



# **CAN PRODUCER ASSOCIATIONS MAKE AGRICULTURE SUSTAINABLE?**

## EVIDENCE FROM FARMER DEVELOPMENT CENTERS IN INDIA

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### ABSTRACT

**T**his paper evaluates the impact of the Self-Employed Women's Association's (SEWA) farmer development center (FDC) initiative across five farming districts in Gujarat, India. The initiative provided a mix of training, information provisions, access to farming inputs, risk mitigation, and output. Controlling for a range of individual-specific, household, and village-level factors, we find that SEWA membership primarily raised awareness of available opportunities among its participants, linked women to the financial sector and to diversified employment opportunities, including

non-farm work. There is also evidence that the program's impact varied depending on the participants' socio-economic background. The poorest members experienced higher farm and non-farm incomes, increased food consumption, improved household and farm productivity, more self-employment opportunities, a greater likelihood of opening a bank account, higher crop harvests, and greater food security. These estimates suggest that the major comparative advantage of FDCs lies in improving access to credit and in expanding access to useful information.

## INTRODUCTION

**T**he problems in farming in developing countries are numerous and well-known: drought vulnerability, soil degeneration, a lack of financial instruments (credit and insurance), high transaction costs imposed by intermediaries, the inaccessibility of reliable inputs, and a lack of market opportunities. Over the past decade, agriculture in India has undergone what one state-level commission terms a period of “generalized rural distress,” producing high levels of rural unemployment, forced migration, and declines in per capita calorie consumption among the poor (Commission on Farmers’ Welfare 2005; Suri 2006). Indian agriculture—characterized historically by much greater volatility than the general economy (Figure 1)—has also been adversely affected in recent years by declining productivity, greater import competition, and rising prices for fertilizer, seed, and pesticides. Although the percent of agricultural employment in the labor force has been declining, most of that decline has been due to the loss of cultivators (Figure 2).

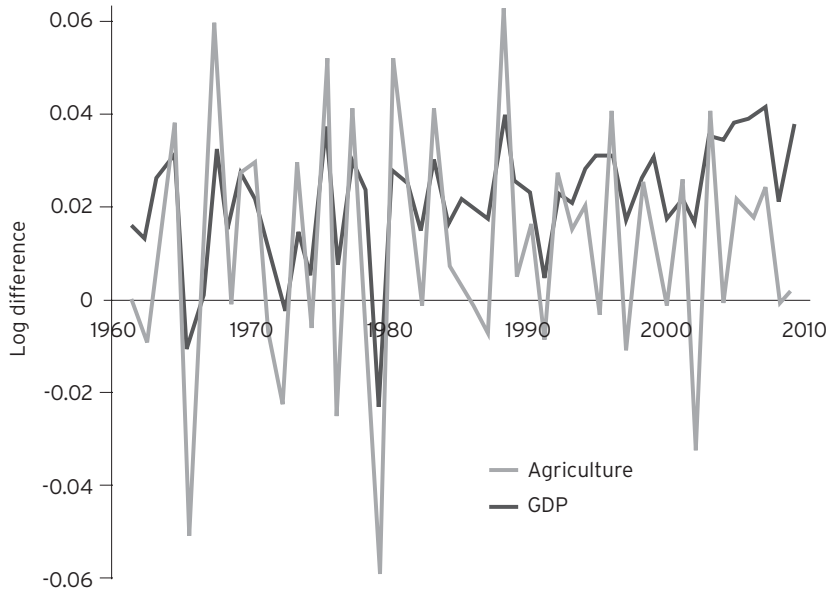
Adjustment costs in the Indian rural economy have fallen disproportionately on tenant farmers and rural day or “casual” laborers, and in particular, on female farmers.<sup>1</sup> Women constitute only one-third of the Indian workforce, but three-quarters of these economically active women are engaged in agriculture (compared to 53 percent of men), as either workers in household farms owned or tenanted by their families, or as wage earners, and almost all of these agricultural workers are in the informal sector. Moreover, Indian women face a range of disadvantages that are exacerbated by the pressures of rising input costs, cuts in agricultural subsidies and risks of weather shocks. First, they encounter steeper entry barriers than men in agriculture. Patriarchal inheritance codes restrict women’s property rights over agricultural land, particularly in North India (Agarwal 1994b; Dyson and

Moore 1983). Barriers to access in land translate into barriers to accessing credit, since most formal sector loans require land titles. Female farmers also face other impediments such as cultural indifference, regulatory barriers, as well as higher bribe taxes from officials than their male counterparts (World Bank 2001). As a result, most women’s agricultural work is informal, done under conditions of high insecurity in relation to a lack of contract and benefits, and the availability of a large supply of surplus labor (Unni and Rani 2003).

Second, most government investments in agricultural-support programs—such as agricultural extension—have typically excluded women and have almost exclusively been targeted at men (Danida 2002; Raabe 2008). Third, the lack of collective-action mechanisms available to women in rural areas relative to men has limited female access and representation in local decision-making, and has contributed to the self-exclusion of women from a variety of participatory schemes and other community-based development programs that might mitigate the results of rural gender bias.

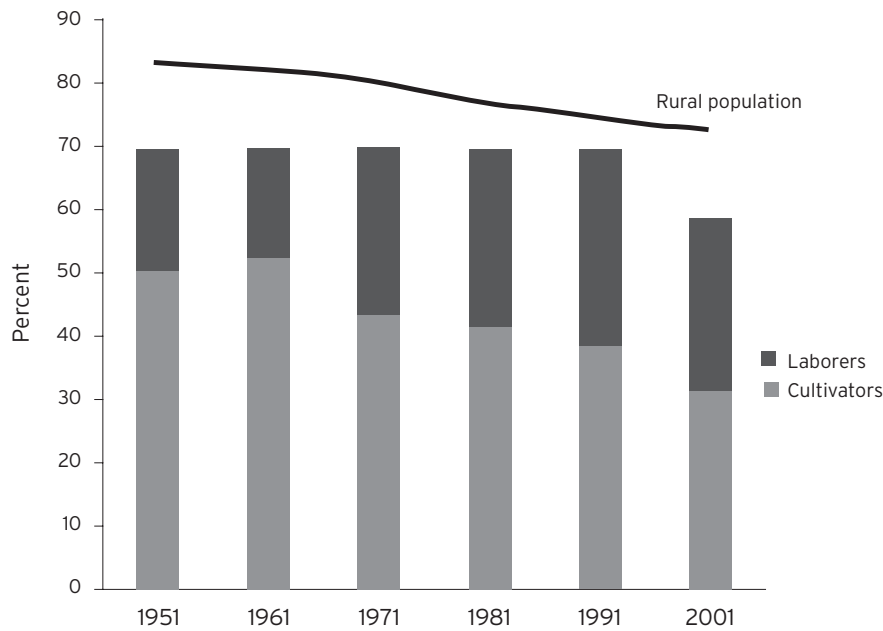
In recent years, several non-governmental organizations have attempted to address these issues and provide support to female farmers. “Membership-based organizations” have emerged to provide women with organizational resources that increase coordination, improve their capacity for management of collective goods (e.g., property, irrigation schemes), and support their participation in village affairs and local politics.<sup>2</sup> In rural communities, producer associations have mobilized and organized female farmers, provided them with diverse services that include access to information and training, assistance in organizing inputs, marketing support, provision of credits, as well as in enhancing the bargaining power of farmers for securing better contracts and prices. The general basis for

**Figure 1: Agriculture and Economic Growth in India, 1960 - 2010**



Source: World Bank, World Development Indicators.  
 Note: Log differences in agricultural value added and GDP are calculated from annual constant-dollar amounts.

**Figure 2: Structure of Agricultural Employment in India, 1951 - 2001**



Source: Census of India, various years.  
 Notes: Laborers and cultivators are in percentages of total workers; rural population is in percent of total population.

the proliferation of producer associations is the view that local farmers' possess informational advantages regarding their own farming needs and placing them at the center of decision-making leads to greater efficiency, greater equity and lower transactions costs (Bank 2008; Chen et al. 2007)

Governments and multilateral development institutions have increasingly promoted producer associations.<sup>3</sup> It is expected that collective action by farmers increases participation, improves agricultural productivity, establishes better connectivity with markets, and increases their bargaining power in securing inputs and selling outputs. In the long run, this contributes to both growth and poverty alleviation. Recent research however, demonstrates that this approach has its challenges. Evidence from Sub-Saharan Africa and South Asia suggests that local producer associations' informational advantages may be nullified by problems ranging from local elite capture, exclusion of the poorest groups from decision-making, and the lack of information about the external environment and market conditions. These issues can prevent producer associations from translating their informational advantages into either agricultural productivity growth or poverty alleviation (Bernard and Spielman 2009).

Empirical assessments of the impact of producer associations are thus quite important. This evaluation focuses on a program in the Indian state of Gujarat that combines social empowerment with agricultural extension. The program, known as the "Women Farmers with Global Potential" (WFGP) initiative, focuses exclusively on rural women and draws on producer associations as the primary channel for delivering the intervention. The effort was coordinated by the Self-Employed Women's Association (SEWA), a non-governmental organization that has acquired

significant experience in the development of producer associations and other membership-based organizations for the rural poor in India.

We aim to evaluate the impact of the WFGP program at the individual level, considering both economic and non-economic outcomes. We examine results of SEWA membership on income, employment, empowerment, consumption, income, and assets of women in these communities. We draw on a survey of approximately 1,500 women in 42 villages in five rural districts in Gujarat conducted in 2010 over several months following the monsoon, divided between members of SEWA and non-members. Although villages were selected randomly for SEWA treatment, individual women were not. To control for problems of individual selection, then, we rely on propensity score matching on observables to ensure balance between SEWA members and non-members.

Our results illustrate that SEWA membership had some important effects: it raised awareness of available opportunities among its participants, and linked women to the financial sector, and to diversified employment opportunities, including non-farm work. SEWA members are less likely to work as unpaid workers, are more likely to have better knowledge of loan products available, more likely to have obtained those loans, and more likely to have superior information about market prices than non-members. SEWA women were also more likely to sell outside the established state-procurement system than non-members.

We also find considerable evidence of the heterogeneity of impact. SEWA membership benefitted the poorest women (as measured by residence in temporary or "kutcha" housing) as well as those who had faced previous income shocks. Relative to other women, these women experience higher farm and non-farm income,



greater food consumption, improved household and farm productivity, more self-employment opportunities, a greater likelihood of opening a bank account, higher crop harvests, having access to adequate food for the family.

The remainder of this paper is organized as follows. The next section reviews agricultural extension pro-

grams in India, and describes SEWA's intervention in detail. The section after that examines household impacts of the WFGP initiative. The final section discusses the prospects of scaling up the program in India as well as in other developing countries. The final section concludes and offers some implications for agricultural policy in India and globally.

## TOWARDS BOTTOM-UP RURAL DEVELOPMENT IN INDIA

### Agricultural Extension in India

**T**he Indian government has historically sought to remedy some of the problems faced by farmers through use of “agricultural extension” schemes or efforts to transfer information about global markets to farmers who normally face high information costs (van den Ban and Hawkins 1996). As with many developing countries, India’s agricultural extension services have traditionally been publicly funded and delivered through government agencies of various states and territories. Despite the spread of new agencies and private-sector groups, state-level agencies continue to dominate the provision of services to farmers (Sulaiman and Hall 2004).

As with other rural programs, significant evidence suggests that women have often been excluded from these schemes (Danida 2002). Agricultural training through the “training and visit” (T&V) system pioneered with World Bank support in India, for example, was primarily targeted to male farmers, with female farmers being excluded or being given training in areas such as home economics or other irrelevant subjects (Berger, Delancey, and Mellencamp 1984; Macklin 1992). Where extension services have targeted women, their impact has been limited by the restricted agency of female smallholders in crop selection, the poor economic status of women in the family, and the heavy reliance on patronage relations for women to access farming inputs (Agarwal 1994a; Kantor 2009). Finally, the traditional, hierarchical systems of agricultural extension were often inflexible and therefore ill-suited to the needs of highly-differentiated female farmers.

A wide body of evidence, more importantly, suggests that collective-action costs in poor communities limit the ability of the poor to secure high-quality public goods (e.g., (Alesina, Baqir, and Easterly 1999; Barr 2004; Posner 2005). Among women, collective-action barriers are steep due to: limited bargaining power, information asymmetries, low participation in local decision-making, inability to monitor and enforce cooperative agreements, etc. (e.g., (Adhikari and Lovett 2006; Menon-Sen and Shiva Kumar 2001; Woolcock and Narayan 2000). The usual collective-action problems among the poor—the inability of members to impose credible sanctions in diverse communities, the unwillingness of some members to fund essential services that will be used by members of other groups, the lack of consensus on what public goods should be demanded, and the tendency of all groups to free-ride on the efforts of others—are experienced more severely among women. Among the effects of coordination failures:

- Persistent price distortions (Easterly and Levine 1997);
- Lower primary school-funding and poor-quality school facilities (Miguel and Gugerty 2005);
- Lower access to functioning basic infrastructure (Banerjee, Iyer, and Somanathan 2005b; Khwaja Forthcoming);
- Poorer-performing microfinance institutions (Karlan 2007);
- Communal violence, and emigration (Fearon and Laitin 2003; Varshney 2003);
- Exclusion via discrimination and self-exclusion of potential antipoverty program beneficiaries (Platteau 2000).

## **The Self-Employed Women's Association**

The mixed record of top-down extension services over the past two decades, along with the coordination failures present among female farmers has prompted a movement to revise the institutional underpinnings of agricultural extension in India and elsewhere. In particular, the emphasis has shifted to schemes that focus on gender equity, and that feature decentralized, "community-driven," flexible approaches to extension that rely the non-governmental and/or private sector rather than the public sector, in sponsorship (Feder, Willett, and Zijp 2001).

One such effort has been undertaken by the Self-Employed Women's Association (SEWA) in Gujarat. Though the organization was originally established as a trade union of poor and self-employed women in 1972, it has transformed into a cooperative, a labor movement and one of the largest organizations of female workers. With 1.26 million members across 10 states in India and a rapidly expanding international presence, the organization's main mission is to help women in the informal or unorganized economic sectors achieve economic independence and self-reliance through collective action (Chen 1991; Datta 2000; Bhatt 2006). Any self-employed female worker in India can become a member of SEWA by paying an annual membership fee of five rupees (about 12 cents). SEWA provides its members with a variety of services that include the opportunity to organize and bargain for higher wages, employment training programs, new sources of credit (often through its very own bank), subsidized access to new technologies and in many instances, access to free child-care services. Most significantly, SEWA members are given the opportunities and the support services to organize themselves and pursue their own interests. A recent annual report states:

Self-employed women must organize themselves into sustainable organizations so that they can collectively promote their own development. They can be organizations at the village level, at the district level, at the state level, at the national or international level. They can be registered as co-operatives, societies, producers associations or even remain unregistered. Their members may be self-employed women directly, or primary organizations of self-employed women (SEWA Annual Report, 2008:12).

Approximately two-thirds of SEWA's members are rural residents—a reversal of membership patterns in SEWA prior to the 1990s—and one-half of its membership is from its home state, Gujarat.

### **"Women Farmers with Global Potential"**

SEWA designed the "Women Farmers with Global Potential" (WFGP) initiative as a multi-stakeholder project to expand female farmers' ability to access global agricultural markets. Through this initiative, SEWA established over 100 multi-village farmer development centers (FDCs) entirely run by women, covering some 300 villages in five districts in Gujarat, in which over 2,000 female farmers participate. The primary goal of the centers is to support an agricultural extension system that is designed, developed, and managed by the female farmers themselves. The centers also provide a platform for women producers to prepare business plans, to develop collective strategies for procuring inputs, to explore financing options and opportunities, conduct capacity building and training sessions, and discuss policy challenges. The FDCs focused on the following areas of agricultural extension:

- **Training:** Women who joined farmer development centers received technical training in crop management, as well as in farming techniques. Farmer development centers also acted as community-learning centers where awareness training workshops were offered to tenant farmers and farm laborers—mostly to instill confidence in women in household affairs;
- **Input procurement:** SEWA holds a corporate license to distribute seed, organic pesticide, and fertilizer, and acted as a distributor to farmer development centers. In addition, the farmer development center maintained a rental inventory of farming equipment;
- **Finance:** Farmer development centers facilitated credit access through group-based banking with local rural banks;
- **Price dissemination and market information:** Farmer development centers served as a clearinghouse for spot price information for various crops, posting prices on a daily basis, as well as delivering information to mobile phones via text messaging;
- **Market linkages:** SEWA's agro-processing unit, "RUDI" has a presence in all five districts, and farmers through the farmer development centers were to link with RUDI's standardization regimes in order to act as small-scale suppliers to RUDI processing centers.

This evaluation, therefore, focuses on five areas of impact at the household level: (i) farm and non-income (ii) accessibility and cost of inputs (credit, fertilizer, seed, pesticide, equipment); employment; (iii) farm productivity and household employment (iv) expansion of markets for outputs (access to information, mitigating crop wastage, access to markets); and (v) risk mitigation.<sup>4</sup>

## **Data, Methodology, and Results**

### ***Sample Selection and Survey Methods***

The WFGP was implemented primarily in four districts in Gujarat: Anand, Mehsana, Patan, and Surendranagar. Table 1 lists the samples, drawn proportionately based on the SEWA member populations of these districts then matched to groups in villages where SEWA's presence was minimal based on average female literacy, village population, and average household size, using data from the last available All-India National Census (2001), and identifying 750 SEWA members (treatment) and 750 non-members (controls) spread across 42 villages. Due to redistricting since the beginning of the WFGP initiative, two Anand villages were redistricted to Kheda. Figure 3 shows the location of the Gujarat where the WFGP initiative was implemented. Table 2 shows the sample breakdown across villages among these five districts. Most of our villages either have a SEWA presence or no SEWA presence; approximately half of our sample resides in villages where SEWA is not present. However, in some of the larger villages, some of the surveyed women in non-SEWA villages were exposed to SEWA's organizational programs through their sales of crop to, or work for, SEWA-sponsored cooperatives in other villages. Thus 10 villages are considered to have a "partial" SEWA presence.

1,500 women were interviewed—divided between WFGP initiative participants and non-participants—between September and December 2010, after the program had been in effect between four and 16 months in different villages. Surveyors visited villages in teams, first in SEWA villages meeting SEWA leaders (agewans), and then in non-SEWA villages meeting with the village head (sarpanch). In SEWA villages,

**Table 1: District Populations and Sample Selection**

District	SEWA members	Proportionate respondents in each district for the treatment and control	Respondents actually selected from each district (treatment and control)	No. of villages selected from each district
Anand	769	120	120	10
Mehsana	222	35	40	2
Patan	822	128	130	14
Surendranagar	3,008	468	460	16
Total	4,821	750	750	42

Source: Self-Employed Women’s Association.

**Figure 3: WFGP Project Districts in Gujarat State**



\* Two formerly Anand-district villages, due to redistricting, are located here.

**Table 2: Village Control and Treatment Households**

District	Village	SEWA members surveyed	Non-members surveyed	Total	Village designation
ANAND	Ardi	20	0	20	2
	Hathipura	20	0	20	2
	Khadol	0	20	20	0
	Linagda	0	20	20	0
	Manpura	18	1	19	2
	Navakhhal	0	19	19	0
	Pansora	19	0	19	2
	Zala Bordi	0	40	40	0
	Total	77	100	177	
KHEDA	Ratanpur	20	19	39	1
	Sokhada	20	18	38	1
	Total	40	37	77	
MEHSANA	Kaiyal	25	12	37	1
	Vadu	21	20	41	1
	Total	46	32	78	
PATAN	Abiyana	0	20	20	0
	Anternesh	29	1	30	2
	Babari	20	0	20	2
	Bamroli	19	0	19	2
	Dadka	0	20	20	0
	Dhrechna	0	19	19	0
	Gandasai	9	0	9	2
	Jayram Nagar	0	20	20	0
	Kamalpur	19	0	19	2
	Marvada	17	2	19	1
	Ranavada	19	0	19	2
	Ranisa	0	20	20	0
	Satun	0	20	20	0
	Shidhuna	0	19	19	0
Total	132	141	273		
SURENDRANAGAR	Ajitgadh	58	0	58	2
	Bhalgamda	1	59	60	0
	Bubvan	2	46	48	1
	Devipur	4	45	49	1
	Drumath	0	47	47	0
	Eshanapur	2	47	49	1

**Table 2: Village Control and Treatment Households (cont.)**

District	Village	SEWA members surveyed	Non-members surveyed	Total	Village designation
	Ganshyampur	2	44	46	1
	Koyaba	50	0	50	2
	Mota Ankevadiya	90	0	90	2
	Panda Tirath	0	45	45	0
	Ranampur	50	0	50	2
	Ratabher	51	0	51	2
	Rupavati	2	92	94	1
	Sedala	47	0	47	2
	Shivpur	45	0	45	2
	Visavadi	48	0	48	2
	Total	452	425	877	

Notes: Village designations are:

0 - village with no SEWA-WFGP members

1 - village with limited SEWA-WFGP membership

2 - village with less than 95 percent SEWA-WFGP membership

women were randomly selected from member lists provided by SEWA. In non-SEWA villages, women were randomly selected for interviews; in both cases, no more than one female per household was surveyed. All surveys were conducted face-to-face, with no age-wans or other village officials present.

Of the 1,500 women interviewed, 16 responses were eliminated from the sample due to duplication of households, leaving a final sample of 1,482 women representing 1,482 households. Of these, 651 (44 percent) report being landless, casual agricultural laborers, reflecting state-wide patterns where 45 percent of women farmers are reported as landless. Of the 1,482 women surveyed 747 (50.4 percent) were members of one of SEWA's farmers' groups established by the WFGP in these five districts. A comparison of the distribution of plot sizes between SEWA members and non-members (Figure 4) shows that landholding pat-

terns are highly similar between these two groups. Figure 5, finally, shows the relationship between income sources and land size by villages in which women were surveyed. As the graph shows, farm and non-farm income are related to aggregate plot size, indicating that arable land area is associated with larger farming income but also spills over to non-farm activities.

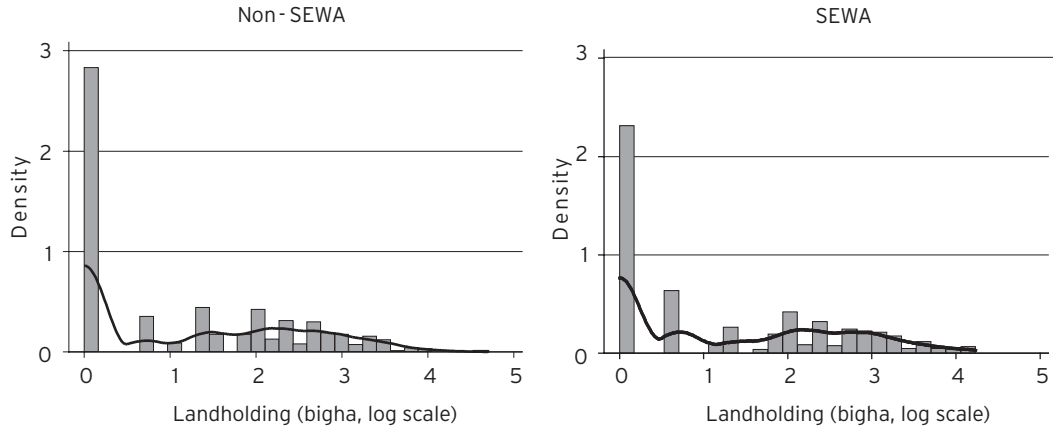
## Specification and Methods

Our basic specifications take the following form:

$$A_i = F(\hat{\chi}_\omega \omega_i, \hat{\chi}_x X_i, \hat{\chi}_y Y_i, \hat{\chi}_z Z_i),$$

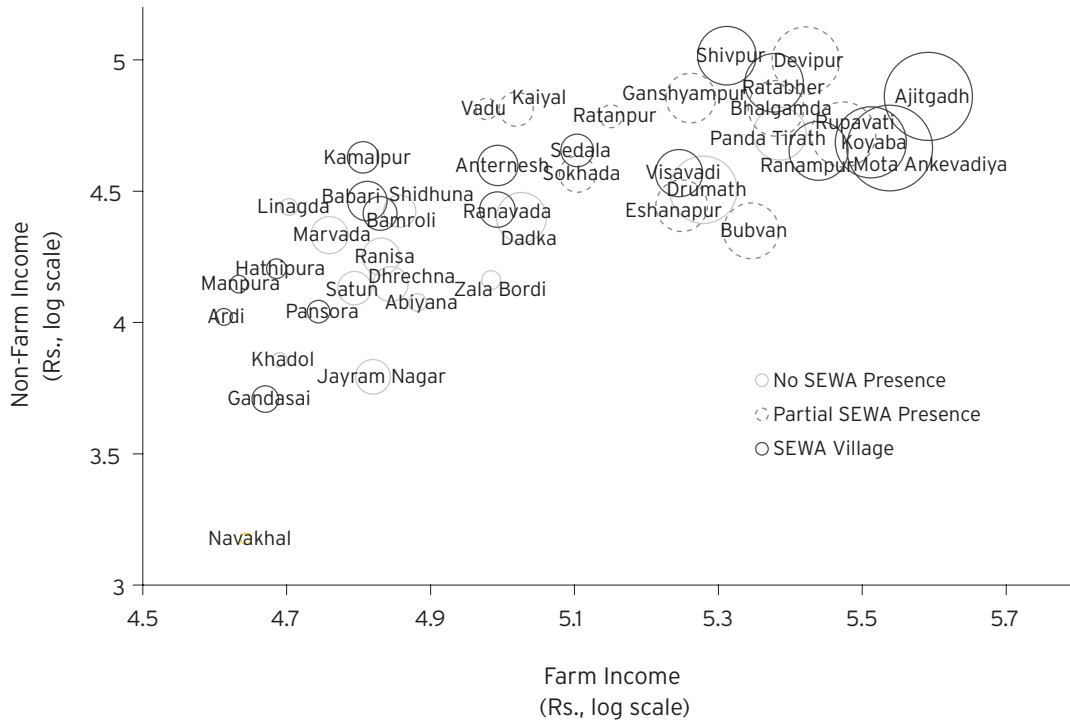
where  $A$  is the estimated household impact for female  $i$  of membership in SEWA  $\omega$  (1 if a member, 0 otherwise),  $x$ ,  $y$ , and  $z$  are vectors of individual-specific indicators, household factors, and fixed effects,

**Figure 4: Landholding Patterns among SEWA members and Non-Members**



Notes: Farm and non-farm incomes are total income levels of all women surveyed in the villages. Circle areas are scaled by the cumulative land owned by all surveyed women (bigha, log scale) in the village. Villages where there is no SEWA presence are those where no surveyed women were SEWA members, SEWA villages are those where 100 percent of surveyed women were SEWA members; partial-SEWA villages are those in between.

**Figure 5: Income Sources by Village**



Notes: Density functions are generated from biweight (quartic) kernels with bandwidths of 0.5.



respectively, and the  $\chi$ s represent parameters to be estimated. Initially we focus on women who have been members of SEWA for a minimum of six months, but in subsequent estimations we include all women regardless of the length of their exposure to SEWA activities. Since the benefits of membership take time to realize, we expect these two measures of participation in SEWA activities to yield different results. The individual-specific characteristics we include are the age of the interviewee in years and her level of education (years of schooling).<sup>5</sup> Household characteristics we include are whether a woman is head of household, the size of the household, the land plot owned by the household (bigha, in natural logs), the fraction of the household that works in agriculture, and the fraction of the household made up of women. Note that landholding serves not only as an indicator of farm holdings, but also identifies cultivators from tenant farmers or laborers (i.e., those with zero land ownership). We also include dummy variables identifying whether the family house is constructed of non-durable materials (*kutchha*)—a useful proxy for general income<sup>6</sup>—as well as whether the household has suffered a work-related shock in the past six months (due to weather, pests, theft, price shocks, illness/death of main household member, etc.). Finally, we include both village-level and crop-fixed effects in all specifications. We also examine conditional (interactive) effects of SEWA membership on a number of household and individual characteristics. Summary statistics of key dependent and independent variables in our analysis are presented in Appendix Table A1.

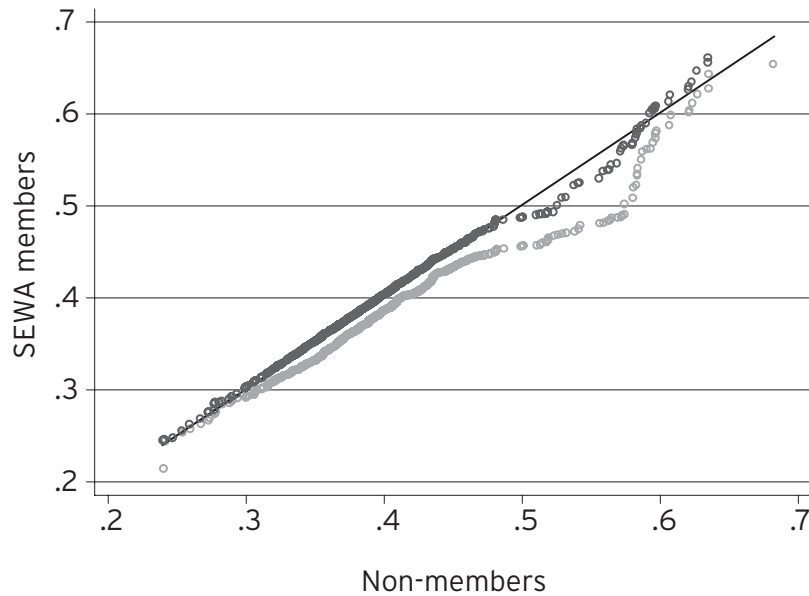
Given that intra-group correlation of errors in survey data can be present even in the presence of fixed effects, we allow errors to be correlated across individuals in a given village, i.e., standard errors are clustered by villages in all specifications. Our basic specifications are estimated using OLS or logit regressions

depending on whether the outcome of interest is continuous or binary.

Considerable efforts were made by field-workers to ensure that villages receiving SEWA interventions were selected randomly, and that the sample of SEWA members and non-members was balanced along the lines of key demographic and socio-economic characteristics. Estimates of village level differences in pre-program characteristics of respondents are reported in Appendix Table A2. These estimates suggest that the two sets of villages are similar in most ways, but there may be a smaller number of women living in *kutchha* or temporary housing structures in SEWA villages relative to villages without SEWA programs. We address the possibility that estimates of SEWA's impact may be affected by selection bias along the lines of certain individual or household characteristics (such as residence in a *kutchha* household). We correct for such observable differences between SEWA members/non-members by pre-processing our data with propensity matching methods, then re-running our parametric analyses on the matched sub-sample of the data.<sup>7</sup> We compute coefficients on all independent variables after matching rather than reporting the simple difference in means without controlling for potential confounding variables. The purpose of matching is to ensure that SEWA members are as similar as possible to non-members firms in terms of relevant covariates in order to sever the links between explanatory covariates and likelihood of treatment. We rely on nearest-neighbor matching to obtain a balanced sample.

Our propensity score is estimated with a logistic regression of treatment variable (SEWA membership, min. six months) on age, education, whether the interviewee is head of household, land plot (bigha<sup>8</sup>, log scale), whether the house is *kutchha*, number of

Figure 6: Quantile-Quantile Plot of Propensity Scores for SEWA Membership



Notes: QQ plot of propensity scores for SEWA membership. The circles represent QQ estimates for the raw data and the solid dots the matched sub-sample. 45-degree lines indicate identical distributions. The propensity score is estimated with a logistic regression of treatment variable (SEWA membership, less than six months) on age, education, whether the interviewee is head of household, land plot (bigha, log scale), whether the house is kutcha, number of adults in the household, and crop dummies.

adults in the household, and crop dummies. Figure 6 gives one summary of the differences between SEWA members and non-members in the quantile-quantile (QQ) distributional plot of the propensity score. The QQ plot of the raw data (circles) is slightly below the 45-degree line for large sections of the distributions, indicating that “treated” individuals (SEWA members)

may be different than “control” individuals. Although model dependence is a potential problem, matching (solid dots) leads to SEWA member and non-member values of estimated propensity scores to converge at almost every quantile.

## RESULTS

**W**e examine several aspects of potential impact of SEWA membership through the WFGP initiative across 42 villages. Our estimates control for selection bias and pre-intervention differences between SEWA members and non-members through propensity-score matching.

### Income

Table 3 shows results of SEWA membership on total, farm, and non-farm income. We find that SEWA membership is associated with *lower* non-farm income, and that this effect is strong enough to affect total income. This may be due to the general shift of SEWA women, following participation in the WFGP initiative, to shift activities away from non-farm work towards agriculture, and thus earn less from work outside farms. However, we also note that SEWA membership has no average effect on farm income, suggesting that any changes in work patterns towards farming through incentives offered by the WFGP have not yielded higher earnings to date. Given that income from agriculture often take an entire season to realize, it is also possible that the measure of total income does not adequately reflect these agricultural activities.

We then examine the combined effect of SEWA membership with four conditional factors: landholding, education, house type, and with the incidence of shocks. The inclusion of these interactive effects shows that the impact of SEWA membership is heterogeneous and varies depending on an individual's socio-economic conditions. For example, although SEWA membership is associated with lower total and non-farm income, SEWA members who reside in kutcha houses, i.e. houses that lack a solid roof or walls, actually experience higher total and non-farm income. The magnitude of the effect is quite significant: Sewa

members who reside in kutcha households experience total income improvements of 31 percent and the effect is statistically significant at the 1 percent level. This suggests that the poorest women in fact benefit from SEWA schemes, even on the short time-horizon on which this project has been evaluated. Given that only 6 percent of all SEWA members reside in kutcha homes however, and that the program features no particular services to this population, further work is necessary to understand the precise drivers of this effect.

The results also indicate that SEWA members who are more educated also have higher non-farm incomes. SEWA members who have experienced work-related shocks such as unemployment, the loss of a job or output, or a shock to inputs earn higher farm income and thus higher total income. SEWA members who are landless or smallholders also report higher farm income (given that the impact of SEWA membership on farm income is declining in land plot size). The effects on income suggest that SEWA's impact is conditioned on these initial conditions, and that SEWA's impact is greatest on educated but poor landless women who have experienced shocks. The finding that poorest women are the biggest beneficiaries of SEWA programs is interesting and important because it differs from other results in the literature that suggest that local groups are often susceptible to elite capture and the poorest are often marginalized and face participation barriers (Bernard and Spielman 2009; Mansuri and Rao 2004).

Other variables function as expected. Women who are older and more educated have greater total income. Larger landholders have larger farm incomes. Household size has an effect primarily on non-farm income, while households with larger fractions of women raise farm income. Households that have ex-

**Table 3: Farm and Non-Farm Income**

	(1)	(2)	(3)
	Total Current Income (Rs., log)	Farm Income (Rs., log)	Non-Farm Income(Rs., log)
SEWA member (more than 6 months)	-0.2937*** (0.0891)	0.1691 (0.4223)	-1.2478* (0.6324)
Age (years)	0.0035** (0.0015)	0.0007 (0.0068)	0.0006 (0.0093)
Education (years of schooling)	0.0089* (0.0044)	0.0216 (0.0299)	-0.0659 (0.0465)
Female head of household	0.0196 (0.0421)	-0.0690 (0.1995)	0.5077 (0.3523)
Kutcha house	-0.2717*** (0.0581)	0.6060** (0.2706)	-1.1043*** (0.3748)
Land (bigha, log scale)	0.1450*** (0.0238)	0.3195*** (0.0905)	0.0326 (0.2292)
Household size	0.0813*** (0.0139)	0.0259 (0.0542)	0.2259*** (0.0703)
Workers per household	-0.0814 (0.0652)	1.1203*** (0.2993)	-1.2483*** (0.4403)
Women per household	0.3837** (0.1465)	0.9762** (0.4708)	0.7937 (0.8023)
Shock	-0.1954*** (0.0688)	-0.9020*** (0.2997)	0.6110 (0.4746)
SEWA x Land	0.0306 (0.0312)	-0.2466* (0.1377)	0.1737 (0.2278)
SEWA x Education	0.0085 (0.0077)	-0.0016 (0.0315)	0.1285** (0.0592)
SEWA x Kutcha house	0.3143*** (0.1044)	0.2533 (0.3730)	0.9412* (0.5071)
SEWA x Shock	0.1888* (0.0954)	0.7759* (0.3927)	0.2232 (0.5799)
N	1,152	1,152	1,152
Villages	42	42	42
R <sup>2</sup>	0.3837	0.2273	0.1876

Notes: Results are from OLS with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01.

perienced shocks, by contrast have lower farm (and total) income. We also see that kutcha house dwellers report significantly lower non-farm income than those who reside in permanent structures, and that this effect is strong enough to lower total income despite the fact that kutcha dwellers report higher farm incomes. Finally, we also note that where a greater fraction of household members are working, the benefit is mainly in terms of boosting farm income.

### **Consumption, Expenditures, and Credit Access**

In Table 4 we explore the impact of SEWA membership on various categories of household consumption and farming expenditures. We first examine impact on food expenditure, given its centrality in assessments of rural poverty (see, e.g., (Subramanian and Deaton 1996)). We find that SEWA membership is strongly correlated with *lower* amounts of food consumption. Specifically, SEWA membership is associated with 21 percent lower expenses on food. This finding, however, is not surprising in light of other evidence from rural India and elsewhere that food consumption does not necessarily increase proportionately as women are “empowered.” Indeed, others have found that caloric intake may actually decline among wealthier rural residents, as those residents begin to use disposable incomes to consume non-food durables and other services (in particular, on festivals, weddings, and other things that may increase status) (Banerjee and Duflo 2011; Deaton and Dreze 2009). We do note, however, that despite the aggregate effect, better educated SEWA members who live in semi-permanent dwellings and who have experienced shocks do increase food consumption. The magnitude of the effect is quite large: this population displays 26 percent higher expenses on food than their counterparts who are non-members and/or reside in permanent structures.

This is perhaps explained by the high reliance of these households on manual labor.

In the case of SEWA members, however, it appears that expenditures may shift away from food towards farm-based inputs: SEWA membership is associated with a 30-50 percent greater expenditures on seed and non-seed items (including fertilizer and pesticide). For these farming-specific expenditures, we see no heterogeneity of treatment effects. More importantly, as we show below, these increased expenditures are more likely occurring because of increases in agricultural productivity, not due to market-based shocks or price hikes.

Turning to relationships between women and financial intermediaries in Table 5, we find strong, positive effects of SEWA membership—both short-term and longer-term—on the information access regarding credit and on the likelihood of obtaining a loan. SEWA members were more likely to know about lending products offered by local banks than non-members, and this effect was present even when short-term members (less than six months) were included. In fact, the magnitude of the effect increases when all SEWA members regardless of length of time in which they have been exposed to SEWA activities are included, and this effect is despite the fact that female-dominated households are less aware of these products. A similar pattern is observed with actually obtaining a loan: SEWA members of any exposure are almost three times as likely to have obtained loans compared to non-members. Our estimation also confirms the role that landholding plays in rural credit access—those with larger land plots increase their probability of obtaining credit. These credit effects are common to members regardless of landholdings, education, dwelling type, or shocks.<sup>9</sup>

**Table 4: Farm Expenditures and Consumption**

	(1)	(2)	(3)	(4)
	Expenditure on Food (Rs., log)	Farm Input Expenditures (Rs., log)	Expenditures for Seed (Rs., log)	Non-Seed Expenditures (Rs., log)
SEWA member (more than 6 months)	-0.2133*** (0.0621)	0.3633* (0.1803)	0.3472** (0.1681)	0.4909** (0.1909)
Age (years)	0.0004 (0.0012)	0.0051 (0.0039)	0.0030 (0.0037)	0.0031 (0.0054)
Education (years of schooling)	0.0010 (0.0048)	0.0062 (0.0137)	0.0022 (0.0140)	0.0060 (0.0189)
Female head of household	0.0187 (0.0361)	0.0416 (0.1484)	0.1164 (0.1287)	-0.1057 (0.1580)
Kutcha house	-0.2188** (0.0820)	0.0603 (0.1520)	0.1447 (0.1392)	0.0843 (0.1717)
Land (bigha, log scale)	0.1206*** (0.0237)	1.7744*** (0.1498)	1.5283*** (0.1326)	1.5022*** (0.1343)
Household size	0.1160*** (0.0088)	0.0107 (0.0364)	0.0379 (0.0337)	0.0290 (0.0447)
Workers per household	-0.0905* (0.0525)	0.9920*** (0.3055)	1.1023*** (0.2474)	0.9052*** (0.3251)
Women per household	0.0306 (0.1037)	-0.2833 (0.5771)	-0.5543 (0.4892)	-0.5550 (0.5344)
Shock	-0.0705 (0.0469)	0.3008 (0.1899)	0.1580 (0.1617)	0.3862** (0.1785)
SEWA x Land	0.0132 (0.0252)			
SEWA x Education	0.0125* (0.0066)			
SEWA x Kutcha house	0.2604** (0.1036)			
SEWA x Shock	0.2328*** (0.0478)			
N	1,126	1,152	1,152	1,152
Villages	42	42	42	42
R <sup>2</sup>	0.3925	0.8546	0.8515	0.7889

Notes: Results are from OLS with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

**Table 5: Loans and Banking**

	(1)	(2)	(3)	(4)	(5)	(6)
	Obtained Loan Information		Obtained Loan		Opened Bank Account	
SEWA member (more than 6 months)	1.7060*** (0.4212)		1.9737*** (0.6667)		0.5002** (0.2431)	-0.1665 (0.4204)
SEWA member (any exposure)		2.2318*** (0.4921)		2.7596*** (0.6580)		
Age (years)	0.0057 (0.0060)	0.0043 (0.0062)	0.0034 (0.0087)	0.0075 (0.0103)	0.0142*** (0.0055)	0.0150*** (0.0055)
Education (years of schooling)	0.0247 (0.0199)	0.0272 (0.0182)	-0.0018 (0.0317)	0.0189 (0.0343)	0.0445** (0.0195)	0.0008 (0.0284)
Female head of household	-0.0805 (0.2318)	-0.1085 (0.2327)	-0.6016 (0.4505)	-0.3841 (0.4451)	0.5073*** (0.1814)	0.5150*** (0.1879)
Kutcha house	0.4352 (0.4558)	0.3753 (0.4636)	-0.1944 (0.4979)	-0.4220 (0.4822)	-0.0710 (0.3342)	-0.4039 (0.5048)
Land (bigha, log scale)	0.0094 (0.0919)	0.0079 (0.0984)	0.7607*** (0.2068)	0.7283*** (0.1843)	0.3306** (0.1473)	0.3772** (0.1586)
Household size	-0.0344 (0.0565)	-0.0174 (0.0550)	-0.0749 (0.0876)	-0.0688 (0.0752)	-0.1092 (0.0749)	-0.1136 (0.0757)
Workers per household	-0.0560 (0.2790)	-0.0726 (0.2651)	0.8778** (0.3974)	0.8139** (0.3923)	0.1517 (0.3796)	0.1037 (0.3768)
Women per household	-1.6600*** (0.5455)	-1.5236*** (0.5383)	-0.2807 (0.9385)	-0.3060 (0.9440)	-0.1397 (0.7809)	-0.1015 (0.7780)
Shock	0.1684 (0.2592)	0.1739 (0.2439)	0.6320* (0.3328)	0.5245* (0.2679)	0.4091* (0.2125)	-0.0860 (0.3258)
SEWA x Land						-0.0744 (0.1603)
SEWA x Education						0.0747** (0.0341)
SEWA x Kutcha house						0.4626 (0.6103)
SEWA x Shock						0.7994* (0.4775)
N	1,398	1,398	848	1,029	1,130	1,130
Villages	39	39	29	29	40	40
R <sup>2</sup>	0.3149	0.3064	0.3480	0.3348	0.1505	0.1571

Notes: Results are from logit regressions with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01.

In terms of opening a bank account, SEWA membership is somewhat instrumental. However, the effect is concentrated among those who have been SEWA members for over six months—there is no effect when the looser, more inclusive SEWA membership designation is used. When we include interactive effects, moreover, the aggregate benefit of SEWA membership in opening bank accounts is mainly among better-educated women, and among women who have faced shocks—perhaps indicating the compensatory role that rural savings plays, and the role SEWA may have played in supporting saving accumulation.

## Farm Productivity and Employment

A production function for household-farm  $j$  in village  $v$  can be written as:

$$\log Y_{jv} = \beta_0 + \beta_v + \beta_L \log L_{jv} + \beta_K \log K_{jv} + \beta_R \log R_{jv} + \varepsilon_{jv}$$

where  $Y$  is output,  $L$ ,  $K$ , and  $R$  are labor, capital, and land inputs, and  $\beta_0$  and  $\beta_v$  are common and village-specific intercepts, respectively. The error term,  $\varepsilon_{jv}$ , can be interpreted as total-factor productivity (TFP) for the household-farm, i.e., productivity after measured inputs have been accounted for. We estimate productivity by generating the residuals (TFP) from the equation above; we then regress the result using our basic specification, allowing us to gauge the effect of SEWA membership on TFP.

We examine household productivity in the aggregate, as well as farm-specific productivity. For output, we use total income (to measure household productivity) and farm income (to measure farm productivity). For labor we use the number of persons in the household. For capital inputs we use total expenditures (as a proxy for capital inputs for the household) or farming-input expenditures (for farm productivity). For land,

we use plot size. All production functions are generated with village- and crop-fixed effects.

The effects of SEWA membership on the resulting residuals may be interpreted as the impact of SEWA membership on overall household productivity as well as farm productivity. These results are in Table 6. We see no average effects of SEWA membership on household or farming efficiency, with one exception—SEWA membership is associated with lower household productivity in the expanded specification (column 2). We also see several conditional effects in this estimation, however. In particular, SEWA women who reside in kutcha houses, and SEWA women who have experienced shocks report higher productivity than those who were better off. With farm productivity, SEWA women who experienced shocks reported higher farming productivity than those who did not. SEWA smallholders also showed higher farming productivity, indicating again SEWA's beneficial impact among the poorest. Finally, the effects of control variables on household and farming efficiency are generally expected: the more educated women report higher household productivity; those in kutcha houses report lower household, but higher farming efficiency (potentially because the amount of inputs they may be able to contribute as factor of production are limited); more workers per household boosts farming productivity, and female-dominated households are more productive in the aggregate and in farming specifically.

In Table 7 we examine some preliminary effects of SEWA on employment patterns. Respondents were asked whether they had been self-employed, had work as a wage-earner (non-cultivator), and whether they had worked without pay over the past six months (“yes” to all three answers were possible).<sup>10</sup> Marginal estimates (not shown here) find that SEWA member-



**Table 6: Total Factor Productivity**

	(1)	(2)	(3)	(4)
	Household Productivity	Household Productivity	Farm Productivity	Farm Productivity
SEWA member (more than 6 months)	-0.1023 (0.0730)	-0.2964*** (0.0894)	0.1847 (0.2959)	0.1674 (0.4225)
Age (years)	0.0035** (0.0014)	0.0036** (0.0015)	0.0007 (0.0069)	0.0006 (0.0068)
Education (years of schooling)	0.0132*** (0.0048)	0.0085* (0.0044)	0.0202 (0.0222)	0.0217 (0.0301)
Female head of household	0.0252 (0.0413)	0.0263 (0.0425)	-0.0730 (0.2037)	-0.0652 (0.1992)
Kutcha house	-0.0948 (0.0589)	-0.2686*** (0.0563)	0.7798*** (0.1791)	0.6033** (0.2683)
Land (bigha, log scale)	-0.0057 (0.0243)	-0.0170 (0.0246)	-0.1290* (0.0686)	0.0014 (0.0897)
Household size	-0.0099 (0.0135)	-0.0094 (0.0135)	0.0235 (0.0534)	0.0250 (0.0541)
Workers per household	-0.0726 (0.0677)	-0.0794 (0.0656)	1.0881*** (0.2989)	1.0898*** (0.3012)
Women per household	0.3859** (0.1458)	0.3761** (0.1449)	1.0123** (0.5011)	0.9951** (0.4746)
Shock	-0.0936 (0.0742)	-0.1901*** (0.0699)	-0.5139** (0.2152)	-0.9109*** (0.2965)
SEWA x Land		0.0312 (0.0309)		-0.2530* (0.1377)
SEWA x Education		0.0088 (0.0076)		-0.0022 (0.0317)
SEWA x Kutcha house		0.3112*** (0.1025)		0.2522 (0.3708)
SEWA x Shock		0.1866* (0.0970)		0.7663* (0.3906)
N	1,152	1,152	1,152	1,152
Villages	42	42	42	42
R <sup>2</sup>	0.0473	0.0634	0.0590	0.0678

Notes: Results are from OLS with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

**Table 7: Employment Patterns**

	(1)	(2)	(3)
	Self-Employed (in past 6 months)	Wage Laborer (in past 6 months)	Unpaid Work (in past 6 months)
SEWA member (more than 6 months)	0.1735 (0.5570)	0.4785 (0.9611)	-1.5323** (0.7735)
Age (years)	-0.0442*** (0.0077)	-0.0423*** (0.0155)	-0.0185 (0.0118)
Education (years of schooling)	0.0552 (0.0355)	0.0079 (0.0474)	-0.0572 (0.0557)
Female head of household	-2.1599*** (0.4131)	-1.5427*** (0.3339)	-3.5568*** (0.7394)
Kutchra house	-1.1796*** (0.3321)	1.9369*** (0.7018)	-0.6625 (0.7071)
Land (bigha, log scale)	0.7999*** (0.1775)	-0.6874*** (0.2661)	0.1382 (0.4785)
Household size	0.0407 (0.0593)	-0.0460 (0.1030)	0.1702 (0.1248)
Workers per household	1.0449* (0.5609)	-5.6909* (3.0475)	-2.2273*** (0.8447)
Women per household	2.8870*** (0.8799)	3.1725 (3.5363)	7.9087*** (1.6952)
Shock	-0.1523 (0.3345)	-0.7346 (0.5385)	-0.9333 (0.5765)
SEWA x Land	-0.1355 (0.2024)	0.5939** (0.2750)	0.0018 (0.4107)
SEWA x Education	-0.0319 (0.0458)	0.0236 (0.0555)	0.0775 (0.0877)
SEWA x Kutchra house	1.4384*** (0.4775)	-0.9324 (0.7813)	0.3593 (1.0420)
SEWA x Shock	0.2996 (0.4514)	0.0887 (0.5961)	1.0337 (0.8894)
N	1,139	530	548
Villages	41	36	35
R <sup>2</sup>	0.4136	0.4060	0.4954

Notes: Results are from logit regressions with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01.

ship reduces the likelihood of unpaid labor, but has no average effect on self-employment or wage-work likelihoods. However SEWA members who live in kutcha houses increase wage employment opportunities. Interestingly, SEWA members with larger land plots are *more* likely to work as wage-earners; this is not necessarily because their cultivation activities are decreasing, but more likely, due to a diversification of employment opportunities they are finding work as wage laborers outside the household-farm.

## Outputs and Market Links

Tables 8 and 9 identify some effects of SEWA membership on output and sale patterns, and on market costs and linkages. Table 8 indicates that SEWA membership is associated with lower average crop harvests, but as in previous instances, the effect is differentiated between SEWA members depending on whether they have experienced shocks. Those who have experienced shocks report an increase in crop harvests, and the magnitude of this increase is greater than the average decrease, indicating that shock-affected SEWA members see a net gain in crop harvests, while non-shock affected members see crop harvests decline. As suggested earlier, this may be due to a reallocation of work activities outside the farm among SEWA members. Moreover SEWA membership of any length is associated with an increased likelihood of sales to private markets. The bulk of crop sales by small farmers in Indian states are to the state-level Agricultural Product Market Committee (APMC). However, in states that have amended their APMC laws, such as Gujarat, agro-processors may choose to source raw materials from small traders or directly from farmers. In such an arrangement, a farmer can sell their produce subject to certain quality criteria (Gulati, Joshi, and Landes 2008). SEWA members for any length of time were more likely to sell outside

the APMC system than non-members; this effect disappears when only longer-term SEWA members are included. SEWA members also sell a greater fraction of their output (rather than use for own consumption) than non-members.

In Table 9 we explore the impact of SEWA membership on market transactions costs. Here we find that SEWA members are more likely to be aware of crop prices prior to market delivery, suggesting that SEWA's price-awareness programs under the WFGP initiative may be having an impact on farmers who do grow crops. Total effects of SEWA membership (not reported here) indicate that SEWA members are about 3 percent more likely to be paid up-front for crop sales and this effect grows to about 10 percent for women with the mean level of education in the population, i.e. 4 years of schooling. However, we also see that SEWA members are more likely to suffer a loss of output due to spoilage when compared to non-members. Interactive effects based on estimates in Column 2 also suggest that these losses are heightened, not mitigated, among kutcha-dwelling SEWA women or among SEWA women who have experienced shocks (while kutcha dwellers who are not SEWA members, and those who have experienced shocks who are not SEWA members, are both less likely to show overall crop losses en route to markets). This finding may be due to a lack of warehousing and storage opportunities among SEWA female farmers, particularly since warehousing and storage are one of the intended pilots of the WFGP initiative in these districts, and the possibility that SEWA members may have self-selected due to a lack of such storage facilities.

Alternatively, output losses may be due to discrimination against SEWA farmers by market middlemen. This possibility is further suggested by responses to a question about bribe giving. Women were asked

**Table 8: Crop Harvest and Sale**

	(1)	(2)	(3)	(4)
	Total Crops Harvested (kg, log)	Private Market Sales	Total Crops Sold (kg, log)	Fraction of Harvest Sold
SEWA member (more than 6 months)	-0.6368** (0.2446)			
SEWA member (any exposure)		1.6608*** (0.4117)	-0.3689 (0.2288)	1.4013* (0.6944)
Age (years)	0.0002 (0.0044)	0.0046 (0.0103)	-0.0011 (0.0032)	-0.0002 (0.0047)
Education (years of schooling)	-0.0172 (0.0156)	0.0313 (0.0385)	-0.0219* (0.0112)	0.0100 (0.0080)
Female head of household	-0.1740 (0.1367)	0.1369 (0.3293)	-0.1417 (0.1466)	0.2283* (0.1186)
Kutcha house	-0.3789 (0.2850)	-0.0253 (0.4374)	0.1669 (0.1037)	-0.1107 (0.1592)
Land (bigha, log scale)	-0.0287 (0.1114)	-0.1849 (0.2892)	0.0668 (0.0704)	-0.0699 (0.0727)
Household size	-0.0323 (0.0394)	-0.0375 (0.0684)	0.0135 (0.0212)	-0.0476 (0.0586)
Workers per household	-0.0569 (0.1941)	0.7005* (0.3916)	-0.1509 (0.1608)	-0.0906 (0.1280)
Women per household	0.1667 (0.3152)	-2.1928* (1.3051)	0.0709 (0.2655)	-0.0136 (0.3038)
Shock	-0.3808* (0.2065)	-0.1086 (0.3725)	-0.1518 (0.1221)	-0.0962 (0.2620)
SEWA x Land	0.0613 (0.1250)			
SEWA x Education	0.0012 (0.0205)			
SEWA x Kutcha house	0.4531 (0.3673)			
SEWA x Shock	0.6747*** (0.2375)			
N	270	1,124	294	332
Villages	42	28	42	42
R <sup>2</sup>	0.4328	0.2943	0.5027	0.2800

Notes: Results are from OLS (column 1, 3, and 4) and logit regressions (column 2) with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01.

**Table 9: Output Loss and Market Conditions**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Output Loss En Route to Market	Know Output Price Prior to Sale	Paid Upfront for Sold Crops	Bribe Required to Facilitate sale				
SEWA member (more than 6 months)	1.3082** (0.5719)	-2.0886 (1.7790)	0.6352* (0.3636)	0.2695 (0.4535)	-1.0290** (0.5132)	-1.8168 (1.6346)		-1.1568 (2.4644)
SEWA member (any exposure)							14.7881*** (1.3811)	
Age (years)	0.0350* (0.0194)	0.0531** (0.0218)	0.0208 (0.0174)	0.0058 (0.0126)	0.0083 (0.0125)	-0.0164 (0.0342)	-0.0096 (0.0292)	-0.0166 (0.0355)
Education (years of schooling)	0.1138 (0.0822)	0.0343 (0.1355)	0.0065 (0.0430)	0.0606* (0.0327)	0.0212 (0.0372)	-0.0030 (0.0760)	-0.0164 (0.0765)	-0.0061 (0.1265)
Female head of household	0.3697 (0.7097)	0.2692 (0.7841)	-0.9975** (0.5047)	0.4020 (0.3407)	0.4609 (0.3513)	1.6568 (1.1806)	1.7620 (1.1593)	1.7114 (1.1223)
Kutcha house	0.8226 (1.2228)	-14.4782*** (1.1478)	-0.5075 (0.4971)	-0.2333 (0.4451)	0.2748 (0.4961)	-0.2665 (0.8009)	-0.0179 (0.8101)	-15.2161*** (1.1204)
Land (bigha, log scale)	0.3711 (0.5483)	0.1759 (0.4716)	0.7808*** (0.1965)	1.0760*** (0.1798)	0.8798*** (0.1764)	-0.4299 (0.3330)	-0.5134* (0.3012)	-0.0942 (0.4365)
Household size	-0.1289 (0.3111)	-0.1760 (0.2724)	0.0321 (0.0896)	-0.1477 (0.0930)	-0.1485 (0.0933)	0.4784 (0.2986)	0.5116* (0.2838)	0.4672 (0.3313)
Workers per household	0.9451 (1.7847)	0.9661 (1.4213)	-0.5130 (0.5950)	0.9881* (0.5097)	0.9853** (0.4978)	1.0112 (1.3809)	0.8754 (1.2873)	1.1049 (1.3528)
Women per household	-2.5736 (2.9397)	-2.2435 (2.7792)	-0.1809 (0.9158)	0.6850 (1.2916)	0.6732 (1.2795)	-7.3290** (2.8610)	-6.8661** (2.7133)	-7.4024** (2.9175)
Shock	-0.4881 (0.5099)	-1.1846** (0.4892)	0.2678 (0.3879)	0.2438 (0.4117)	-0.0753 (0.4020)	0.4785 (0.5046)	0.4879 (0.5361)	-0.0311 (1.3963)
SEWA x Land		0.3428 (0.8636)			0.5158 (0.3704)			-0.7609 (0.4983)

Table 9: Output Loss and Market Conditions (cont.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Output Loss En Route to Market	Know Output Price Prior to Sale	Paid Upfront for Sold Crops	Bribe Required to Facilitate sale				
SEWA x Education	0.1716 (0.1561)		0.1014* (0.0615)					0.0035 (0.2099)
SEWA x Kutcha house	16.8366*** (1.7564)		-1.1001 (0.9219)					15.6663*** (1.6336)
SEWA x Shock	1.5322* (0.8905)		0.7689 (0.7372)					1.1939 (1.5563)
N	320	502	1,100	201	201	201	201	201
Villages	10	35	41	14	14	14	14	14
R <sup>2</sup>	0.3013	0.3929	0.6782	0.4921	0.6844	0.4843	0.5028	

Notes: Results are from logit regressions with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. Estimations in columns 6 - 8 are weighted for non-response. \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

whether they were required to pay side payments in order to be able to sell crops in particular locations. Given the sensitivity of this question, we are left with a large non-response rate. We use a logistic regression controlling for baseline information (used in the propensity-score estimates) to estimate the probability of response for bribe question; the reciprocals of this probability is used as weights in our subsequent analysis. These weighted estimations, maintaining clustering of errors as well as crop- and village-fixed effects, are in columns 6 through 8. We see that, while longer-term SEWA membership does not change the likelihood that a bribe is paid, exposure to SEWA over any period severely heightens that probability of having to pay bribes at market. When we examine the combined effect of SEWA membership and individual and household conditions we see patterns identical to output loss: the poorest SEWA members (kutcha dwellers) are more likely to pay bribes than either SEWA members who reside in permanent houses, or non-members. The possibility that predatory behavior on the part of market intermediaries and middlemen, therefore, cannot be discounted, nor the possibility the poorest SEWA women are being target for bribe payments.

### **Coping with Risk**

Finally, in Table 10 we explore the effects of SEWA membership on household preparedness for future shocks. We see no aggregate effect of SEWA membership on the likelihood that women have adequate food, income, healthcare access, or emergency funds. The poorest SEWA women do appear to increase their ability to provide food in the event of an emergency, but in no other case does SEWA membership—either in the average or conditionally—affect risk coping strategies. Curiously, more educated women—both SEWA members and non-members—seem to have

less food security. It is important to note however, that there may be considerable heterogeneity in individual standards or benchmarks, making responses to such questions quite difficult to interpret (Bertrand and Mullainathan, 2001). Nevertheless, we note that those with larger landholding seem better protected from food or income losses, and have access to saved funds, as is expected. Meanwhile, kutcha residents are the least prepared, but unlike other cases, SEWA membership affords them no greater protection. We also note, finally, that households headed by women are more likely to have access to adequate health-care—supporting other findings that women are more likely to devote income to healthcare than men in rural areas.

### **Heterogeneity of Impact**

One of the more significant results of this section has been the differential effect of SEWA programs on poorer women, as measured by residence in kutcha housing structures. To explore this effect even further, we explore the impact of SEWA membership on two continuous variables – income and productivity – for women reside in kutcha housing and those who do not, holding all other variables held constant at their means. We obtain such estimates from stochastic simulations of the regressions estimated in the previous section (King, Tomz, and Wittenberg 2000). Simulations of the parameters remove some of the uncertainty of statistical predictions and thus allow us to compare the effect of SEWA participation on women who are identical in all ways except the type of housing they reside in. The results of this exercise are presented in Table 11.

The results confirm that women who reside in kutcha homes indeed experience greater benefits than their wealthier counterparts. For this group of women,

**Table 10: Risk Mitigation and Coping Strategies**

	(1)	(2)	(3)	(4)	(5)
	Food Adequate for Family Needs	Food Adequate for Family Needs	Income Adequate for Family Needs	Healthcare Adequate for Family Needs	Have Emergency Funds
SEWA member (more than 6 months)	0.2730 (0.2861)	0.1010 (0.4066)	0.0339 (0.3738)	-0.2248 (0.2485)	-0.4120 (0.3526)
Age (years)	-0.0057 (0.0061)	-0.0059 (0.0057)	0.0071 (0.0075)	-0.0052 (0.0058)	-0.0031 (0.0049)
Education (years of schooling)	-0.0565*** (0.0190)	-0.0554** (0.0254)	0.0067 (0.0184)	0.0007 (0.0202)	0.0306 (0.0252)
Female head of household	-0.0786 (0.2756)	-0.0854 (0.2774)	0.4607* (0.2395)	0.5563** (0.2554)	-0.4939* (0.2842)
Kutcha house	0.0187 (0.2524)	-0.6643 (0.4316)	-1.2016*** (0.2383)	-0.7058*** (0.1923)	-0.0867 (0.2347)
Land (bigha, log scale)	0.3934** (0.1645)	0.3206 (0.1967)	0.2484*** (0.0949)	0.1695 (0.1087)	0.2700** (0.1332)
Household size	-0.0238 (0.0543)	-0.0266 (0.0562)	0.0119 (0.0539)	0.1149* (0.0648)	0.1508*** (0.0484)
Workers per household	0.2695 (0.3329)	0.2923 (0.3313)	0.1291 (0.4188)	0.0554 (0.2982)	-0.0247 (0.3638)
Women per household	-0.2607 (0.7377)	-0.3281 (0.7262)	1.2616** (0.6386)	0.7258 (0.5695)	-0.8844 (0.7388)
Shock	0.1288 (0.2746)	0.2546 (0.3105)	0.2628 (0.2944)	0.2845 (0.2103)	-0.0611 (0.2558)
SEWA x Land		0.2005 (0.1594)			
SEWA x Education		-0.0055 (0.0397)			
SEWA x Kutcha house		1.4044*** (0.5417)			
SEWA x Shock		-0.3360 (0.5210)			
N	1,150	1,150	1,119	1,099	1,123
Villages	42	42	40	39	41
R <sup>2</sup>	0.2067	0.2134	0.1853	0.1238	0.2053

Notes: Results are from logit regressions with robust village-clustered errors (in parentheses). Crop- and village-fixed effects, along with an intercept, are included but not reported. \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$



**Table 11: Difference in impact of SEWA programs on women who reside in temporary/kutcha housing and those who reside in permanent/solid structures**

<b>Dependent Variable: Log of total income at the current time</b>			
	SEWA Member	Non-SEWA Member	Difference
Temporary/Kutcha Home	8.254	8.231	0.023
Permanent/Solid Home	8.210	8.502	-0.292

<b>Dependent Variable: Log of agricultural income at the current time</b>			
	SEWA Member	Non-SEWA Member	Difference
Temporary/Kutcha Home	8.285	7.865	0.420
Permanent/Solid Home	7.419	7.261	0.158

<b>Dependent Variable: Log of non-agricultural income at the current time</b>			
	SEWA Member	Non-SEWA Member	Difference
Temporary/Kutcha Home	2.443	2.751	-0.308
Permanent/Solid Home	2.600	3.863	-1.405

<b>Dependent Variable: TFP</b>			
	SEWA Member	Non-SEWA Member	Difference
Temporary/Kutcha Home	-0.084	-0.098	0.014
Permanent/Solid Home	-0.127	0.171	-0.298

<b>Dependent Variable: TFPa</b>			
	SEWA Member	Non-SEWA Member	Difference
Temporary/Kutcha Home	.861295	.4651127	0.396
Permanent/Solid Home	.0052713	-.1451838	0.150

SEWA membership increases total income by approximately Rs. 87 and agricultural income by approximately Rs. 1,360. Their counterparts in wealthier households experience declines in total income of Rs. 1,247 and increases in agricultural income of only Rs. 244, a third of the improvement by women in kutcha households. Both groups of women experience declines in non-farm income, but the declines are less significant for women in kutcha households. These women “lost” Rs. 4, while wealthier women lost Rs. 34. Similar results are obtained for productivity: poorer women experience greater productivity gains than

wealthy women. As noted earlier, these results must be interpreted cautiously for they may be indicative of the fact that wealthier women were making greater investments that were yet to generate returns in the short time-line of this evaluation. The WFGP program offered women a wide range of services (training, input procurement, access to finance, price dissemination and market information, and market linkages through access to processing centers). It is possible that landed women chose to use the program to access credit and make investments in their land, while landless agricultural laborers use it for the acquisition

of skills or opportunities to increase their wage income. Landed women thus experience income gains in the long-term while landless women experience those gains in the short term.

Overall, we interpret these results as evidence that the impact of SEWA's programs were heterogeneous and varied based on women's socio-economic status. This is an important finding for it suggests that pre-program socio-economic status affects the extent to which women experience benefits. Previous literature on farmer centers has also documented the heterogeneity of impact in the context of Sub-Saharan Africa

(Bernard and Spielman 2009). Other work has found that small groups are often suffer from the problem of "elite capture" whereby wealthier, more educated and more powerful members are able to exert a greater influence on decision-making (Mansuri and Rao 2004). That we find the opposite effect in this program - wherein poorer women benefit more from this grass-roots initiative - is an interesting and important finding. Further research, particularly on the long-term impacts of this program, are however necessary to establish both the robustness and the broader significance of this finding.

## REPLICABILITY AND SCALABILITY

**D**oes the WFGP program have the potential to be scaled up either across a broader geographic area of India, or even extended in other developing countries? Recent literature on the scaling-up of anti-poverty efforts suggest that the answer to this question depends on a variety of factors: the program's flexibility and adaptability to broader contexts and geographies, the potential to mobilize resources for a broader roll-out.

Several aspects of the WFGP program make it an attractive program for further scale-up. At its core, it is an agricultural extension system that is designed, developed, and managed by female farmers themselves. This model has the flexibility to meet a wide range of needs across diverse geographies and agricultural systems. The project's focus on empowering farmers also fits with the Indian government's recent commitment to decentralize both the design and implementation of development and anti-poverty programs (Bardhan 2002; Bardhan and Mukherjee 2006; Crook and Manor 1998).<sup>11</sup>

A successful scale-up led by SEWA however, would likely encounter three principal challenges. First, the project would be positioned between India's rapidly growing private market economy and a powerful state that already runs a significant number of poverty-alleviation and rural-development programs, often with overlapping goals and implementation systems (Devarajan and Kanbur 2007; Kapur and Mukhopadhyay 2007). This reduces the incentive for the private sector to efficiently correct its own "market failures," for example, by developing new insurance products for poor farmers and competing for their business, and also reduces the incentive for the government to improve the efficiency and effi-

cacy of existing rural-development and policy-alleviation programs. A scaled up program may thus have a negative long-term impact on the efficacy of these institutions.

A related issue here is that if SEWA expands the scale of its operations, it would likely need to alter itself and align with the best-practices and regulations of larger institutions. For example, as the amount of credit or insurance extended to farmers grows, SEWA may need to alter its financial management, insulate itself from the volatility of financial markets and comply with additional regulations, particularly related to capital requirements, that are designed for private sector banks.

A second challenge in scaling up programs such as the WFGP is that the length of the commitment would require a considerable allocation of resources for a multi-year period. Unlike micro-credit programs, employment programs, or even training programs, programs aimed to improve agricultural productivity take time to bear fruit. Agricultural investment is expensive, output takes at least one season or more to realize, and in the meantime, farmers are exposed to high levels of risk. Large scale programs would likely need to include "safe-guards" to ensure that farmer investments are protected against such risks and yet maintain their incentive to achieve productivity gains. Evaluating the success of programs on long time-horizons can be expensive, particularly if the best-practices of evaluation are adhered to throughout the process.

There is also the related issue of the source of funding. The WFGP program evaluated in this paper has been largely subsidized by outside institutions. A scaled-up effort however, would either need to raise revenues through the program itself or secure long-term fi-

nancial support from outside entities. Case-studies of scale-up suggest that projects funded by general revenues rather than direct cost recovery, tend to increase demand for a scaled up service (Hartmann and Linn 2008). The WFGP program evaluated here however, lacks such a component. The development of such a component would require a detailed assessment of demand for services, which then conflicts with the need to maintain flexibility and adaptability over time.

A final challenge in scaling-up the WFGP effort is political. SEWAs efforts to mobilize farmers on a large-scale would undoubtedly influence local politics in rural India and alter the equilibrium between the government and key groups (Desai 2007). This issue is particularly important in light of the evidence that

the program may affect the level of rural inequality. Recall the result that in the short-term, poorer women were able to experience greater improvements in income and productivity than wealthier or land-owning women. If this is driven by the greater investments of landholders into their land and systems of production, then it is possible that these patterns will eventually reverse and wealthier farmers may experience larger sustained improvements in income. Such shifts in the rural income distribution—first towards greater equality and then towards greater inequality—could have profound consequences. A scaled up version of the program would thus need to take these impacts into consideration, particularly considering the high levels of inequality that already characterize Indian villages (Banerjee, Iyer, and Somanathan 2005a; Jayaraman and Lanjouw 1999).

## CONCLUSIONS

**W**e evaluated the impact of SEWA's rural producer organization (RPO) initiative across five farming districts in Gujarat state, India. The effort—known as the “Women Farmers with Global Potential” initiative—was designed as a mechanism for non-public sector agricultural extension, targeting female farmers. The initiative included a mix of training, information provision, access to farming inputs, risk mitigation, and output.

Controlling for a range of individual-specific, household, and village-level factors, we find that SEWA membership primarily raised awareness among its participants, and linked women to the financial sector, and to diversified employment opportunities, including non-farm work. SEWA women were more likely to have better knowledge of loan products available, more likely to have obtained those loans, and more likely to have superior information about market prices than non-members. SEWA women were also more likely to sell outside the established state-procurement system than non-members. Moreover, SEWA members were less likely to work unpaid.

We also see a strong “separation” effect of SEWA membership, where some members benefit more than others. We see the poorest SEWA members or those members affected by shocks benefit in terms of: higher farm and non-farm income, greater food consumption, improved household and farm productivity, more self-employment opportunities, a greater likelihood of opening a bank account, higher crop harvests, having access to adequate food for the family. We also saw a possibility that predatory officials are targeting SEWA women—one negative result of women organizing as producers, but having to cope with markets that may be dominated by men.

These findings carry implications for not only SEWA's ongoing activities, but also for agricultural policies in India more broadly. First, it illustrates that Indian farmers, particularly women, face severe obstacles in making the transition from subsistence or small-scale cultivators and wage labor to higher value-added agriculture. Despite their productive potential, they can be deterred from making investments that yield benefits in the longer-term due to high short-term transaction costs, price risks, a lack of credit, and poor knowledge of markets and crops. Small farmers therefore find themselves trapped by income uncertainty and low risk-bearing capacity. Policies that increase access to clearinghouses, linkages to rural credit, and support contract farming are likely to be particularly helpful.

Second, the findings of this project illustrate that the comparative advantage of organizations like SEWA may lie in linking the informal sector to the formal sector (particularly for credit) and in expanding access to useful information. While these organizations may ultimately succeed in lowering transaction costs and in reducing risks, these impacts are likely to take time. An interesting question for future research is whether government investment in the establishment of clearing houses, credit sources, contract farming opportunities, etc. could achieve greater impact in the same time-horizon.

Third, the findings illuminate the tremendous heterogeneity and diversity of agricultural labor and female farmers. In the case of SEWA, we saw that the farmer development centers function as a de facto welfare program for the poorest and most vulnerable farmers. An important lesson for policy-makers is that agricultural policies must be designed to fit this heterogeneity and allow women of differing backgrounds to climb the value-chain. The ultimate impact of such policies may be to make agriculture and rural livelihoods more sustainable.

## APPENDIX

Table A1: Summary statistics for all variables considered in this paper

Variable	N	Mean	Std. Dev.	Min	Max
SEWA member (more than 6 months)	1482	0.390	0.488	0	1
Age	1482	45.381	13.109	10	80
Education (years of schooling)	1481	4.212	4.299	0	15.000
Female head of household	1482	0.314	0.464	0	1
Kutcha house	1482	0.157	0.364	0	1
Land (bigha, log scale)	1482	1.215	1.275	0	4.700
Household size	1482	4.356	1.598	1	9.000
Workers per household	1482	0.394	0.360	0	1
Women per household	1482	0.102	0.167	0	1
Shock	1482	0.586	0.493	0	1
Total Current Income (Rs., log)	1482	8.304	0.622	6.909	10.374
Farm Income (Rs., log)	1482	7.378	2.470	0	10.309
Non-Farm Income (Rs., log)	1482	3.086	3.732	0	9.741
Expenditures on Food (Rs., log)	1449	7.863	0.542	5.298	10.127
Expenditures for Seed (Rs., log)	1482	4.422	4.114	0	10.933
Farm Non-Seed Input Expenditures (Rs., log)	1482	4.343	4.286	0	11.815
Household Productivity	1482	0	0.503	-2.018	2.043
Farm Productivity	1482	0	2.262	-8.527	3.719
Self-employed (past 6 months)	1482	0.289	0.454	0	1
Wage laborer (past 6 months)	1482	0.354	0.478	0	1
Unpaid worker (past 6 months)	1482	0.164	0.370	0	1
Obtained Loan Information	1482	0.491	0.500	0	1
Obtained Loan	1482	0.084	0.278	0	1
Opened Bank Account	1482	0.190	0.392	0	1
Total Crops Harvested (kg, log)	341	6.167	0.752	2.996	7.741
Private Market Sales	1482	0.093	0.291	0	1
Total Crops Sold (kg, log)	302	6.190	0.747	2.996	7.601
Fraction of Harvest Sold	341	0.232	0.973	-10	1
Output Loss en route to Market	1482	0.017	0.129	0	1
Know Output Price Prior to Sale	1482	0.394	0.489	0	1
Paid Upfront for Sold Crops	1482	0.502	0.500	0	1
Bribe Required to Facilitate sale	1482	0.027	0.163	0	1
Food Adequate for Family Needs	1482	0.746	0.435	0	1
Income Adequate for Family Needs	1482	0.571	0.495	0	1
Healthcare Adequate for Family Needs	1482	0.580	0.494	0	1
Have Emergency Funds	1482	0.757	0.429	0	1

**Table A2: Unconditional differences in key outcomes for SEWA and non-SEWA villages**

	Weighted Village-level averages		
	SEWA	Non-SEWA	Difference
Years of schooling	4.283	3.767	0.516 (0.556)
Age	44.34	44.37	-0.0250 (1.515)
Land Area Owned	5.584	5.368	0.216 (1.745)
Number of Plots Owned	1.005	0.907	0.0977 (0.242)
Grow Any Crops	0.495	0.480	0.0151 (0.0516)
Own home	0.949	0.956	-0.00621 (0.0188)
Kutchra home	0.133	0.231	-0.0984* (0.0510)
Electricity	0.948	0.936	0.0119 (0.0324)
Piped water into Dwelling	0.200	0.295	-0.0954* (0.0543)
Water source: Public tap	0.419	0.336	0.0833 (0.0881)
Cotton	0.336	0.185	0.151 (0.0933)
Castor	0.113	0.0613	0.0522 (0.0350)
Cumin	0.0995	0.0429	0.0566 (0.0410)
Wheat	0.211	0.141	0.0697 (0.0517)
Pulses	0.0327	0.00769	0.0250* (0.0145)
Log of income 6 months ago	8.239	8.102	0.136 (0.0830)
Log of agricultural income 6 months ago	8.077	7.978	0.0999 (0.0824)
Log of per-capita income 6 months ago	2.502	2.529	-0.0264 (0.0832)
Number of villages	29	13	

*Note: Villages where more than 75% of all survey respondents are participating in SEWA villages are coded as "SEWA". The remainder are coded as non-SEWA villages.*

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## ENDNOTES

1. The most extreme manifestation of the crisis is in the suicides by farmers who are unable to repay debts. According to a widely-cited report, an Indian farmer committed suicide every half-hour between 1997 and 2005. Roughly one-fifth of these suicides is committed by female farmers (see Center for Human Rights and Global Justice 2011)
2. These organizations are largely defined as entities whose members attempt to achieve collective objectives using, in part, their own contributions (Chen, Jhabwala et al. 2007).
3. Exact estimates of spending on these organizations are very difficult to find, but numerous case-studies of collaboration between multilateral organizations and local NGOs are found in Rouse (2006), World Bank (2008) and Spielman and Pandya-Lorch (2009).
4. In addition to providing a channel for agricultural extension, the WFGP was also in the process of piloting two additional initiatives addressing problems of weather insurance and warehouse financing. Given the start-up status of these initiatives, they were beyond the scope of this evaluation. Previous reports outlined the challenges small farmers in managing incremental weather and its effects on productivity, yield, and income, the WFGP began to address these constraints through the provision of rainfall insurance policies. Meanwhile, castor farmers, in particular, suffered falling prices due to the economic recession. Without adequate storage facilities, farmers are forced to sell at a loss. A pilot program for warehouse-receipts farming would provide capital for farmers with secure backing of an external financial institution.
5. We considered including marital status among the individual-specific indicators. However, 89% of women surveyed are married, and the indicator is balanced between SEWA members and non-members
6. Houses that have walls and/or a roof made of material such as un-fired brick or clay, bamboo, mud, grass, reeds, thatch, loosely packed stones, etc. are treated as kutcha.
7. We perform parametric analyses on the matched sub-sample of the data as recommended by Ho et al. (Ho, Imai, King and Stuart 2007), and similar to parametric bias-adjustment for matching (Abadie and Imbens 2006).
8. 1 bigha = 0.25 hectare (approx.).
9. Estimates of marginal values of interaction terms used in these and subsequent logit regressions are available from the authors by request. We obtain these estimates using the STATA commands "margins" and "lincom". These allow us to compute the magnitude and statistical significance of the interaction effect using the estimated cross-partial derivative (rather than the coefficient of the interaction term), as noted by Norton, Wang and Ai (2004).
10. Note that, in our propensity-score estimation, the inclusion of these as independent variables in determining the likelihood of SEWA membership has no effect on the propensity score, thus is it unlikely that SEWA membership selection is determined by work patterns.
11. Decentralization is the transfer of administrative authority, public resources and responsibilities from central government agencies to lower-level organs of government, non-governmental bodies or the private sector. One of the most significant steps in this direction was taken by the Indian government in 1993, when a Constitutional act formally recognized a third tier of government at the sub-State level and empowered these entities to make local decisions.





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