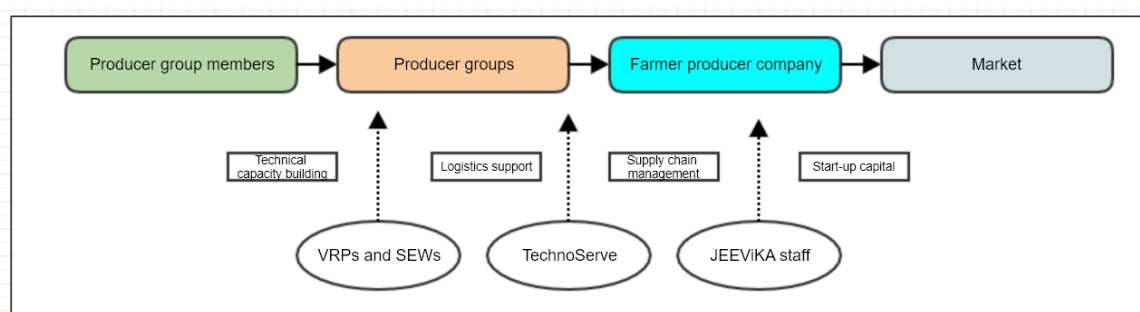
The theory of change underlying this programme is outlined in **Figure 3**. JEEViKA frontline workers, comprising village resource persons (VRPs) and skilled extension workers (SEWs), aggregate SHGs into village-level PGs. PG members are motivated to become shareholders in FPCs that can carry out business on a commercial scale. Under the WARDA project, TechnoServe works with JEEViKA, PGs and FPCs to help pilot approaches to value chain strengthening for identified crops.

The theory of change lays out the pathways to change envisioned as part of WARDA. It is important to note the dotted line that connects TechnoServe to the PGs. Per the original plan, TechnoServe was required to work only with JEEViKA and FPCs by building their capacity to implement the business plan developed collaboratively with the participation of different stakeholders, but facilitated by TechnoServe. Although capacity building is the cornerstone of WARDA's approach to help build a sustainable model, WARDA combines a number of innovative processes and interventions put in place to facilitate setting up profitable value chains for the farmer producer company.

The key outcomes WARDA hoped to achieve, as identified by the project team, were at three levels: (1) at farmer level, to help women attain greater mobility and control over household income, resources and decisions; (2) at household level, to increase household income from better price realisation and participation in markets; and (3) at FPC level, to help build a well-governed and financially sustainable institution.

Figure 3: WARDA theory of change for maize crop
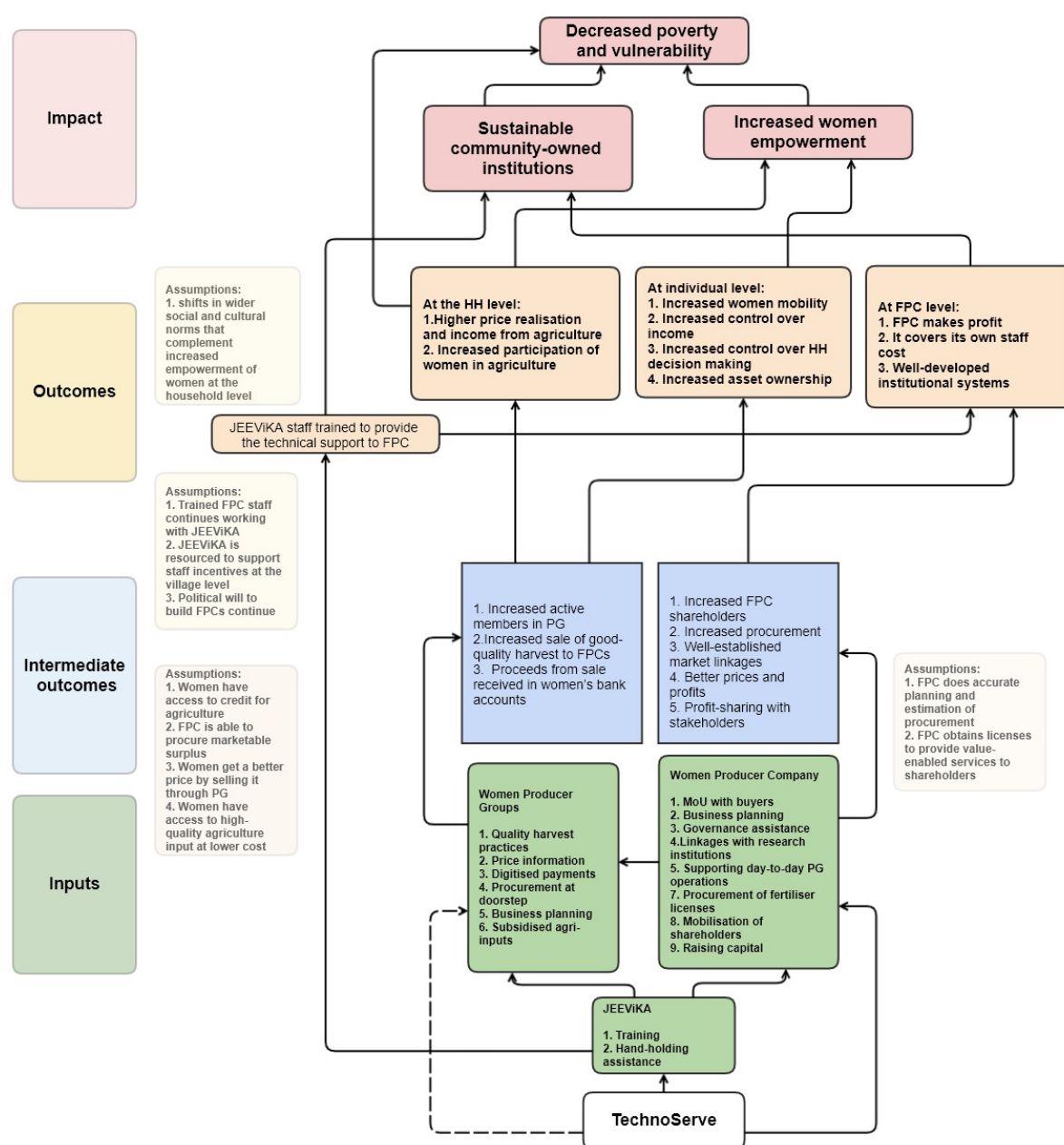
In 2015, in its first year of operation, only 10 PGs with a total of 657 members were included in the project. By 2016, the number of PGs increased to 73. By 2017, the project extended to a total of 110 PGs (with around 8,000 total members), spread across four blocks in Purnea district and one block in the adjoining district of Katihar. The first two years were a pilot, and the project was officially launched in 2017.

WARDA's business plan necessitated implementation at scale: the economic viability of the FPCs—and hence the entire system—required a relatively large number of PGs to be members of the federation. Thus, the intent of the project was to 'saturate' a block, a distinct geographic and administrative unit within a district, before moving on to others, linking all available PGs within the block to an FPC. However, as detailed in our process evaluation, rollout after 2017 slowed. The primary reason for this appears to have been

the slow pace of JEEViKA's promotion of PG. Management information system (MIS) data reveal that only 22 new PGs were formed in 2018. Future plans called for the creation of just 11 PGs in 2019 and 15 in 2020 (in new blocks).

The second implementation issue, also described in our accompanying process evaluation, related to the PGs' procurement of maize for sale through FPCs in the 2017–18 rabi season,[6] preceding our baseline assessment. Prior to this season, acquisition of output had been through door-to-door visits to PG members. This significantly reduced costs for farmers, ensuring that a relatively high proportion of members sold their produce through the PG. In the 2017–18 season, however, this approach was changed to one that required farmers to bring their produce to collection centres. Our understanding is that this change was not well communicated: Farmers lacked information on the new marketing channel and frequently received information very late. As a result, sales through the FPCs dropped significantly during this season. MIS reports from TechnoServe suggest that only 13% of PG members sold grain through the FPCs, compared to more than 40% in previous seasons, and our survey data, discussed below, show that only 5% of PG members did so.[7]

This significant decline reinforces the importance of attention to implementation details regarding the methods or providing information to farmers and collecting crop output. It suggests that the reduction in transportation costs offered by a door-to-door programme is critical to the success of the programme, and confirms that profit margins for the marginal and small farmers that constitute these PGs are small.

4. Objectives and methodology of baseline assessment

In most cases, a baseline assessment is just one component of the data required for an impact evaluation. Because it is generally conducted prior to the implementation of a programme, it provides no evidence on the programme itself. Instead, it serves to understand specific socio-economic features of the region that may affect programme outcomes and implementation. Most baseline studies primarily report summary statistics for the programme region, sometimes combining these with formative analysis that helps identify existing constraints on intended outcomes.

The first part of this report follows this objective, describing summary statistics that help to understand households and the survey region, and are helpful in both shaping any final impact evaluation that may be undertaken and designing related policies. Because the project had started working with PGs prior to the baseline, it allows us to go further and also explore causal relationships using a difference-in-difference framework that exploits the differences between treatment and control PGs, and between target and non-target households.

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[6] The rabi season relates to crops that are sown in winter and harvested in the spring
[7] This discrepancy may reflect that MIS records provide information on a per transaction basis, not a farmer basis, and that unique IDs were not attached to each farmer. As a result, multiple transactions were recorded for a farmer. In the absence of unique IDs, we attempted to reconcile the data by matching by name. This resulted in a 5 per cent decline in the proportion of sales reported in the MIS system. Because matching by name was imperfect, the difference between the MIS estimates and survey estimates would probably be further reduced.

Our final sample comprised around 5,200 members of 79 PGs, of which 70 per cent (55) were in the treatment sample and 30 per cent (24) in the control. Both treatment and control PGs were divided across three blocks.[8] There was no choice over the control sample—all available PGs were included. To try and ensure the comparability of the two sets of PGs, we attempted to restrict our attention to treatment PGs that had been formed relatively recently: We included all six PGs that had entered the project in 2018 and selected the remaining sample randomly from those that had entered in 2017. However, these samples had to be subsequently adjusted, because some of the initially selected PGs were no longer functioning or because duplicate PGs had been included in the MIS data, we based our selection on. We ended up including eight PGs formed in 2015 and 2016. The majority of treatment PGs (75%) were initiated into the project in 2017 (i.e. for the 2016–17 rabi season), with 11 per cent (6) entering in 2018.

We were, however, aided by a unique feature of existing PGs, which likely exists because this is a formative stage for agricultural livelihood-based PGs in India. Despite the intervention seeking to enhance agricultural incomes, membership in PGs is not restricted to cultivators or land-owning households. On average, as many as 36 per cent of members of our survey PGs came from landless households.[9] Although such households may still have access to maize, if paid in kind for work as agricultural labourers, their participation in the project was likely to be minimal.

This allowed us to divide PG members into target and non-target samples, and offered potential to use difference-in-difference regressions combining any time-series variation with variation across treatment and control PGs, as well as between (predicted) target and non-target PG members. Rather than draw samples of target and non-target members from the total membership of the PG in question, we surveyed all members of our sample of treatment and control PGs.[10] This removed the previously mentioned, common problem in evaluation studies of identifying treatment effects in contexts where take-up is low (Crépon et al. 2015). We sampled the entire PG, which provides for the significant advantage of being able to address issues related to the effect of the composition of the PG and possible spillovers that may exist between PG members.

However, the set of outcomes we could evaluate was constrained by the very limited sales through the Aranyak FPC in the 2017–18 rabi season. This meant that causal impacts of the project on outcomes such as agricultural incomes, marketing channels and prices could not be estimated using data just from the baseline assessment.

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[8] For the treatment sample, 25 PGs came from Barhara Kothi, 21 from Dhamdaha and 9 from Bhawanipur. In the control sample, 13 PGs came from Purnea East, 9 from Rupauli block and 2 from Krityanand Nagar.

[9] Fieldwork conducted during the course of this study revealed that landless households joined PGs because they were not quite sure what the role of the PG was and thought that they might have some benefits, despite not growing any maize.

[10] We had initially planned such an approach based on a predicting exercise to identify active and inactive members for a smaller sample of PGs based on a census survey for this smaller sample. This increased costs, but the binding constraint was the ability of the survey field team to identify those PG members to be included in the survey 'on the ground.' Given the very high possibility for significant error in this process, we decided instead to survey all PG members.

Given the inability to address issues related to agricultural incomes and increases in the incomes controlled by women, the section of this report that focuses on causal impacts is restricted to a study of women's empowerment. Even without an increase in the income women control, the project is likely to have affected women's bargaining position due to its objective of providing women with training on agricultural practices and post-harvest operations to increase farm productivity. Research evidence suggests that projects that train women in business skills do produce some positive results, such as greater participation of women in formal credit markets (Field et al. 2016).

Thus, the objectives of this baseline assessment were twofold. Firstly, we provided descriptive statistics from the baseline data to better understand local conditions and help guide any future evaluation. This information might also help inform future policies in this area. Secondly, we supplied evidence from an empirical analysis of the project's effect on women's empowerment.

For the baseline survey, we implemented a standard household module, with detailed data on agricultural output, marketing channels and additional sources of income. The module also provided information on hours of work by both men and women. The household module entailed a section on women's empowerment in agriculture, the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) that had previously been used to study women's empowerment in an agricultural context. We also included modules intended to collect information on JEEViKA frontline personnel, the VRPs and SEWs. These sections could not be completed for all such personnel. Thus, data are available for just 61 VRPs.

The baseline household questionnaire can broadly be divided into three sections.

Table 1: Household questionnaire

Question categories	Target respondents
Demographics and socio-economic background	Fielded to the most knowledgeable household member
Expenditure	
Productive and financial assets	
Savings account and outstanding loans	
Income from wages, enterprises and other sources	
Agricultural cultivation details	
Minimum dietary diversification	Questions related to women's dietary diversity, awareness, participation in CBOs, mobility, etc. – fielded to a PG member
Female respondents' background and CBO membership	
Women's awareness of FPCs	
Women's awareness of household agriculture	
Women's participation in CBOs	
Accessibility and mobility	
A-WEAI	Questions related to women's empowerment – fielded to a PG member and male household head

5. Timelines

Following approval of the pre-analysis plan for the evaluation, the first draft of the baseline household survey was developed in January 2018. We extensively consulted the TechnoServe project, their monitoring and evaluation team and team members of the Bill & Melinda Gates Foundation to refine the survey instrument, which was piloted three times between April and June 2018. TechnoServe developed the enumerator instruction manual and hired the survey agency, Social Research Network Organization (SRNO), for the study. SRNO was brought on board in late June 2018, and enumerator training began shortly thereafter. Baseline data collection took place over the next two and a half months, followed by data cleaning. SRNO handed over the last set of clean data in February 2019.

Figure 4: Major milestones for baseline assessment
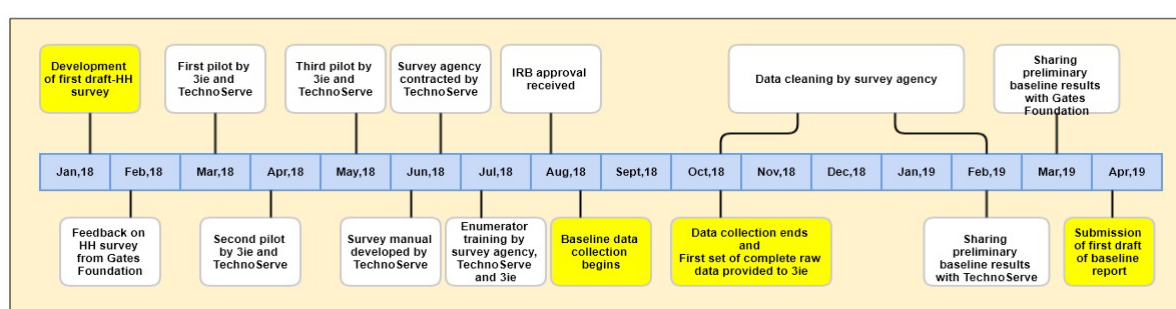
Note: HH = household

We conducted preliminary data analysis even as SRNO was cleaning the data, and we shared initial findings with TechnoServe in February 2019 and the Bill & Melinda Gates Foundation in March 2019. In collaboration with TechnoServe, we applied to The Institutional Review Board of Sigma (Sigma-IRB) for ethical clearance of the baseline assessment. The Sigma-IRB Committee approved the study in early August 2018, in accordance with the compliance of the Title 45, Code of Federal Regulations, sub-part A (Common Rule) of National Institute of Health (NIH).

6. Descriptive statistics

6.1 Socio-economic background

Table 2 provides details on the socio-economic background of the women surveyed and their households, for the sample as a whole and then separately for members of treatment and control PGs. PGs constituted under JEEViKA are generally drawn from among poorer households. This is reflected in the relatively high proportion of members from SCs and STs at 37 per cent, relative to 16.25 per cent for the district (2011 Census). Levels of literacy and schooling are very low, but this is partly a consequence of PG members being generally older: the average age of members is 41 years.

Table 2: Socio-economic and demographic characteristics of female members of PGs surveyed

Variable	Full sample	Treatment PGs	Control PGs
Age	41.33	41.87	39.89
	(12.21)	(12.40)	(11.58)
SC/ST	0.37	0.39	0.33
	(0.48)	(0.49)	(0.47)
Literate (read/write)	0.19	0.18	0.22
	(0.39)	(0.38)	(0.41)
Attended school	1.81	1.82	1.78
	(0.40)	(0.39)	(0.42)
Highest grade completed	1.39	1.31	1.62
	(3.16)	(3.06)	(3.40)
Widow	0.09	0.09	0.07
	(0.28)	(0.29)	(0.26)
Number of children	2.71	2.73	2.66
	(1.58)	(1.62)	(1.48)
APL household	0.55	0.54	0.57
	(0.50)	(0.50)	(0.49)
Prop. owning some agricultural land	0.64	0.63	0.67
	(0.48)	(0.48)	(0.47)
Land owned, for those owning land (acres)	1.09	1.04	1.20
	(1.60)	(1.48)	(1.87)
Women's occupation			
Prop. of women whose primary occupation is cultivation	0.30	0.29	0.34
	(0.46)	(0.45)	(0.48)
Prop. of women whose primary occupation is casual labour	0.19	0.18	0.21
	(0.39)	(0.38)	(0.41)
Prop. for whom primary occupation is (any) productive work	0.54	0.51	0.60
	(0.50)	(0.50)	(0.49)
Prop. for whom primary occupation is domestic work	0.41	0.42	0.35
	(0.49)	(0.49)	(0.48)
Household occupation			
Prop. from households whose main occupation is cultivation	0.51	0.50	0.52
	(0.50)	(0.50)	(0.50)
Sample size (n)	5,228	3,812	1,416

Note: APL = Above poverty line; productive work includes work on own farm or own non-farm business, casual labour market, skilled labour market, livestock, fisheries and salaried employment.

Because we surveyed all members of PGs, this average is identical to the mean age of women in our survey PGs. A histogram of age (**Figure 5**) reveals the very small proportion of young women: Women between the ages of 20 and 30 constitute only 12 per cent of the sample (of women over the age of 20). This age distribution has important implications for what we can achieve through PGs. For example, with membership reflecting a slightly older population, any improvement in the bargaining position of

members may have minimal effects on decisions regarding fertility or the health of infants. Conversely, affecting change among this age distribution may have a larger effect on the schooling attainment of the women's children.

Figure 5: Histogram of age of sample PG members
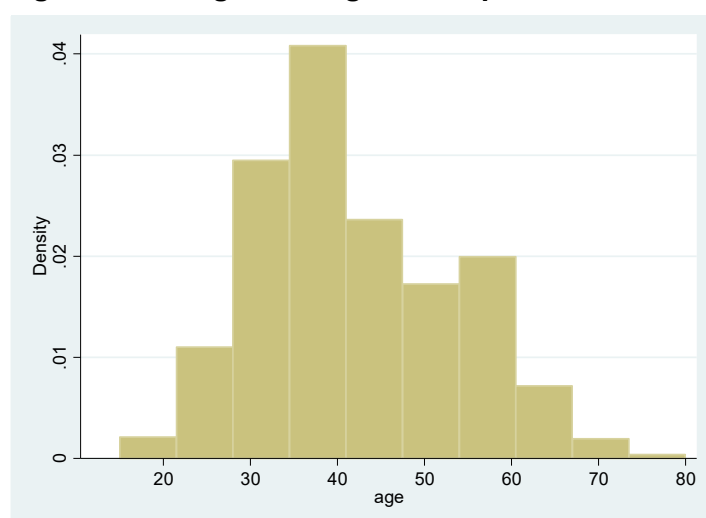
Approximately 64 per cent of the sample own land and 51 per cent of households report cultivation to be their primary occupation. Among landowners, average land size, at 1.09 acres, is almost identical to the average farm size for the state (0.96 acres, 2015–16 Agricultural Census). The proportion of women who report cultivation as their primary occupation, at 0.30 is, not surprisingly, lower than the same statistic at the household level. However, summing all income-earning activities: 54 per cent of women report an income-earning activity as their primary occupation, while 41 per cent report their primary occupation to be domestic work within the home. This percentage is lower in control blocks (35%), with a correspondingly higher percentage reporting their primary occupation to be an income-earning activity (60%).

Because treatment and control blocks are contiguous, all falling in the western part of the district, agro-economic conditions are generally very similar.[11] However, even within the relatively small geographical area of a district, there are important differences that may affect outcomes. The district is divided into four distinct agro-economic zones (Government of Bihar 2011), with the PGs in our treatment sample falling in the Kosi Flood Plain West zone, comprising areas to the west of the old bed of the Kosi river. In contrast, two of the control blocks, Krityanand Nagar and Purnea, fall in a different agro-economic zone, the Central Purnea Plains. Additionally, their proximity to the district headquarters in Purnea town suggests the potential for significant differences between treatment and control PGs.

Small differences in socio-economic indicators are, indeed, apparent in **Table 2**. For example, although both treatment and control PGs have a higher proportion of members from SCs and STs than the district average, this percentage is greater in treatment PGs. Similarly, measures of education, the proportion of households owning land and average

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[11] Most impact evaluation studies that use a difference-in-difference regression in the Indian context are conducted at district level; for example, Imbert and Papp (2015).

land size of landowners are all lower in treatment PGs: average land size among landowners is 1.04 acres in treatment PGs, but 1.2 acres in control PGs.

6.2 PG and VRP characteristics

The socio-economic characteristics detailed in **Table 2** provide information on PGs, because we surveyed all members of our survey PGs. Thus, data on land ownership and primary occupation reflect the socio-economic background of PG members. In addition to such socio-economic characteristics, the size of PGs may also significantly affect outcomes. The average size of a PG is 66 members. However, variation is large, with the smallest PG having only 25 members and the largest 153. **Figure 6** graphs this variation, providing information on the variation in PG size by quartiles of the distribution of membership size across all PGs.

Figure 6: Box plots of (membership) size of PGs, by quartiles of total membership
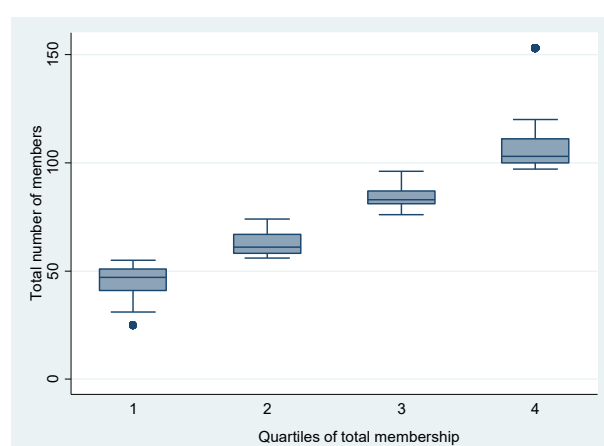
PG size is likely to positively affect some outcomes, but have adverse effects on others. On the positive side, the focus of the project on scale requires a relatively large number of active members within a PG. This is reinforced by JEEViKA staff being primarily associated with WARDA. VRPs and SEWs are paid on commission, which varies with the amount sold to the FPCs. As a result, their incentives to exert effort are limited in small PGs. On the negative side, large group size is known to adversely affect collective behaviour (Olson 1982). Information on the effect of size on the PGs' operation is limited.

Information on VRPs comes from a module designed to collect data on all VRPs associated with our survey PGs. As noted above, we obtained such data for just 61 VRPs: 43 associated with treatment PGs and 18 with control PGs. The VRP is a dedicated member of the community cadre responsible for training PG and SHG members on best agricultural practices and supporting their implementation. TechnoServe was not mandated to conduct VRP training. Its capacity-building efforts were directed at state- and district-level teams, and should, therefore, theoretically benefit all PGs in the state, regardless of treatment status. However, recognising the lack of capacity within JEEViKA to ensure adequate training of field staff, TechnoServe provided orientation sessions, leaving responsibility for continuous capacity enhancement of VRPs through regular training to JEEViKA. TechnoServe officials noted the need for constant hand-holding support of JEEViKA frontline staff, particularly at the beginning of the procurement season.

The data reported in **Table 3** suggest differences across these two groups in terms of age, sex, and completed years of schooling, with VRPs in treatment PGs being slightly older (mean age of 33 compared to 26), more likely to be male (0.74 in treatment PGs and 0.5 in control PGs) and less educated (11 years of completed schooling compared to 12 for VRPs in control PGs). Of more interest are data on the training they received on different topics: 65 per cent of VRPs in treatment PGs reported having received training on agricultural practices, as opposed to just 39 per cent in control PGs. Proportions reporting training on other topics, such as financial literacy, the formation of PGs and how to mobilise women, were approximately equal across the two sets of PGs. These proportions are low, which reflects that responsibility for mobilising women and overseeing lower-level community institutions generally rested with other JEEViKA staff.

Table 3: VRP characteristics

Variables	Full sample	Treatment PGs	Control PGs	T-test for difference
Age	31.26	33.42	26.11	1.78[*]
	(14.91)	(2.35)	(2.95)	(0.08)
Prop. male	0.67	0.74	0.5	1.88[*]
	(0.47)	(0.07)	(0.12)	(0.07)
Completed years of schooling	11.36	10.95	12.33	-1.01
	(4.88)	(0.25)	(2.05)	(0.09)
Years of experience as VRP	3.72	3.95	3.17	1.34
	(2.09)	(0.35)	().35)	(0.18)
Prop. also assigned to same PG in 2017	0.64	0.70	0.5	1.47
	(0.48)	(0.07)	(0.12)	(0.15)
Any other source of income	0.51	0.51	0.50	0.08
	(0.50)	(0.08)	(0.12)	(0.94)
Prop. who received any training in:				
Agricultural practices	0.57	0.65	0.39	1.91[*]
	(0.50)	(0.07)	(0.12)	(0.06)
Financial literacy	0.36	0.37	0.33	0.28
	(0.48)	(0.07)	(0.11)	(0.78)
Mobilising women	0.15	0.16	0.11	0.51
	(0.36)	(0.06)	(0.08)	(0.61)
Formation of PGs	0.18	0.21	0.11	0.90
	(0.39)	(0.06)	(0.08)	(0.37)
Sample size (n)	61	43	18	

Note: Figures in parentheses for full sample are standard deviations, and standard errors for treatment and control PGs. For T-tests, figures in parentheses are Pr(|T|>|t|), for the null hypothesis of equal values.

6.3 Survey evidence on sales through the FPC, rabi season 2017–18

Table 4 to **Table 7** document marketing outlets by survey households for the 2017–18 rabi season, as well as for the 2016–17 season. They confirm the large decline in sales through PGs between these two years, a consequence of the change in procurement

practices.[12] In treatment PGs, only 4 per cent of households reported sales of maize through the PG.[13] The vast majority of households sold maize to informal traders who came to the village. Sales through FPCs were higher in the 2016–17 rabi season, with nearly 18 per cent of households reporting such sales. That year, too, informal village traders remained the preferred marketing choice.

Table 4: Percentage of households reporting sales by trader type, rabi seasons 2017–18 and 2016–17

Trader type	Rabi 2017–18	Rabi 2017–18, TechnoServe PGs only	Rabi 2016–17	Rabi 2016–17, TechnoServe PGs only
Trader from village	75.64	73.66	66.79	62.52
Trader who comes from outside to the village	17.92	19.82	16.30	17.30
Mandi (market) outside village	3.24	2.20	3.17	1.92
Mandi (market) inside village	0.10	0.09	0.07	0.05
FPC	3.10	4.22	13.67	18.21
Sample size (n)	2,902	2,190	2,773	2,081

Table 5 and **Table 6** reveal that the duration of the project did not significantly affect marketing choices in either season.

Table 5: Percentage of households reporting sales by trader type and year TechnoServe operations started, rabi 2017–18

	2015	2016	2017	2018	No operations
Trader from village	75.90	77.91	70.0	100	77.17
Trader who comes from outside the village	18.6	14.80	23.83	–	16.20
Mandi outside village	2.75	2.02	2.67	–	5.89
Mandi inside village	0.14	0.11	–	–	0.15
FPC	2.62	5.16	3.50	–	0.59
Sample size (n)	726	892	600	5	679

Table 6: Percentage of households reporting sales by trader type and year TechnoServe operations started, rabi season 2016–17

	2015	2016	2017	2018	No operations
Trader from village	61.45	69.29	62.69	60.00	73.42
Trader who comes from outside the village	13.09	13.36	24.36	40.00	16.28

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[12] Discussions with TechnoServe staff revealed that two factors possibly contributed to the dip in sales to FPCs. Either the farmers lacked information about the changed procurement practices or, in cases where they did not, they were reluctant to carry produce to the procurement centre.

[13] As previously noted, the difference between survey estimates and those from MIS data reflect the difficulties in working with the MIS data due to the lack of a unique ID for each woman member. It may also reflect possible measurement errors in the survey data.

Mandi outside village	2.99	1.48	2.39	–	6.64
Mandi inside village	0.14	–	–	–	0.17
FPC	22.33	15.87	10.56	–	3.49
Sample size (n)	703	876	587	5	602

Finally, **Table 7** shows the amount sold to different sources and whether the distribution of marketed output differed from the frequencies at which households sold through different sources. This table reveals that these two frequencies are very similar—the amount sold by treatment PG members to the FPC (3.5% of total sales) was only slightly smaller than the percentage of members reporting sales. For this group, 72 per cent of sales were to informal traders.

Table 7: Amount harvested and sold through different marketing sources, rabi 2017–18

Households reporting maize output		
Amount in quintals	TechnoServe PGs (n = 2,487)	Other PGs (n = 893)
Maize output	69.16 (1,516.02)	27.68 (31.48)
Total sales	26.11 (82.40)	20.62 (30.09)
Trader type		
Informal, inside village	18.77 (79.98)	15.52 (24.35)
Informal, outside village	5.22 (19.22)	2.95 (26.28)
Mandi outside village	1.18 (15.12)	2.14 (13.14)
Mandi inside village	0.01 (0.44)	0.01 (0.27)
FPC	0.92 (6.72)	0

Note: Figures in parentheses are standard deviations.

In our household survey, we asked women to list their preferred choice of trader and state their reasons for this choice. Not surprisingly, women's stated preferences closely matched the data on actual sales sources. Of women in treatment PGs reporting agricultural incomes earned during the 2017–18 rabi season and stating a preference, 73 per cent reported preferring the village trader, while only 5 per cent reported a preference for the FPC. The primary reason women listed for their preference for a village trader was that they had greater control of cash receipts (reported by 59% of women in treatment PGs).[14] The only other significant reason (reported by 39% of treatment PG members) was the timely receipt of payments from village traders, who generally handed over cash to sellers immediately upon sale of the produce.[15]

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[14] This question was asked separately for each source—for each source, we asked the reason that source was preferred.

[15] At the time of the survey, the researchers were not aware of the change in the FPC procurement model. The response options to the question on farmers' reasons for choosing a particular source were, therefore, restricted to those around cost considerations in transporting produce, trust, access to inputs and credit, better prices and bonuses. Although there was an option for 'any other' reason, it was hardly used.

6.4 Women's knowledge of agriculture and FPCs

Given the focus of WARDA on agricultural operations and communicating information on agriculture to women, we also included questions to measure women's knowledge of agriculture. These questions were asked only of women from households that reported some agricultural income in the 2017–18 rabi season. **Table 8** shows responses to a sub-sample of these questions.

Table 8: Women's knowledge of agricultural operations

Variable	Full sample	Treatment PGs	Control PGs
Total knowledge score	5.80	5.72	6.0s3
	(1.56)	(1.57)	(1.52)
Prop. of women who know:			
Amount of land under cultivation	0.94	0.94	0.94
	(0.23)	(0.24)	(0.23)
Amount of Di-ammonium Phosphate	0.83	0.81	0.87
(DAP) fertiliser applied	(0.38)	(0.39)	(0.33)
Whether a loan was taken out for	0.13	0.13	0.13
agricultural purposes	(0.33)	(0.33)	(0.34)
Amount of output produced	0.80	0.81	0.78
	(0.40)	(0.39)	(0.41)
Quality of output	0.28	0.26	0.36
	(0.45)	(0.44)	(0.48)
Type of trader used	0.75	0.75	0.76
	(0.43)	(0.43)	(0.43)

Sample: Women reporting any agricultural income in Kharif 2017–18

Note: The table shows results for a partial list of the survey questions relating to women's knowledge of agriculture. The variable 'total knowledge score' reports the sum of indicator variables over all nine survey questions. These are: (1) the amount of land under cultivation; (2) amounts applied of urea, (3) NPK and (4) DAP applied; (5) whether a loan was taken out for cultivation purposes; (6) the amount of the loan; (7) the total amount of agricultural output produced during the season; (8) the type of trader the output was sold to; and (9) the quality of output. All questions relate to women's knowledge of operations in the 2017–18 rabi season.

Relative to a maximum score of nine, women answered more than half the questions affirmatively. The breakdown of the questions reveals that the vast majority of women in both treatment and control PGs knew details such as the amount of land under cultivation and fertiliser usage. However, despite the WARDA project's focus on marketing and improving the quality of maize, only just over a quarter of surveyed respondents stated they could judge the quality of their output. This percentage is lower for treatment PGs, but this may reflect the differences in socio-economic conditions in treatment and control PGs noted in **Table 2**. Additionally, women appeared to have had very little knowledge of household loans. For the sample as a whole, only 13 per cent of women in cultivating households reported knowing whether an agricultural loan had been taken out.

Survey data reveal that 54 per cent of treatment PG members were FPC shareholders. At the time of the survey, members had to pay Rs 500 to become a shareholder.[16] Some 49 per cent of shareholders stated that the primary reason for becoming a shareholder was to receive the patronage bonus. Responding to additional questions relating to the benefits of being a shareholder, 29 per cent of treatment PG shareholders stated that the primary benefit was the ability to sell maize through the PG. Receipt of the patronage bonus was the second most frequent response (17% of treatment shareholders). These relatively low percentages undoubtedly reflected the lack of sales to PGs in the 2017–18 rabi season that ended just prior to our survey. Shareholders' knowledge of the FPC's operations, however, appears limited: 82 per cent of shareholders in treatment PGs stated that they did not know where the company stored foodgrains after procurement; and only 2 per cent stated they knew how the company marketed their produce. Similarly, only 5 per cent were aware of the board of directors within the FPC.

6.5 Benefits of CBOs

Our survey also included a brief module that asked questions regarding the benefits received from any CBOs, including SHGs. Given that all women in the sample were members of such groups, these questions were asked of all survey respondents (in contrast to questions relating to agricultural knowledge that were asked only of those reporting agricultural incomes). This module primarily asked about services such as the availability of financial literacy training, receipt of loans for productive and other purposes, receipt of insurance for agricultural crops, information on market prices, agricultural training and so on. In terms of other benefits related directly to women's empowerment, we asked whether they had attended any sessions or received any training on women's rights and women's roles. We also asked whether they had received help in accessing government programmes.

Few women reported receiving these benefits from CBOs, suggesting that their impact had likely been more in terms of social outcomes and networks than enhanced access to productive inputs, including financial services. The most frequently reported benefits were: (1) training on rights (16% of women in treatment PGs and 25% in control PGs), improved agricultural farming practices (13% and 22%) and financial literacy (13% and 23%); (2) 10% of treatment members reported receiving information on nutrition and/or child care; and (3) 9% stated that the organisation also helped them receive health insurance. The corresponding percentages in control PGs were 12 per cent (health training) and 11 per cent (health insurance). Very few reported loans from CBOs, either for personal reasons or for agricultural production (7% and 6%, respectively, for the sample as a whole).

We also asked women which of these benefits they found the most useful. For the sample as a whole, women cited financial literacy training (25% of the sample) as the most beneficial. Following this, 21 per cent of the sample stated they had benefitted the most from sessions related to training on agricultural practices and 18 per cent mentioned training on women's rights and roles.

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[16] The subscription fee was initially Rs 200, but was raised to Rs 500 in early December 2017.

6.6 Women's empowerment

Our measures of women's empowerment come primarily from the A-WEAI questionnaire that we implemented as part of the household questionnaire. This questionnaire focused on women's role in decision-making on production and income-generating activities, and their access to productive capital and credit. Malapit and colleagues (2015) provide detailed information on A-WEAI and the construction of indices of women's empowerment based on the questionnaire. Unfortunately, our survey did not implement the entire questionnaire, omitting sections on group membership and questions related to time use data. Thus, although we calculate an index following the guidelines suggested by Malapit and colleagues, it is not comparable to the indices they construct for the countries in their sample.

Following their guidelines, we constructed the following four variables: (1) *credit*, an indicator that takes the value 1 if the woman, either by herself or jointly with another member of the household, made decisions regarding at least one source of credit and reported household borrowing from at least one credit source over the past 12 months; (2) *participation*, if she reported participating in at least two economic activities;[17] (3) *income decision*, if there was at least one domain of economic activity where she participated and provided input into most or all decisions, or if she felt that she could make her own personal decisions to a significant extent in domains related to non-farm economic activities, wage employment, and expenditure on major or minor household durables, as long as this was not just in the domain of minor household durables;[18] and (4) *owning asset*, an indicator that takes the value 1 if she reported ownership, either singly or jointly, of at least one major asset or two minor assets (poultry, non-mechanised agricultural equipment or minor durables). Combining these four components, we report an overall A-WEAI score in **Table 9** for the entire sample, then separately for the treatment and control samples, and then for large and small landowners, with the latter including the landless.[19]

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[17] These are: food crop farming, cash crop farming, livestock raising, non-farm economic activities, wage and salary employment, and fishing or fishpond culture.

[18] This indicator takes the value 1 if the woman reports that she has input into 'most or all' income decisions, or if she reports that she can make her own personal decisions to a 'medium' or 'high' extent with regards to non-farm employment, wage employment or expenditure on household durables.

[19] Guidelines for the construction of the A-WEAI also use information on membership in community groups, reported levels of dissatisfaction with leisure time and attributes of leadership (public speaking). In the interest of brevity, these sections were not included in the version we fielded.

Table 9: Empowerment indices

	A-WEAI	Economic	Mobility	Domestic	Total	Food diversity score
Full sample (n = 5,228)	2.34 (1.15)	2.08 (1.52)	2.89 (1.19)	0.82 (1.00)	5.79 (2.62)	3.72 (1.51)
Treatment PGs (n = 3,812)	2.33 (1.14)	2.00 (1.50)	2.89 (1.19)	0.80 (1.03)	5.69 (2.67)	3.56 (1.38)
Control PGs	2.35 (1.17)	2.28 (1.56)	2.91 (1.19)	0.87 (0.90)	6.05 (2.45)	4.17 (1.74)
Large landowners (n = 1,998)	2.46 (1.09)	2.16 (1.47)	2.84 (1.18)	0.76 (0.98)	5.77 (2.60)	3.81 (1.53)
Small landowners and landless (n = 3,230)	2.26 (1.18)	2.02 (1.55)	2.93 (1.19)	0.86 (1.01)	5.80 (2.63)	3.67 (1.50)
Max. score possible	4	6	6	4	16	10

Note: Large landowners are households in the top half of the land size distribution. The 'Total' index is the sum of scores for the economic, mobility and domestic indices.

We also provide an alternative aggregation of the information the A-WEAI module provides, combining it with responses to other questions in our survey to construct indices that reflect women's empowerment in different dimensions: economic, mobility and household decision-making. The index of empowerment in economic activities (*economic*) sums up women's responses to questions about: (1) their participation in any income-earning activity, (2) their ability to make decisions about the activities they participated in, (3) whether they had control over the use of income, and (4) their role in decision-making about loans from formal and informal sources.[20]

The *mobility* index reflects the number of visits to banks, the market for the purchase of domestic items, and home, as well as indicators of whether permission was required for such visits. The *household* index is based on responses to questions enquiring into the women's decision-making role on major and minor household durables. The overall *general index* is the sum of the scores in these three separate sub-indices.[21] It primarily differs from the A-WEAI reported in this study in its inclusion of data on mobility obtained from the women's responses to questions in the main household survey.

A final measure of women's welfare comes from detailed data on dietary diversification reported by the women interviewed for the A-WEAI module. Although dietary diversification is not a measure of women's empowerment traditionally considered in the literature, it is an important measure of women's well-being, one that we expect to see improve as women's decision-making authority expands. As with the measures of empowerment discussed

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[20] In the module, questions relating to women's decision-making, their input into decisions, and so on were asked separately by activity. Our measure is based on a set of indicator variables we constructed that take the value 1 if women replied affirmatively for any income-earning activity.
[21] We deliberately omitted visits to the market for the purchase of agricultural inputs or the sale of agricultural outputs, because women from landless households could not answer these questions.

above, it is subject to reporting error. However, to the extent that it asks women about their food intake rather than directly about their level of empowerment, it complements other indices by providing a more objective measure of a woman's status. The module we fielded to measure women's dietary diversity follows Food and Agriculture Organization of the United Nations (FAO) and United States Agency for International Development (USAID) guidelines (FAO and USAID 2016). Adopting their definitions, we define a set of indicator variables for each of 10 food groups. These variables take the value 1 if the woman reported consumption of any item in the food group in question over the past 24 hours. Summing these indicators provides the reported measure of dietary diversification. Women are considered to meet minimum dietary diversity if their total score is equal to or exceeds 5. Our regression analysis based on this measure is, however, based on their total score.

The data in **Table 9** suggest that levels of empowerment are low on average: The average score on the A-WEAI is 2.34 (out of 4). Scores on the mobility index are higher (48%), while scores on the economic sub-component are similar to those on the overall general index (35%). Average scores on decision-making in the domestic sphere are lower (21%). Aggregating these three sub-indices, our alternative *total* index is just 5.8 out of a total of 16 (36%). Finally, food diversity is poor, with the average score being 3.72. This implies that, on average, women do not achieve the recommended minimum level of dietary diversity.

In general, women in control PGs do better on all these indices but, as previously noted, it is hard to draw any conclusions from a straightforward comparison of treatment and control PGs due to the socio-economic differences between the two revealed in **Table 2**. Examining the data by landowning groups, scores on the mobility index and those for decisions regarding domestic goods are marginally higher for smaller landowners and landless households, than for large landowners. As previously noted in section 2, existing empirical evidence from India notes a decline in outcomes associated with women's empowerment, and by inference, with improvements in household income and maternal education (Das Gupta 1987; Goldin 1995; Weiner 1990).

Statistics on the individual questions that constitute the different indices (**Table 10**) reveal that although 71 per cent of women had participated in income-earning activities over the past year, their involvement in decision-making was low. Less than half of the women we interviewed reported involvement in decisions regarding income-earning activities (39%), formal loans (27%), informal loans (28%) or decisions on the purchase of major (19%) and minor (44%) household durables.

The low level of autonomy regarding credit decisions was maintained despite the vast majority of women (82%) reporting having a bank account in their own name and 97 per cent of those who stated they were the primary agents for transactions on that account. The A-WEAI module also asked women to characterise the level of their involvement in these decisions. These data suggest women's participation in decision-making was to a 'high extent' minimal (14% for decisions regarding economic activities, 6% for major durables and 13% for minor durables). Measures of women's mobility are generally better: The majority of women reported visiting their parents' home in the previous year, as well as visiting markets and banks. However, the majority of women also stated that they needed permission for these visits.

Table 10: Summary statistics on components of empowerment indices

Variables	Full sample	Treatment PGs	Control PGs
Income and income decisions			
Participated in income-earning activity in past 12 months	0.71	0.71	0.73
	(0.45)	(0.46)	(0.44)
Responds that she takes decisions regarding any income-earning activity	0.39	0.38	0.45
	(0.49)	(0.48)	(0.50)
Responds that she participates in most or all decisions on the use of income from any source	0.41	0.41	0.43
	(0.49)	(0.49)	(0.49)
Responds that she is involved, to a high extent, in decisions regarding any economic activity	0.14	0.13	0.17
	(0.35)	(0.33)	(0.38)
Responds that she is involved in decisions regarding formal loans	0.27	0.22	0.40
	(0.44)	(0.42)	(0.49)
Responds that she is involved in decisions regarding informal loans	0.28	0.23	0.41
	(0.45)	(0.42)	(0.49)
Household decisions			
Responds that she is involved in decisions regarding purchase of large household durables	0.19	0.22	0.13
	(0.40)	(0.41)	(0.33)
Responds that she is involved in decisions regarding purchase of minor household durables	0.44	0.40	0.52
	(0.50)	(0.49)	(0.50)
Responds that she has high ability to make decisions regarding major durables	0.06	0.06	0.05
	(0.23)	(0.24)	(0.22)
Responds that she has high ability to make decisions regarding minor durables	0.13	0.12	0.17
	(0.34)	(0.32)	(0.38)
Mobility			
Visited natal home in past 12 months	0.76	0.77	0.72
	(0.43)	(0.42)	(0.45)
Visited market for domestic purchases in past 12 months	0.65	0.66	0.62
	(0.48)	(0.47)	(0.49)
Number of market visits for domestic purchases in past 12 months	8.54	9.43	6.15
	(14.00)	(14.97)	(10.64)
Visited bank in past 12 months	0.75	0.78	0.69
	(0.43)	(0.42)	(0.46)
Number of bank visits in past 12 months	2.76	2.90	2.40
	(4.20)	(4.52)	(3.18)
No permission required for home visit	0.35	0.34	0.38
	(0.48)	(0.47)	(0.49)
No permission required for market visit	0.49	0.48	0.53
	(0.50)	(0.50)	(0.50)
No permission required for bank visit	0.41	0.39	0.47
	(0.49)	(0.49)	(0.50)

Note: Sample size is 5,228 for mobility measures and 5,033 for all other variables.

Table 11 provides results from simple ordinary least squares regressions of these indices on a set of determinants. We stress that this table is intended to provide evidence on correlations; we make no attempt to assign a causal interpretation to the

results. The determinants we consider include conventional individual- and household-level determinants of women's empowerment: age and education of the woman and her husband, caste (an indicator for members of SCs or STs), land ownership and measures of wealth (total value of assets and, separately, of financial assets). However, we also assess the importance of variables that measure the degree of population concentration and caste-based residential segregation within the village. For this purpose, we use measures (described below) derived by matching sample villages to census data (2011) and the 2011 habitation survey.[22]

Table 11: Simple regressions on empowerment indices

Variable	Overall index	Econ. index	Mobility index	Household index	A-WEAI abbrev. index	Food diversity score
Wage difference	-0.01^{**}	-0.01^{**}	-0.002	-0.0006	-0.01^{**}	0.002
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Village pop. concentration index	0.49	0.55^{**}	-0.14	0.08	0.76^{**}	0.09
	(0.33)	(0.20)	(0.14)	(0.12)	(0.15)	(0.18)
Village segregation index	-0.32^{**}	-0.22^{**}	-0.02	-0.07^{**}	-0.27^{**}	-0.08^{**}
	(0.05)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Distance to district HQ	-0.07^{**}	-0.04^{**}	-0.02^{**}	-0.02^{**}	-0.0002	-0.013^{*}
	(0.01)	(0.01)	(0.01)	(0.005)	(0.01)	(0.007)
Agricultural land, acres	-0.05^{*}	-0.01	-0.02^{*}	-0.02	0.03^{**}	0.08^{**}
	(0.03)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
Woman's age	0.13^{**}	0.06^{*}	0.03	0.03	0.06^{**}	-0.09^{**}
	(0.06)	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)
Woman's age sq.	-0.002^{**}	-0.001^{**}	-0.0004	-0.0004	-0.001^{**}	0.001^{**}
	(0.001)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Woman's education, years	-0.01	-0.02^{*}	0.01	-0.002	-0.01^{*}	0.03^{**}
	(0.01)	(0.01)	(0.006)	(0.01)	(0.006)	(0.01)
Husband's education, years	-0.03^{**}	-0.01	-0.01^{**}	-0.01^{**}	0.002	0.009
	(0.01)	(0.01)	(0.004)	(0.004)	(0.004)	(0.006)
SC/ST household	-0.33^{**}	-0.15^{**}	-0.03	-0.15^{**}	-0.16	-0.05
	(0.08)	(0.05)	(0.04)	(0.03)	(0.04)	(0.05)
Asset value (all), Rs ''000	-0.04^{*}	-0.02^{**}	-0.01	-0.01	-0.012^{*}	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.006)	(0.01)
Asset value (financial), Rs '000	0.98^{*}	0.78^{**}	0.01	0.21^{**}	0.34^{**}	-0.14
	(0.25)	(0.17)	(0.11)	(0.09)	(0.10)	(0.12)
Regression F (Probability >F)	31.34	32.90	5.12	34.53	65.59	23.35
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: Sample size for all regressions is 4,320. Sample is women between the ages of 20 and 60. In addition to listed regressors, all regressions include the following: quadratic in village population, number of hamlets in the village, village proportion SC/ST, quadratic in husband's age and block fixed effects. Robust standard errors in parentheses. **($p < = 0.05$) *($p < = 0.10$)

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[22] Available at https://indiawater.gov.in

The importance of these measures for studies of women's empowerment reflects the geography of India's villages. Each village generally comprises a set of hamlets, with the division of the population into hamlets following caste lines. As a consequence, villages differ significantly not just in their total size and caste composition, but also in the extent of the geographic concentration and caste-based segregation across hamlets. Extensive caste-based residential segregation may directly inhibit the mobility of women from SCs and STs and serve to reinforce traditional social norms that discriminate against them and impede their economic development. Additionally, for any two villages of the same population size but with significant differences in their levels of population concentration, women's empowerment may be lower in villages whose population is more divided across scattered hamlets.

In addition to these direct effects, the degree of population concentration and residential segregation are also likely to indirectly affect women's empowerment through their impact on the quality of community based organisations, including PGs. Both population concentration and segregation likely affect group size, as well as the caste composition of PGs. In turn, group size and the heterogeneity of members is known to affect collective behaviour (Olson 2012). Knowledge of these factors may, thus, help to shape rules that govern the formation of PGs, creating groups that are more conducive to fostering change.

We measure the extent of population concentration in the village by a Herfindal index, constructed by summing the square of the population share of each hamlet in the village. Therefore, the maximum value of 1 represents the case of complete concentration in a village with no hamlets. Village residential segregation is measured by the dissimilarity index, which captures the difference in the representation of general caste households in any given hamlet relative to the distribution of SCs and STs.[23]

If households from SCs and STs are distributed across hamlets in the same way as are households from upper castes, so that the caste composition of each hamlet is approximately the same, this index of dissimilarity is zero. Thus, a high value in the index suggests a high level of segregation. Because both measures reflect village population and the number of hamlets, all regressions include a quadratic in village population and the number of hamlets in the village.

We include another measure of economic geography—the distance of the village from the district capital Purnea. Remoteness, as reflected in this variable, is also likely to influence women's empowerment directly and through its effect on the quality of community institutions.

The regressions reported in **Table 11** suggest that existing levels of residential segregation within the village and the distance of the village from the district capital have strong adverse effects on women's empowerment. Increases in segregation reduce all

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[23] Formally, let $SCST_v$ and GEN_v be the total number of SC and ST households, and the total number of general caste households, respectively, in village v. Correspondingly, let $SCST_i$ and GEN_i represent the total numbers of these groups in hamlet i. Let N be the total number of hamlets in the village. Then, the dissimilarity or segregation index is given by: $egregation\ index = \frac{1}{2}\sum_i^N \left| \frac{SCST_i}{SCST_v} - \frac{GEN_i}{GEN_v} \right|$.

measures of empowerment, including the food diversity score. Similarly, women who reside in villages that are farther from the district capital record lower empowerment scores. Although population concentration appears to enhance empowerment, the effects are statistically significant only for the A-WEAI and the economic index. This evidence suggests the need for more intensive interventions in remote villages and those characterised by extensive residential segregation.

Turning to other determinants, the data support the general belief that women's empowerment was adversely affected by the difference in their income-earning capacity relative to men, as reflected in the difference between male and female agricultural wages in the village. The regression results in **Table 10** also suggest a concave relationship between empowerment and women's age. While the overall indices (both A-WEAI and the total index we construct) do not exhibit a statistically significant correlation with women's education, measures of economic empowerment and mobility are negatively correlated with a woman's education years, supporting the earlier cited literature that suggests declines in women's empowerment with improvement in female education (Das Gupta 1987; Goldin 1995; Weiner 1990). Correlations of empowerment indices with husbands' education are also generally negative. In contrast, the effect of women's education on food diversity is positive and strong. Also, women from SCs and STs are characterised by significantly lower levels of empowerment across all dimensions, with the exception of the mobility index and the food diversity score, which do not vary by caste.

Finally, the last two rows of the table examine the correlation between household wealth and empowerment. The value of all assets is negatively correlated with empowerment. Much of this reflects the value of agricultural land, and supports the finding that increases in agricultural land are negatively correlated with measures of women's empowerment. Conditioning on the value of total assets, increases in the value of financial assets appear to improve the value of empowerment indices, with the exception of the mobility index.

6.7 Determinants of PG characteristics

While the extent of population concentration and segregation can generally be expected to affect the size and composition of any collective institution within the village, their effect on PGs may be greater. This is because these groups are formed by building on JEEViKA's institutional architecture, with members drawn from VOs that represent an apex institution for the SHGs, which constitute the lowest level of this federated structure. SHGs, in turn, are formed by bringing together women who reside in a hamlet. Correspondingly, the number of SHGs that can be formed within any village, and hence the size and composition of VOs and PGs, will reflect the geographic concentration of the village's population and extent of caste-based residential segregation across hamlets.

We provide evidence of this by regressing PG size (total number of members) and the proportion of SC/ST members in each PG based on the village characteristics considered in **Table 10**. For these regressions, the data are aggregated at PG level, so the unit of observation is the PG. Thus, there is a significant reduction in sample size (79), which in turn, reduces the precision of the results.

The results summarised in **Table 12** indicate that some of the effects of residential concentration and segregation may operate through their effect on PG size and composition. Thus, more extensive segregation increases PG size, while greater residential concentration reduces it. The second regression in this table also reveals that these same measures affect the proportion of PG members who belong to SCs and STs: Population concentration reduces the proportion of members from SCs and STs, while more extensive residential segregation increases it. If, as is generally assumed, collective behaviour is weaker in large and more diverse institutions (Olson 1982), then these results suggest that the effect of population concentration and segregation on women's empowerment in **Table 11** may partly reflect their effect on the size and caste composition of PGs.

Table 12: Determinants of PG characteristics

	PG size	Prop. of SC/ST members
Wage difference	0.51[**]	–0.001
	(0.21)	(0.002)
Village pop. concentration index	–45.47[**]	–0.37[**]
	(18.00)	(0.17)
Village segregation index	4.37	0.07[**]
	(3.75)	(0.03)
Distance to district HQ	1.42[**]	–0.013[*]
	(0.64)	(0.007)
Village population ('00)	–0.16	–0.002
	(0.14)	(0.001)
Village population sq.	0.0003	2.3 e–6
	(0.0003)	(3.0 e–6)
Number of hamlets	–2.52[**]	0.002
	(1.20	(0.01)
Village prop. SCs/STs	–34.28	0.45[**]
	(21.03)	(0.22)
Regression F	5.79	9.23
(Probability > F)	(0.00)	(0.00)

Note: Data are aggregated at PG level; sample size for all regressions is 79. [**]($p <= 0.05$) [*]($p <= 0.10$)

6.8 Graphical analysis of women's empowerment

We supplement our analysis with a graphical representation of individual and household determinants of women's empowerment. **Figure 7** graphs the overall empowerment index by women's (five-year) age cohorts. It reveals that empowerment is the lowest for young women. It rises until the age of 30 and then remains approximately level, falling off at the age of 50.

To the extent that this indicates differences in empowerment by age for the survey area as a whole, these results urge caution in interpreting measures of aggregate levels of empowerment for any CBO: Groups with lower mean ages will be characterised by lower levels of empowerment than CBOs formed of older members. Additionally, group characteristics would similarly affect the scope for enhancing or improving women's

bargaining power through policy. Mirroring similar arguments in areas such as education, there is greater potential for improvements in relatively disadvantaged groups. This means that the scope for improvements in measures of women's empowerment will be lower in groups comprising older members.

**Figure 7: Empowerment index by five-year age cohorts**
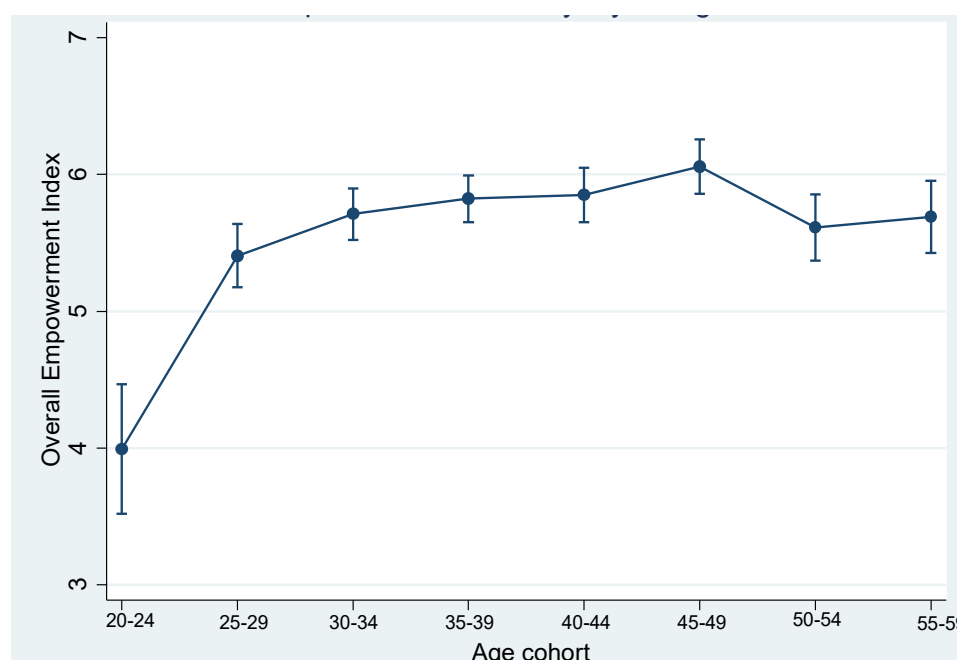
Similar caution needs to be exercised even when relating measures of empowerment to household attributes. This is because most studies, including the current survey, measure levels of empowerment for just one woman in the sample.[24] If the surveyed woman is characterised by low levels of empowerment because another woman in the household is responsible for decisions regarding mobility, domestic production and involvement in income-generating outcomes, clearly, we cannot conclude that all women in the household are disempowered.

Figure 8 illustrates this point. As in **Figure 7**, it graphs the overall empowerment index by women's five-year age cohorts. However, we now restrict the sample to households with two or more women. Comparing the two figures, the age gradient at lower ages (20–29) is less steep in households with two or more women, suggesting a greater role for decision-making among older women in such households.

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[24] In our case, we had hoped to survey two members of each household. However, the additional time required for this second survey rendered it infeasible, given the known difficulties in administering surveys to households that take more than three hours (the quality of responses reduces dramatically). An alternative would be to separate the sections on women's empowerment from the rest of the household module, and administer these as a separate survey, conducted at some interval from the household survey. This separate survey could then be administered to multiple women from the same household, in households with two or more women.

Figure 8: Empowerment index for women, households with > = 2 women over the age of 20
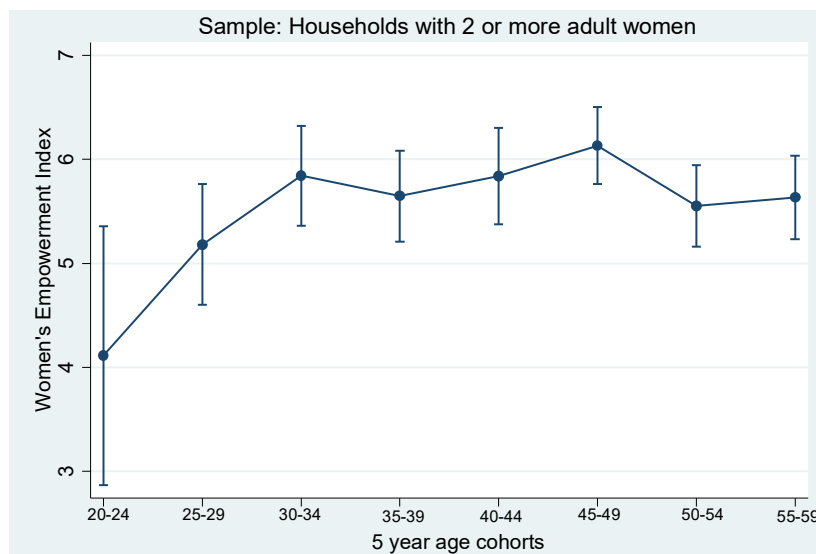
The trend in empowerment by age is suggestive of well-known patterns of women's workforce participation. We graph women's hours of work by age cohort in **Figure 9**. Hours of work in this and later regressions are measured by the number of hours devoted to income-earning activities, in either a primary or a secondary activity, but excluding hours spent in a salaried job or on domestic tasks. As with the empowerment index, hours of work are the lowest among young women, increasing with age until approximately 45, and then declining, particularly after the age of 55. The correlation between the two graphs supports the hypothesis that women's empowerment is closely related to their hours of work in income-generating activities.

**Figure 9: Woman's hours of work by age cohort**
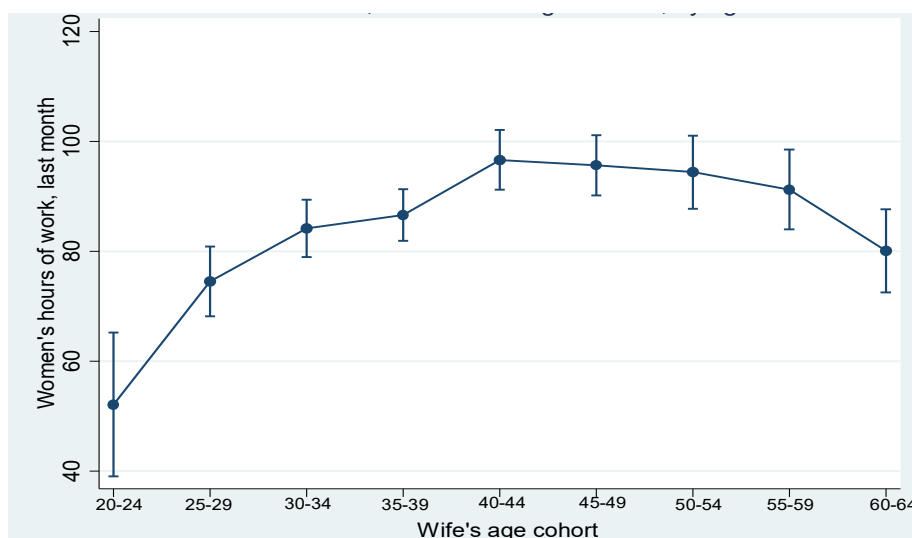
Because a woman's bargaining power reflects her standing relative to her husband's, it is worth also considering trends in husbands' hours of work. **Figure 10** graphs hours of work in income-earning activities reported by husbands, by their *wives'* age cohort. While the youngest men also work fewer hours then their older counterparts, the difference is

less than it is for women. The big difference between hours of work for men and women is the striking decline in husband's hours of work with his wife's age, with a reduction of approximately 30 hours of work in a month by men in early years of marriage relative to later years.

Figure 10: Husband's hours of work in income earning activities by wife's age cohort
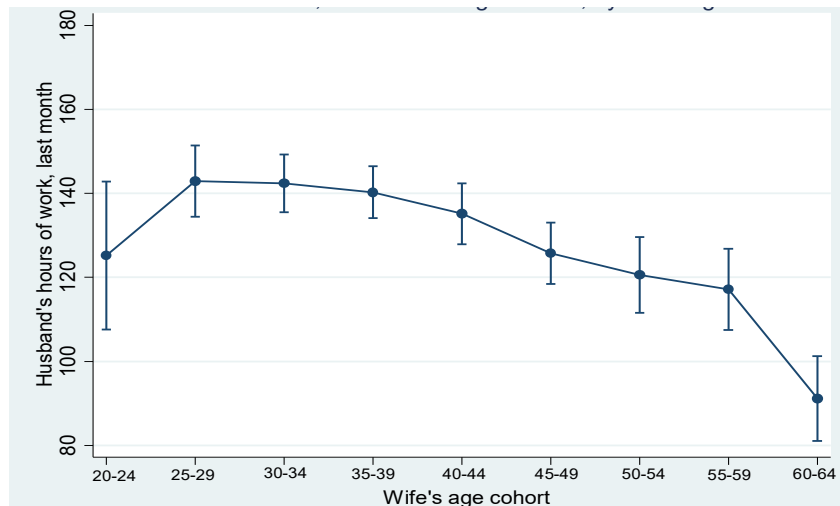
Among young couples, therefore, the fewer hours of work by young women relative to older women is offset by the greater hours put in by their husbands, while the decline in hours of work by older men is offset by increased hours of work by their wives. As a consequence, the sum of hours of work by men and women remains relatively stable across women of different age cohorts (**Figure 11**).

Figure 11: Sum of husband's and wife's hours of work, by wife's age cohort
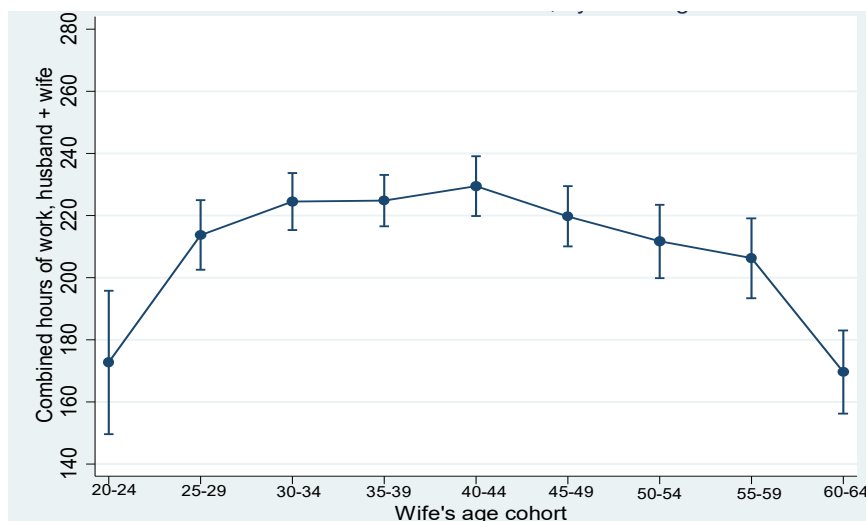
These graphs depict correlations and do not suggest causal relationships. However, they raise the possibility that women's hours of work and, correspondingly, improvements in their bargaining power with age reflect the decline in their husband's hours of work over time.

To explore differences by land ownership, the next set of graphs divides households by quintiles of the land ownership distribution (including landless households), and separately graphs empowerment indices for young (aged 20–34) and older (35–50) women. **Figure 12** shows that, at all levels of land ownership, younger women do worse than older women. It also demonstrates that empowerment first rises and then falls with land ownership, and is as low among women in the largest landowning class as among landless households (the first quintile of the land distribution).

Figure 12: Overall empowerment index by land ownership and two age groups
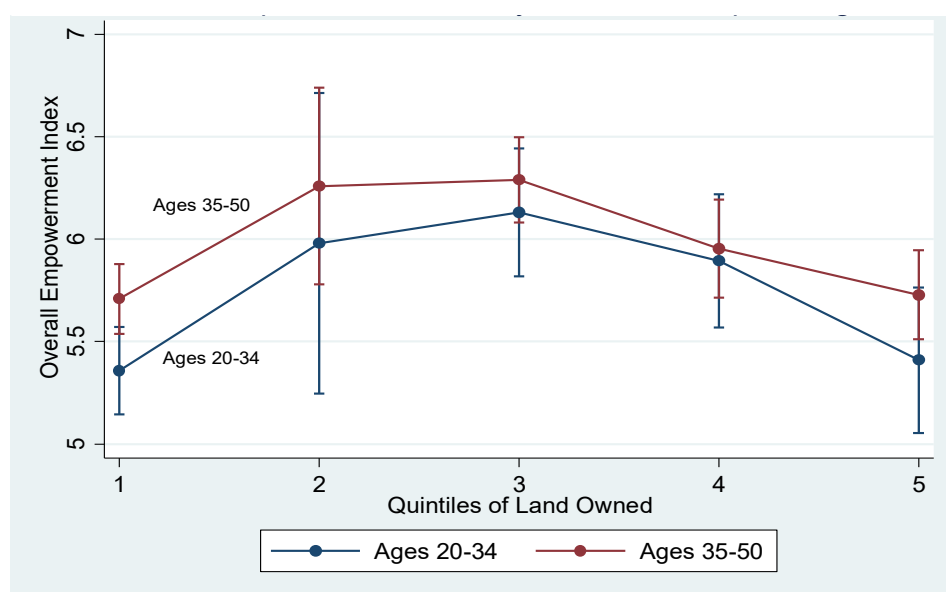
This inverted U-shape corresponds to women's hours of work by land ownership, graphed in **Figure 13**, which is similarly characterised by a decline in hours of work among women in the largest landowning class.

Figure 13: Women's hours of work for income-generating activities by land ownership and age group
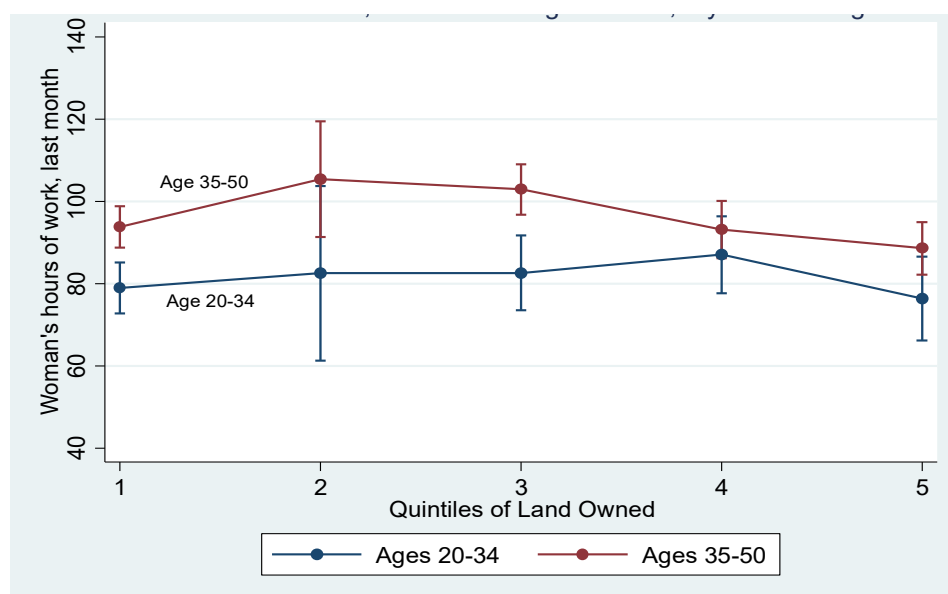
As with the previous graphs, regressions on husband's hours of work (**Figure 14**) suggest a negative correlation between men's and women's hours of work: Men's hours suggest a linear, increasing trend with land ownership, raising the possibility that the decline in women's hours of work in households with more land reflects the greater hours of work put in by their husbands.

Figure 14: Husband's hours of work for income-earning activities by land ownership and wife's age group

In conclusion, this graphical analysis suggests a strong correlation between women's economic roles and their empowerment. Causality, however, could run in either direction: Increased participation in economic activities could empower women, but social norms that weaken women's bargaining position may also prevent them from engaging in work outside the home. Additionally, these graphs suggest that men's hours of work may play a role in determining women's engagement in economic activities and their empowerment.
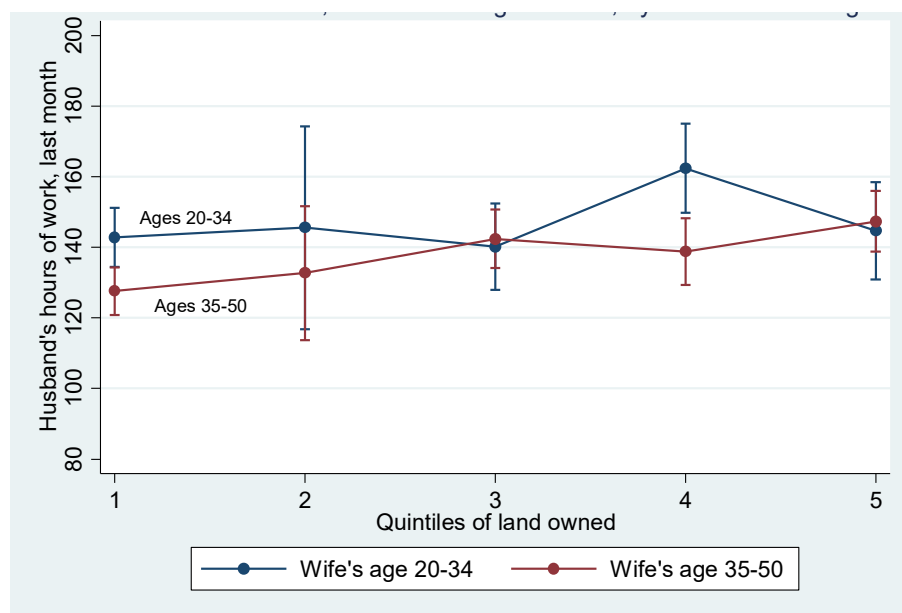
On the policy side, data imply that the women who are least able to make their own decisions are younger women and those with (relatively) more wealth, as measured by land ownership. The lower levels of empowerment of young women suggest that social norms regarding women's roles and, in particular, their mobility and engagement in work outside the home may be particularly binding for this age group. However, information, networks and work experience are also likely to play a role. Young wives frequently come to their husband's home without any prior experience of working on a farm, reflecting very low levels of economic work by adolescent girls. Their knowledge of the village economy is limited, reflected in a lack of familiarity with village traders and informal lenders.

While social norms may be difficult to change, at least in the short run, policies can certainly affect information, networks and the pace at which young women accumulate work experience. This suggests that involving young women in cooperative groups, including SHGs and PGs, may have a large payoff, as would providing them with training in agricultural practices and financial literacy. It also suggests payoffs to providing similar training to adolescent girls. In turn, improving the decision-making ability of younger

women is critical to affecting change in fertility behaviour, such as decisions regarding the number of children they have, birth intervals and the age at which they first give birth. These outcomes affect the human capital of children—in particular girls—and hence the welfare of future generations.

7. Identifying the causal effect of WARDA on women's empowerment

7.1 Methodological overview

This section of the report describes our methodology for identifying the causal effect of WARDA on women's empowerment. We use a difference-in-difference regression that compares the difference in empowerment outcomes across target and non-target households in treatment relative to control PGs, with target households being those most likely to sell maize.[25] This methodology accommodates differences in (mean levels of) women's empowerment between treatment and control PGs prior to the project. The critical identifying assumption is that, prior to initiating the project, differences in measures of empowerment between target and non-target members of treatment PGs were identical to this same difference in control PGs. We provide evidence from census data and a sample of control PGs to support this assumption. This 'equal pre-trends' condition implies that any identified increase in this difference, following the initiation of WARDA, in treatment relative to control PGs represents a causal impact of the project.

However, any identified causal impact of the project does not necessarily imply that all gains accrued to target households—there may also have been spillover effects on non-target households, despite their negligible involvement in agricultural production. For example, changes in the mobility of targeted women could cause similar changes among landless women through demonstration effects. Additionally, VRPs associated with the project to enhance agricultural practices may also encourage non-targeted women to similarly assume greater decision-making roles in non-agricultural occupations they may be engaged in. We briefly address this issue through a set of auxiliary regressions, reported in section 7.3 **below**.

7.2 Methodological details

As noted above, we identify the effect of the project by comparing the difference in empowerment indicators between target and non-target households, in treatment versus control PGs. This methodology differs from a simple comparison of (mean) outcomes across treatment and control PGs, because it controls for average differences in empowerment across treatment and control PGs and across blocks. As previously discussed, such differences are significant (**Table 2**).

Given that the project targets households with a marketed surplus in maize, we identify target members as those with land holdings in the top half of the (sample) land distribution. This amounts to 38 per cent of the survey sample, close to the proportion of households (41%) identified by TechnoServe, across all the PGs it worked with, as

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[25] Details on the identification of target and non-target households are provided in the next sub-section.

selling maize to the FPC in the 2016–17 rabi season. For our sample, average land holdings of target households are 1.61 acres and 0.12 acres for non-target households. Some 38 per cent of target women reported their primary occupation was cultivation, as did 18 per cent of non-target women. Cultivation through leasing is minimal in both samples: 2 per cent of target women and 6 per cent of non-target women reported their primary occupation was cultivation on leased land.

Let P_j be an indicator variable that takes the value 1 for treatment PGs, 0 otherwise. Similarly, let T_{ij} take the value 1 if household i in PG j is a target (large landowning) household. The basic identifying equation for outcome Y is:

(1) $\qquad Y_{ij} = \alpha_0 + \alpha_1 P_j * T_{ij} + \alpha_2 P_j + \alpha_3 T_{ij} + X'_{ij}\alpha_4 + B_j + u_{ij}$

In this regression, B is a set of block fixed effects. The inclusion of block fixed effects eliminates differences in outcomes caused by block-level characteristics. The vector X is a set of household- and village-level variables, included to eliminate pre-treatment differences between treatments and control PGs. Although we also report results from a very simple specification, with minimum control variables, the broadest specification includes a large number of household and village controls. Household and individual controls are (1) quadratics in the age of the woman and her husband, (2) their years of schooling, and (3) an indicator for SC or ST households. Village-level controls are (1) wages (by season and by sex), (2) the price of maize, (3) distance to the district capital (Purnea), (4) village population, (5) the proportion of the village population from SCs and STs, (6) the number of hamlets in the village and (7) the measure of population concentration and segregation described in section 6.7 **above**.

7.3 Testing equal pre-differences

Assessing the validity of the equal pre-project difference hypothesis requires data from a 'true' baseline—data on survey households prior to the initiation of the project in 2015, for both treatment and control PGs. Although TechnoServe conducted a number of scoping studies that provided information on variables such as land ownership, these data are available only for treatment PGs, not for control PGs. Moreover, given the focus of this study on women's empowerment, such a test would ideally be based on pre-project data on empowerment measures.

Lacking such data, we use a variety of alternative methods to evaluate this assumption. First, we use data from the 2011 census to compare outcomes that are known to be either determinants of women's empowerment or else affected by women's empowerment. Our ability to use the census for this purpose is due to the fact that treatment PGs primarily belonged to one set of blocks and control PGs to another. This allows us to identify treatment and control blocks, and compare outcomes across target and non-target households in these two different sets of blocks. While census data are not available separately for landowning and landless households, they are available for SC and ST households relative to others. This caste division is closely correlated with a variety of poverty measures, including land ownership.

We, therefore, compare the difference between SC and ST women, in treatment relative to control blocks, across a set of outcomes. These are (1) female literacy rates, (2) sex ratio for children aged 0–6 years and (3) labour force participation rate. Because the data

are from 2011, just as the JEEViKA programme was being initiated, outcomes are unlikely to be affected by either JEEViKA or WARDA. The assumption is that if outcome differences across castes are the same in treatment and control blocks, we can reasonably conclude that differences in bargaining power across landowning and landless women would also be identical across these blocks.

Table 12 provides estimates from the following difference-in-difference regression for this set of outcome variables (Y), where T_j is an indicator that takes the value 1 if block j is a treatment block, 0 otherwise, and $SCST_{ij}$ is an indicator of the caste group (i) in block j. The coefficient on the interaction term, $T*SCST$, measures whether caste-wise differences in outcome differ across treatment and control blocks. A significant coefficient would suggest that the equal pre-programme assumption was invalid. The regression we run is:

(2) $Y_{ij} = \alpha_0 + \alpha_1 T_j * SCST_{ij} + \alpha_2 T_j + \alpha_3 SCST_{ij}$

Regression results in **Table 12** support the equal pre-project assumption, although the small sample size obviously is a concern: Standard errors are correspondingly large, reducing the ability to identify significant effects. However, the magnitude of the coefficients is close to zero. The credibility of this analysis is further strengthened by the regressions picking up statistically significant differences between treatment and control blocks, and between general and other castes. These differences suggest that a simple comparison across treatment and control blocks, or between landed and landless households, would provide biased estimates of the effect of the project on women's empowerment.

Table 12: Supporting evidence for methodology from census data (2011)

	Coefficient on		
	Treatment block * general castes	**Treatment block**	**General castes**
Difference in male and female literacy rates	0.05 (0.10)	–0.05 (0.06)	–0.002 (0.07)
Sex ratio, ages 0–6	13.35 (29.08)	–15.28 (16.79)	–18.54 (20.56)
Difference in male and female labour force participation rates	–0.03 (0.04)	–0.05[*] (0.02)	0.08[*] (0.03)
Female literacy rate	–0.03 (0.04)	0.04 (0.02)	0.10[*] (0.03)
Female labour force participation rate	0.03 (0.05)	0.05 (0.03)	–0.09[*] (0.04)

Note: Data are from block-level and caste group (general versus SC/ST), for rural areas only, from the 2011 census, for the six blocks in our survey. The number of observations is 18. Labour force participation rates are defined as the total number of main and marginal workers to population counts. [**](p < = 0.05) [*](p < = 0.10)

Stronger supporting evidence for the hypothesis of equal pre-project differences between treatment and control PGs is possible by exploiting the variation in agro-economic conditions within the set of control PGs. Specifically, as previously noted, one of the control blocks, Rupauli, comes from the same agro-economic zone as the three treatment blocks (Barhara Kothi, Bhawanipur and Dhamdaha). These zones are narrowly identified—the particular zone these blocks are located in only comprises these four blocks. Rupauli adjoins one of our control blocks Bhawanipur, and is farther from Purnea town—and the treatment blocks of Krityanand Nagar and Purnea East—than are the other three control blocks. This, in turn, implies that a comparison of outcomes between Rupauli and the remaining two control blocks provides a very good approximation of pre-project differences between the treatment and control samples.

Exploiting this variation within the control sample across these geographical zones, and the similarity of Rupauli to the three treatment blocks, we support the equal pre-project difference assumption by comparing the difference in the overall empowerment index between target and non-target members in Rupauli to that in Krityanand Nagar and Purnea East. Our test uses a similar difference-in-difference regression to (2), where the dependent variable is the overall empowerment index described in section 6.6 **above**.

Table 13 shows regression results. All standard errors are clustered at the PG level. Regression 1 includes no additional controls, other than block fixed effects. The coefficient on the interacted variable, Rupauli * large landowner, in this regression is statistically insignificant at conventional levels. The magnitude of the coefficient is, however, relatively large, suggesting that there *are* differences between Rupauli and the other control blocks in variables associated with women's empowerment, which are likely to be significant in regressions with a larger sample size. Regression 2 includes controls for village agricultural wages, maize price and the distance to the district capital Purnea. Including these controls reduces the coefficient on the interacted term to close to zero (–0.02). This suggests that a 'matched' specification that includes additional village price controls will satisfy identification requirements, enabling us to credibly estimate the project's effect on women's empowerment.

Table 3: Supporting evidence for methodology from comparison of blocks within control sample

	Regression 1	Regression 2
Rupauli block * large landowner	0.37	–0.02
	(0.29)	(0.29)
Rupauli block	–0.55	3.45
	(0.41)	(2.04)
Large landowner	–0.34[*]	–0.22
	(0.29)	(0.16)
Additional controls	Block fixed effects	Village wages, prices, distance to district HQ, block fixed effects
Regression F	1.66	5.25
	(0.19)	(0.00)

Note: Regression sample is restricted to the control blocks of Krityanand Nagar, Purnea East and Rupauli. Standard errors, clustered at the level of the PG, are reported in parentheses. Sample size is 1,159. [**]($p < =0.05$)   [*]($p < = 0.10$)

8. Results

8.1 Difference-in-difference estimates on measures of women's empowerment

Table 4 reports difference-in-difference estimates from a set of regressions that differ in their set of included regressors to examine the sensitivity of results to different controls. The dependent variable for regressions reported in the first column is the overall empowerment index, while subsequent results provide disaggregated results for the different components of this index. All standard errors are clustered at the PG level.

Table 4: Difference-in-difference estimates of the effect of the project on women's empowerment

Variables	Overall index	Econ. index	Mobility index	Domestic index	Food diversity score
Regression 1: Limited additional controls					
Treatment * large landowner	0.27	0.20[*]	0.13	–0.07	–0.14
	(0.19)	(0.11)	(0.09)	(0.08)	(0.12)
Large landowner	–0.21	–0.01	–0.20[**]	–0.003	0.34[**]
	(0.15)	(0.08)	(0.08)	(0.07)	(0.10)
Treatment PGs	–0.33	–0.51[**]	–0.20	0.38[**]	–0.03
	(0.39)	(0.24)	(0.13)	(0.13)	(0.14)
Regression 2: Add husband's age, husband's and wife's educ. yrs, SCST					
Treatment * large landowner	0.32	0.22[*]	0.15[*]	–0.06	–0.18
	(0.21)	(0.12)	(0.09)	(0.09)	(0.12)
Large landowner	–0.31[*]	–0.08	–0.20[**]	–0.03	0.31[**]
	(0.18)	(0.10)	(0.08)	(0.08)	(0.10)
Treatment PGs	–0.24	–0.42[*]	–0.24[*]	0.43[**]	0.07
	(0.41)	(0.24)	(0.14)	(0.13)	(0.15)
Regression 3: Add village variables					
Treatment * large landowner	0.37[*]	0.26[**]	0.11	–0.002	–0.22[*]
	(0.20)	(0.11)	(0.09)	(0.09)	(0.13)
Large landowner	–0.41[**]	–0.16[*]	–0.15[*]	–0.10	0.39[**]
	(0.17)	(0.09)	0.08	(0.09)	(0.11)
Treatment PGs	1.13	0.22	0.20	0.71[**]	0.31
	(1.08)	(0.71)	(0.25)	(0.33)	(0.41)
Regression 4: Add project duration					
Treatment * large landowner	0.60[**]	0.34[**]	0.11	0.15	–0.29[*]
	(0.25)	(0.14)	(0.11)	(0.09)	(0.15)
Project duration * large landowner	–0.23[*]	–0.09	–0.002	–0.14[**]	0.04
	(0.13)	(0.09)	(0.05)	(0.05)	(0.07)
Large landowner	–0.41[**]	–0.16[*]	–0.15[*]	–0.10	0.40[**]
	(0.17)	(0.09)	(0.08)	(0.09)	(0.11)

Variables	Overall index	Econ. index	Mobility index	Domestic index	Food diversity score
Treatment PGs	–0.04	–0.33	0.008	0.28	–0.48
	(1.18)	(0.76)	(0.27)	(0.33)	(0.38)
Project duration	0.61**	0.28**	0.09*	0.23**	0.37**
	(0.18)	(0.11)	(0.06)	(0.06)	(0.10)

Note: Regression 1 includes block fixed effects and a quadratic in the woman's age. The second regression adds a quadratic in the husband's age, wife's and husband's completed years of schooling and SC/ST indicator. The third regression adds village variables (wage rates, maize prices, distance to Purnea town, village population, SC/ST proportion, number of habitations, population concentration and segregation indices). Standard errors, reported in parentheses, are clustered at the PG level. Sample size for regressions with full set of regressors is 4,340.
**(p < = 0.05)   *(p < = 0.10)

Regression 1 includes only a quadratic in the woman's age and block fixed effects, in addition to the interacted term and the landowner indicator variable (included in the table). This specification suggests a statistically significant effect at the 10 per cent level only for the index of economic empowerment. Coefficients on the interacted term in regressions on other indices, including the overall index, are statistically insignificant at conventional levels. Adding individual and household controls (Regression 2) also yields a statistically significant coefficient (at the 10% level) on the mobility index.

Regression 3 adds on the full set of village-level control variables, including wages, prices, village population and the proportion of its population from SCs and STs, distance to the district capital, the number of hamlets in the village, and indices of population concentration and caste-based residential segregation. As discussed in the previous section, the assumption of equal pre-trends, required for interpreting the coefficient on the interacted term (treatment * large landowner) as a causal effect of the project, requires these additional controls. This last regression, therefore, is our preferred specification.

This regression reveals a strong and statistically significant effect (at the 5% level) of the project only on the economic index. This strong effect also generates a positive effect on the overall index, but at a lower level of statistical significance (10%). This specification yields a *negative* effect of the project on the food diversity score—an effect that is statistically significant at the 10 per cent level.

The last set of regressions (Regression 4) allows for duration effects by including an interaction between land ownership and the number of years for which the project had been in effect in the PG. These regressions exploit the variation in the duration of the project, even across PGs within any given treatment block. Allowing for this additional interaction increases the magnitude of the project's impact on the economic index and hence, the overall index, as well as on the food diversity index. This is because the effect of the project on women's empowerment and food diversity *declines* over time.

One reason for negative duration effects could be the increase in the project's scale over time: The total number of PGs covered by the project in its early years was minimal, but it increased significantly with each successive year. Thus, attention to early-implementing PGs could have reduced in later years. Additionally, the lack of sales through the FPC in the survey year, as discussed in section 6.4, may also have

adversely affected women's empowerment in PGs that had earlier sold extensively through the FPC. It is beyond the scope of this study to identify the precise factors underlying negative duration effects.

While the coefficient on the interaction of project duration with target households is negative, the regression results reveal that the common effect of duration on treatment and control PGs, given by the coefficient on the variable *Project duration* in the table, is strongly positive. This may reflect the endogenous selection of early PGs. As previously discussed, PGs are formed from VOs and a general requirement was that the VO should have been in existence for several years and should be functioning well. This means that early PGs are likely to comprise members from strong SHGs and VOs and hence, women characterised by relatively higher levels of empowerment and with experience of working in CBOs. This interpretation is supported by the association of years of duration with higher levels of empowerment in all domains (economic, mobility and domestic), as well as with higher levels of diversity of food intake. These effects are statistically significant, generally at the 5 per cent level. They suggest that while PGs are important for improving women's participation and decision-making in income-earning activities, women's participation in other community institutions, such as SHGs and VOs, may importantly empower them in other dimensions.

8.2 Effects on hours of work and expenditure

Given the literature that relates women's empowerment to hours of work and their contribution to household income, it is worth asking whether our finding of significant project effects on overall indices and those related to economic empowerment are supported by similar effects on hours of work. **Table 15** reports regressions, identical to those in Regression 3 in 4, on hours of work by women and their husbands in employment in income-generating activities. Hours of work are defined as described in the previous section. Observations in the top percentile of the hours of work distribution are excluded from regressions and standard errors are clustered at the PG level.

Table 5: Difference-in-difference regressions on hours of work in income-earning activities, previous month

	Women's hours of work in income-earning activities	Women's hours of domestic work	Husband's hours of work in income-earning activities
Full sample			
Treatment * large landowner	8.22[*]	−10.30[*]	10.25
	(4.70)	(6.24)	(9.72)
Large landowner	−6.71[*]	16.27[**]	2.53
	(3.80)	(5.19)	(8.35)
Treatment PGs	−37.07[**]	11.93	−48.20[**]
	(13.43)	(15.95)	(14.74)
Sample size	4,408	4,398	4,402
Ages 20–65			
Treatment * large landowner	8.58[**]	−10.51[*]	11.08
	(4.76)	(6.19)	(9.65)

	Women's hours of work in income-earning activities	Women's hours of domestic work	Husband's hours of work in income-earning activities
Large landowner	–6.99[*]	16.66[**]	2.43
	(3.867)	(5.11)	(8.24)
Treatment PGs	–37.71[**]	11.88	–54.47[**]
	(13.35)	(15.43)	(15.58)
Sample size	4,353	4,342	4,190

Note: Standard errors, in parentheses, are clustered at the PG level. In addition to listed regressors, all regressions contain block fixed effects for the full set of individual, household and village variables: quadratic in wife's and husband's age, SC/ST indicator, wife's and husband's education years, wage rates, maize prices, distance to Purnea town, village population, SC/ST proportion, number of habitations, population concentration and segregation indices.
[**]($p < = 0.05$)   [*]($p < = 0.10$)

The regressions show an increase in women's hours of work in income-generating activities, supporting the hypothesis that improvements in women's empowerment are most likely when women's contribution to household income increases. This increase in women's hours of work in income-earning activities appears to come at the cost of time spent in domestic work, providing one explanation for the decline in women's dietary diversity generated by participation in the project. There is no effect on husband's hours of work, indicating that the project also increased women's *relative* contribution to household income, perhaps a stronger indicator of the likelihood of an improvement in women's bargaining power.

8.3 Evidence of project effects on non-target members

Our analysis, so far, has assumed an absence of project effects on non-target women—those from households with marginal or no agricultural land. This allows us to attribute identified effects of the project to target households and provides an estimate of the benefits such households received.

To test the validity of this assumption, we disaggregate land ownership further, identifying PG members by quintiles of the land distribution. We then repeat Regression 1, but now interacting the indicator for treatment PGs with a set of indicator variables that denote membership in each quintile of the land distribution. **Table 16** shows the results, with quintile 1 (the excluded category in the regression) representing the landless and quintile 5 representing the largest landowners. The cut-off for membership in this largest quintile is around 1 acre of land. This group of large farmers constitutes around half of the target group in the sample. However, the variation in the composition of PGs is such that, for any given member of the target group, the proportion of members in the PG from this largest landholding category (> = 1 acre) is just 0.25. For non-target households, village residential patterns are such that this proportion is just 0.18.

Table 136: Suggestive evidence on project effects for marginal landowners and landless

Variables	Economic index		
	Sample: full	Sample: non-target women	
		OLS	IV regression
Treatment * land group 2	0.02	–	–
	(0.21)		
Treatment * land group 3	–0.10	–	–
	(0.14)		
Treatment * land group 4	0.11	–	–
	(0.19)		
Treatment * land group 5 (largest)	0.29*	–	–
	(0.15)		
Economic empowerment index, large farmers			1.08**
			(0.30)
Treatment * prop. large farmers		2.37**	–
		(0.64)	
Treatment	0.19	–1.74**	–0.71
	(0.69)	(0.77)	(0.71)
Prop. large farmers		–1.70**	–0.25
		(0.58)	(0.48)
Regression F / Wald χ^2	18.09	25.75	447.88
(Prob. > F, χ^2)	(0.00)	(0.00)	(0.00)
Sample size	4,340	2,642	2,642

Note: IV = instrumental variable; standard errors, in parentheses, are clustered at the PG level. In addition to listed regressors, all regressions contain block fixed effects on the full set of individual, household and village variables: quadratic in the wife's and her husband's age, SC/ST indicator, wife's and husband's education years, wage rates, maize prices, distance to Purnea town, village population, SC/ST proportion, number of habitations, population concentration and segregation indices. Instrument for the last regression is treatment * proportion of large farmers in the PG. **($p <= 0.05$)　　*($p <= 0.10$)

The results (**Table 16**) confirm that WARDA benefits only large landowners. In fact, they suggest that there are no benefits to women from households that own less than 1 acre of land. This is not unreasonable: WARDA is a project that targets landowners who can be expected to have a significant marketable surplus in maize production. They are only likely to be farming households with at least 1 acre of land.

The relatively narrow reach of the project also indicates that there might be spillover effects to landless households, but these would obviously exist only in those PGs with a significant share of large landowners. Such PGs are likely to be those with fewer landless households, perhaps explaining the overall insignificant impact of the project on women from landless households.

We test this hypothesis by restricting the sample to non-target households and considering heterogeneity in the impact of the project by including an interaction of the treatment with the proportion of members of the PG with 1 acre or more of land. Results, in Regression 2 of **Table 16** find that such effects are significant: The proportion of large landowners in a PG yields benefits of the project for non-target households.

Under the assumption that these effects represent peer effects, because they are a consequence of the interaction of women from large landowning households with non-target women through PGs, we can use Regression 2 as a first-stage regression in an instrumental variable regression that examines the effect of empowering large landowners on non-target households. This regression (Regression 3) reveals positive peer effects. We note, however, that this result depends on the validity of exclusion restrictions and would have to be confirmed through additional research.

If this result holds up with further research, this suggests positive effects for the poor of membership in 'mixed' collectives comprising both landless and landowning households, at least as far as economic mobility is concerned. This accords with the evidence presented above that increased residential segregation reduces empowerment.

9. Conclusions and recommendations

This report presents a descriptive analysis of data relating to members of WARDA and non-WARDA PGs, as well as an empirical analysis of the effect of WARDA on measures of women's empowerment, based on a baseline survey conducted in September 2018.

Our descriptive analysis provides information on the socio-economic background of members of both treatment and control PGs, and on topics such as their knowledge of agricultural practices and the benefits they derive from participating in CBOs, as well as information on PGs and the village-level government staff affiliated with the project. In general, women in these areas appear to be moderately well informed about the use of inputs on family farms and details regarding output.

The data show, however, that they are far less knowledgeable about financial matters, such as whether loans had been taken out for agricultural operations. Our survey also revealed a demand by women for financial literacy programmes. It appears that most village-level functionaries had not received training in providing financial services, although this may be because JEEViKA assigns different responsibilities to different staff members. Because of the importance of financial services for economic operations, one policy recommendation is to work more closely with JEEViKA to ensure that financial literacy training accompanies livelihoods initiatives.

We documented several aspects of the economic geography of a village that affect women's empowerment, both directly and through their effect on group size and caste composition. While a body of research documents differences in women's empowerment across broad regions, such as agro-economic zones, our findings relate to differences across villages within narrowly defined zones, perhaps even neighbouring villages. These findings suggest the need for greater attention to the formation of PGs, given the importance of group attributes to the success of any project or programme.

Our descriptive analysis of measures of women's empowerment suggests important life cycle effects—empowerment is the lowest among young women. In turn, this suggests targeting such women in programmes intended to enhance livelihoods, as well as in the formation of CBOs. Our analysis also indicates correlations between hours of work and empowerment, supporting the hypothesis underlying WARDA: Improvements in women's empowerment follow an increase in women's engagement in income-earning activities.

Exploiting the fact that both treatment and control PGs included target and non-target members, primarily from landless households, who were minimally affected by the project, we also provide estimates of the causal effect of the project on women's empowerment. We find positive and significant effects on women's participation in income-earning activities and their role in income-related decisions. However, effects on other measures, such as decision-making regarding household goods or in mobility indices, are insignificant. This may appear surprising: If a woman makes decisions regarding income, surely, she should also have more freedom over her movements and in decisions regarding household purchases? Further research on these issues is needed to confirm some of the possibilities we raise to resolve this puzzle. This includes research on the changing distribution of women's time between income-earning activities and domestic work.

Understanding and assessing these compensating effects is important in evaluating any policy, but particularly those that seek to change women's roles and their bargaining power within households. Although our study finds no effect of the project on husbands' hours of work, the possibility that this may occur in response to larger benefits (such as those that may have materialised if women sold maize through the FPC) is a potential concern. If such compensating responses exist, then improvements in household outcomes, such as food expenditure and nutrition, may not materialise.

Finally, our analysis of spillovers between landowning and landless members of a PG suggests that the formation of a network of women that promotes livelihood activities does engender positive externalities, even for women who are not engaged in the same activities. This is an important result, because it supports the hypothesis that community-based groups can generate such externalities and hence, redress existing inequalities. However, the small proportion of target women that non-target members are combined with in any given PG minimises the effect of such spillovers, explaining the project's overall lack of impact on women with marginal or no agricultural land. Programmes that focus on activities that do not feature such a sharp division of target and non-target households, such as those involving non-agricultural enterprises, are likely to generate much larger effects.

Additionally, it is also worth keeping in mind that PGs and other CBOs that seek to enhance livelihoods are better placed to generate income-augmenting spillovers due to the diversity of their membership. Small, homogeneous organisations, such as SHGs, are less likely to generate such spillovers. Their advantages are likely to be in areas that benefit from homogeneity, such as providing informal insurance and a minimum level of food security. Building on empirical evidence that a certain level of security and insurance is required to encourage income-enhancing investments, it may well be that the success of a new generation of policies that focus on PGs and other livelihood-enhancing institutions requires continued attention to the quality of the SHGs that these higher-level institutions build on.

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