Investing in Digital Technology to Increase Market Access for Smallholder Farmers: Experimental Evidence from Rural Guatemala*

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Abstract

Smallholder farmers in developing countries face information barriers that hinder market opportunities and business productivity. This paper evaluates the impact of a digital information campaign aimed at addressing the lack of market access and information

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faced by smallholders in Western Guatemala during the COVID-19 pandemic. The intervention focused on providing information about a new market opportunity—the national School Feeding Program (SFP)—which purchases half of schools' food from local family farming by law. Results from a Randomized Controlled Trial in 252 villages indicate that the intervention increased business-related knowledge about the SFP, especially for households not typically reached by extension programs. This led to increases in the prices received by farmers and the likelihood of selling their products. However, farmers are not more likely to join the SFP due to product mismatches, production capacity, and institutional trust, calling for better alignment of the SFP with local market conditions. Instead, the gains appear to occur in the traditional market. Consistently, the effects on prices and sales were driven by areas with lower incidence of COVID-19 cases, where farmers were more able to sell in the traditional market and less likely to join the SFP. On the other hand, the SFP became a more appealing alternative in areas with higher incidence of COVID-19. Overall, this study highlights that digital technology can be used to increase market access in rural areas and enhance the status of smallholder farmers in the business sphere.

1 Introduction

This paper investigates the effect of a digital information campaign on market knowledge and access of smallholder farmer women in Guatemala. Worldwide, digital technologies are being increasingly recognized for their broad potential to lower the cost of economic and social transactions for firms, individuals, and the public sector (World Bank, 2016), which can in turn translate into improved efficiency, equity, and environmental sustainability of agrifood systems (Schroeder et al., 2021; World Bank, 2019). On the farm, digital technologies can provide timely and precise information on input use and help the process of farm decision-making for resource allocation and management, thereby boosting production efficiency. By delivering information on agricultural practices, tools, and inputs to a wide range of producers at lower cost than traditional extension services (Aker, 2011), electronic extension systems (e-extension) involving combinations of software, platforms, and devices with varying levels of sophistication can increase the spread and rates of adoption of good agriculture practices and technologies (Al-Hassan et al., 2013; Cole and Fernando, 2012; Gandhi et al., 2009; World Bank, 2011).

By reducing the cost of remoteness and making advisory services and technical assistance available to a broader range of producers, moreover, e-extension can also contribute to farmers' inclusion and promote equity (Deichman et al., 2016). Off-farm, on the other hand, digital technologies can lower information-related transaction costs associated with farmers' access to upstream and downstream markets, leading to improved allocative efficiency and equity in agrifood markets. Notably, digital technologies facilitate the transmission of market information, allowing producers to overcome persistent information asymmetries and reliance on market intermediaries (Deichman et al., 2016). A number of studies have shown that, in many cases, this can result in better farmgate prices (Hildebrandt et al., 2020; Labonne and Chase, 2009; Mitra et al., 2018; Svenson and Yanagizawa, 2009) and in higher competition and lower price dispersion on local agrifood markets (Aker and Fafchamps, 2015; Beuermann et al., 2012; Jensen, 2007) in various parts of the world.

This paper explores whether the diffusion via digital means of simple messaging on market opportunities and information can be a driver of market inclusion of women in rural settings, spurring their entrepreneurship and livelihoods. The analysis takes advantage a World Bank's pilot project in Western Guatemala (cf. Perego et al., 2022), which piloted digital technologies to improve market access for women farmers in the ambit of the national School Feeding Program (SFP) — a promising business opportunity for smallholder farmers

in the country.

In particular, the paper experimentally evaluates the impact of a digital information campaign carried out by the project across 252 villages in San Marcos, Guatemala. Women in the treatment group received a bundle of videos and text messages with information on participation in the SFP, including how to participate, food quality standards and practices, products and prices, and relevant contact information. The campaign was entirely carried out by phone by sending the information bundle consisting of a video sent through WhatsApp and a series of text messages. Adult women with access to a smartphone and working in agriculture were invited to participate. A total of 881 eligible women enrolled in the program. The endline survey took place two months after the delivery of the treatment.

We find that the program had positive impacts on knowledge around the SFP, sales, and prices. The digital information campaign increased the share of women that report knowing key aspects about the SFP, such as the products traded in the SFP market by 9 percent, and that they can register as providers by 21 percent. In addition, the intervention increased the likeliness of selling animal products by 12 percent, as well as increased the prices received by women in the treatment group by 31.5 percent.

Although the information campaign had significant impacts on various outcomes, it did not make women more likely to join the SFP market. We draw from the impact evaluation results and additional qualitative analysis to shed light on the barriers that prevent women from entering the SFP. We find that smallholder women farmers lack the production capacity and portfolio diversity needed to cater to the SFP and the managerial and technical skills to trade in it. Moreover, at the market and structural level, prices need to be more competitive, and the institutions involved need to be trusted by all parties involved. Finally, the registration process needs to be simple and understood by prospective candidates.

We interpret this result as women using the information in the traditional market. Consistently, the study finds that women benefited the most from higher prices and sales in areas with low incidence of COVID-19. In this areas, where the traditional market was less disrupted, women were less likely to join the SFP. On the other hand, in areas where COVID-19 was more prevalent and the government policies were stringer, women did not benefit from higher prices or sales and were more willing to join the SFP, and alternative market.

This paper finds that a light-touch information campaign can empower smallholder women farmers and change their business-related decisions. Our paper contributes to a body of work on the role of information in business performance. Lack of information be-

tween buyers and suppliers can present an important transaction cost for small businesses (Allen, 2014; Startz, 2016), which can constrain firm growth and productivity (Goyal, 2020; Jensen and Miller, 2018). Especially in rural settings, firms lack information on new markets and potential customers (Rudder, 2020). In particular, our work relates to studies on the relevance of market information on the performance of women-led businesses (Campos et al., 2015) and the benefits of empowering women in rural areas (see Anderson et al., 2020 for a review).

Women's empowerment and inclusion is a high priority on the international development agenda (Muller and Casabonne, 2020; World Bank, 2012, 2015), and is a long-standing issue in Guatemala, which ranks among the lowest in the United Nations Development Programme's Gender Inequality Index, standing at 127th out of 189 countries globally. In the agriculture sector, one of the main limitations women face is invisibility: while women formally constitute approximately 10 percent of Guatemala's agricultural employment, [1] the portion of women in agriculture rises to almost 40 percent if one counts those that execute other agriculture-related activities, participating in unpaid farm work and/or supporting their spouses on the family farms. [2] Moreover, 57 percent of women employed in agriculture do not earn a salary, and of those that do, 97 percent earn below the minimum wage. [3] These dim figures are largely due to cultural and social norms, which tend to categorize women as secondary agricultural workers or helpers to their husbands, fathers, or brothers, and not as economic subjects in their own right. Finding mechanisms to promote women's entrepreneurship and specialization holds great promise to enhance their economic opportunities, livelihoods, and decision-making ability, contributing to their improved status in their households and communities.

The rest of the paper is organized as follows. Section 2 describes the School Feeding Program, highlighting its functioning, the main actors involved, its expected benefits and the challenges it faces. Section 3 presents the intervention, the experimental setting, and timeline of the experiment. Section 4 and 5 respectively outline the empirical strategy and the main findings of the impact evaluation, together with the potential mechanisms that could be driving the results. Section 6 discusses lessons learned and concludes.

[1] FAOSTAT,2017.
[2] 2018 Guatemala Census.
[3] 2014 Guatemala National Survey of Employment and Income.

2 Context

Guatemala's School Feeding Program (SFP) is a national initiative that aims at guaranteeing school meals, promoting children's healthy eating, food access, and permanence in public schools while promoting rural economies linking family agriculture as the main source of inputs for food preparation. 50 percent of products to be used to prepare school meals must originate from products from family farming in the school's community or municipal jurisdiction. The SFP is regulated by the School Feeding Law (Decree 16-2017), and is coordinated by the Ministry of Education (MINEDUC) in collaboration with other ministries and institutions. The program serves 2.6 million students from 29,469 public schools in Guatemala.

To be registered as SFP Providers, family agriculture producers must be classified as small commercial producers in the official Ministry of Agriculture (MAGA) Family Agriculture registry and be registered with the Superintendency of Tax Administration (SAT) to have a tax identification number and be able to issue invoices. MINEDUC and MAGA establish reference food prices for the SFP based on average prices in local markets. The price list is made public and is shared with every school. Most schools have Parent Organizations (OPFs), which purchase the food, choose the school menus, maintain the direct relationship with the food provider, and keep administrative records. The OPFs receive periodic training to verify purchases, invoices, cash flows, or quotes. Despite promising results in terms of child nutrition and involvement of family farmers, the operation and effectiveness of the SFP are challenged by school's infrastructural deficiencies and information gaps that prevent effectively linking schools with registered SFP providers. In addition, small farmers' low production capacity, unclear administrative procedures, and lack of economic incentives discourage many potential providers from participating in the program.

The COVID-19 created additional challenges. Due to quarantine and mobility restrictions, schools started delivering food bags to students' families to cook at home, restricting the list of SFP products to only non-perishable foods. While ensuring food security for children and their families during the pandemic, these changes reduced the nutritional content of children's food intake, and reduced the earnings of family farmers engaged in the SFP. In addition, reduced in-person activities by government institutions affected the monitoring of food quality, the provision of agricultural extension, and assistance in the SFP registration process by MAGA extensionists. Overall, these challenges have been particularly felt by women producers, who face higher information gaps, lower market access, and higher

informality than their male counterparts, compounded by restrictive social norms.

Yet, school feeding represents a crucial opportunity for women farmers, whose production usually specializes in foods that are in high demand by schools (such as seasonal fruit, vegetables, eggs, cheese, small animals), and it could represent an avenue for improved female entrepreneurship and empowerment.

3 Intervention and timeline

The World Bank's DIGITAGRO project piloted digital technologies to improve market access for women agri-preneurs in the ambit of the School Feeding Program. The intervention, which operated in the department of San Marcos in Western Guatemala, in partnership with the World Food Programme and the Food and Agriculture Organization of the United Nations and in coordination with local authorities, broadly aimed to address the information gaps and asymmetries that preclude the smooth functioning of the SFP, on one hand, and hold back women from taking advantage of the program as a profitable market opportunity, on the other.

Among other activities, the project featured a digital information campaign which attempted, within the socially-distanced COVID-19 context, to promote the SFP as a profitable market opportunity for women and to provide essential SFP product, price, and contact information, through a short video and SMS reminders. The campaign was entirely carried out by phone, by sending eligible women an information bundle consisting of: (i) a video with key information on the general features of the SFP, ways for farmers to sell to schools, food quality standards and practices, and SFP functioning under COVID-19; and (ii) a tailored set of six text messages that included reminders on how to access the SFP, information on products demanded and prices paid by the program, and relevant contact information. Eligibility was defined by being an adult (aged 18+) woman having sold crops or products of animal origin in the previous year and having access to a smartphone.

The digital information intervention was carried out between January and November 2021, and it involved 881 eligible women across 272 villages in San Marcos. The randomization protocol followed a cluster trial methodology, where villages (clusters) were allocated randomly into a treatment or control group, stratified on a set of characteristics. Specifically, the strata were the municipality and a variable to account for villages with high rates of WhatsApp adoption (above 95 percent). In total, 445 women in 130 villages were assigned to the treated group, and 436 women in 142 villages were assigned to the control group.

The baseline data collection happened in April and May of 2021. Treatment delivery (video + SMS) happened after the baseline survey, using WhatsApp and text messages. While women in the treated villages received the information on the SFP, women in the control villages received a placebo bundle of video and SMS of similar structure and length the treatment. All control-group participants were granted access to the full SFP information available to the treatment group at the end of the evaluation period. Once the participant finished answering the baseline interview, she agreed with the enumerator on a specific day when they could watch the video. On that day, the farmer's phone would receive an internet package equivalent to approximately 1 USD, and the farmer would receive the video through WhatsApp. This internet package was included as an incentive for participation and allowed the interviewee to watch and download the video without incurring any personal cost. After sending the video, a protocol would verify that the participant had been able to watch the video and offered help in case of technical difficulties if needed. Once the verification process was finalized, the farmers received the SMS suite, with two-day intervals between each message to avoid saturation and fatigue.

The endline survey was conducted in August of 2021, allowing for one cycle of school food purchases between the baseline and endline. Attrition between baseline and endline was not negligible but remained within acceptable levels for phone interview recontact rates: 73 percent of the individuals interviewed at baseline could be recontacted at endline. Descriptive statistics of the sample are available in Table A1.

To complement the main data collections, several complementary qualitative and data collection activities were conducted with key actors of the program (existing SFP providers, MAGA officials, and School Parents' Organizations) throughout the duration of the intervention. In the context of the COVID-19 pandemic, and to prevent any potential health risks and comply with social distancing and mobility restrictions in the country, all surveying activities and focus groups were done remotely. The baseline and endline were done by phone, while the focus groups where done through video call.

4 Empirical strategy

To evaluate the impacts of the information campaign, we rely on the randomness of the treatment assignment. Given an individual-level outcome of interest y_{ivs} and a village-level treatment assignment indicator T_v, we estimate Equation 1 by OLS for woman i belonging to village v and randomization stratum s (defined by the intersection of municipality indicators

and an indicator for villages with high rates of WhatsApp adoption):

$$y_{ivs} = \alpha + \beta \times \mathrm{T}_v + + X'_{ivs}\pi + \delta_s + u_{ivs} \tag{1}$$

The coefficient of interest is β, which we can interpret as the causal average treatment effect under the assumption that the treatment assignment T_v is not correlated with the residual term u_{ivs}. In order to increase statistical power, we also include a set of covariates, X'_{ivs}, measured at baseline.[4]. When available, X'_{ivs} includes the outcome variable measured at baseline. Standard errors are clustered at the village level.

4.1 Speficiation checks

We find no evidence of threats to identification in the treatment assignment, suggesting that the randomization protocol worked. We do not find any statistical difference across treatment and control group on a large set of covariates as indicated by the balance test presented in Column 4 of Table A1. In addition, a regression of the treatment assignment on the set of covariates of Table A1 yields and F-stat for joint significance of 0.88 (controlling for strata effects). Finally, recontact at endline is not correlated with the treatment as indicated by a regression of recontact status on treatment assignment.[5]

We find evidence of strong take-up of the information campaign among the treated. Table A2 in the appendix reports the share of individuals that remember at end-line having received the information campaign. A total of 96.2 percent of women in the treatment group remember having watched a video about the SFP. When asking an open question about what they remembered the most about the video, 63.0 percent accurately reported contents of the video. Moreover, 78.5 percent remember having received the set of text messages, although a more limited 32.9 percent accurately recalling their content.

Moreover, participants report a shift in the main information source about the SFP

[4]We control for household strucure characterisitcs (number of household members, children under age 15, indiviuals age 65 or older, adult women, adult men), dummies to indicate relationship with the household head (self, partner, parent, other), age-group dummies (18-29, 30-39, 40-49, 50+), dummies for education level (none, primary, secondary, tertiary), dummies for marital status (partnered, single), dummies for agricultural practices (use of fertilizers, pesticides/herbicides, improved seeds, technified irrigation system, machinery, none), dummies for land size (0-1 cuerdas, 1-2 cuerdas, 2-3 cuerdas, 3-5 cuerdas, 6-10 cuerdas, and 10 cuerdas or more), dummy for land ownership, dummies for type of harvested crops (permanent crops, temporary crops, undefined), dummies for products' climatic zone (cold, warm, both) and dummies for interviewee's climatic area (plateau area, central area, coastal area).

[5]We regress recontact status at the endline on the treatment assignment, controlling for strata effects, and clustering standard errors by village. The estimated coefficient is 0.009, and it is not statistically different from zero (p-value = 0.747).

that is consistent with the intervention (Table A3 in the appendix). Both the video and text messages mentioned the MAGA and its field official multiple times and consistently encouraged participants to reach out to the MAGA to learn more about the specifics of the SFP, even providing the contact information of local MAGA extensionists. Consistently, almost a third of the treated group report it is through the MAGA that they know about the SFP, an increase of over 38 percent vis-à-vis the control group. Moreover, the treatment group is also 20 percent less likely than the control group to report that they know about the SFP through schools, OPFs, or teachers, who were the most prominent pre-treatment information channels. Importantly, 5.2 percent of the treated sample report the information campaign among their main sources of information about the program, with no individuals in the control group reporting the campaign as their main source of information (as indicated by the mean in the control group of the outcome variable on Column 4). The latter result also suggest little potential for across-village spillover effects of the treatment to the control group.

5 Results

The main finding from the impact evaluation is that the digital information campaign increased (i) awareness among rural women about the SFP as an economic opportunity, (ii) the share of women selling animal products despite the short time horizon between treatment and endline, and (iii) the price received by women for their products. However, we find that the information campaign did not change women's participation or willingness to participate in the SFP market. We suggest that remaining constraints to participation, such as lack of skills and product mismatch between supply and demand, are potential explanations.

5.1 Information:

Our first main result, shown in Table 2, is that participants in the treatment group are more aware of the SFP as a business opportunity. Table 2 shows estimates of Equation 1 for six information related outcomes. As the SFP is a very popular food-security government program, knowledge about its existence as such is very widespread across Guatemala. In our sample, 88 percent of women in the control group already knew about the SFP: while the point estimate is positive, the effect is not statistically significant (Column 1).

The intervention increased the share of women that report knowing they can participate in the SFP and how. Women in the treatment group are 6.5 percentage points more likely to

report that they know which products are traded in the SFP (Column 2) and 10.8 percentage points more likely to report knowing that the SFP sources products from local farmers (Column 3). In addition, the information campaign improved women's knowledge of the basic features of the program: women in the treatment group are 23.7 percent more likely to report knowing that they can register as an SFP provider (or 7.8 percentage points, Column 4) and 71 percent more likely to report knowing the steps to register as a provider (7.8 percentage points, Column 5). Finally, the intervention more than doubled the share of women that think that it is easy to register in the SFP; however it should be noted that this outcome has a very low prevalence in the control group (4.6 percent).

Although knowledge about the SFP is self-reported, several pieces of evidence suggest that social desirability bias is not the main driver of the results (i.e., that women are not answering favorably to sympathize with the interviewer). First, participants in the treatment group remember specifics of the video when prompted open-ended questions about it: from a total of 96.2 percent of treated women who remember watching the video (Table A2), what they report remembering the most about the video was how to sell crops to the SFP (26.8 percent), the products traded in the SFP (25.5 percent), the video's recommendations on how to improve product quality (32.7 percent). Second, other self-reported answers, such as willingness to participate in the SFP, were not answered favorably by participants, as described later in this paper (see e.g. Section 5.3). And third, the intervention also affected behavioral margins such as sales and prices, as we document in Section 5.2.

The delivery of information proved especially relevant for individuals that are not reached by traditional extension programs as well as ethnic minorities, which highlights the potential of digital tools in promoting information and knowledge diffusion to remote and marginal populations. Table 3 reports the results of stratifying Equation 1 by an indicator variable on whether the participants received agricultural training or assistance from the MAGA over the past year. Among those women who reported not receiving agricultural training or technical assistance (Panel B), the information campaign increased awareness about the existence of the SFP by 11 percentage points, increased the likeliness of being aware that the SFP buys products from local farmers by more than 60 percent, raised awareness that farmers can register as providers by 14.2 percentage points, and almost doubled knowledge about the registration steps. For those already reached by traditional extension mechanisms (Panel A), the information campaign still had a statistically significant effect on the likelihood of considering the registration process is easy (which likelihood almost doubled). However, the campaign did not affect other knowledge margins. The campaign was also effective at reach-

ing ethnic minorities, as indicated by table **??**. This result shows that, while certainly not a substitute for, digital tools can still be a useful complement to traditional extension services, supporting the more efficient dissemination of simple messages among large audiences.

5.2 Sales and prices:

The information campaign also increased women's likeliness to sell. Table 4 shows the results of estimating Equation 1 with an outcome variable indicating whether women had any sales in the last two months. Having been identified as potential suppliers of the SFP, all participants in the experiment were engaged in some sort of commercial agriculture or agribusiness the year prior to the baseline interview. As such, the percentage of women in the control group that reported selling any agricultural or animal product in the two months prior to the endline interview is already high (83.8 percent). Thus, it is not surprising that the intervention did not have an effect on the likeliness of reporting selling any agricultural or animal products at all (Column 1).

The intervention, however, induced an increase in the likeliness of selling products specifically demanded by the SFP, which were featured both in the video and SMS of the information campaign. Specifically, while Column 2 of Table 4 shows that the intervention did not have a statistically significant impact on the likeliness of selling SFP agricultural products, Column 3 shows a large and positive effect on the likeliness of selling SFP animal products, equal to 7.5 percentage points or 20 percent of the outcome mean in the control group.

These findings are encouraging, as they show that light-touch digital interventions might change business-related behavioral outcomes. The fact that effects are detected for animal and not agricultural products is quite intuitive: in light of the short time interval between treatment and endline interview, one could expect faster adaptation in animal products given their availability and readiness to be sold, vis-à-vis agricultural products that necessarily need to follow the rhythms of agricultural cycles. In addition, women in San Marcos tend to specialize precisely in the production of animal products such as eggs and chicken meat, while men are mostly engaged in on-field agricultural production. This is consistent with the results in Table A4, where the effect on animal sales appears to be driven by chicken meat and eggs (although the estimated coefficient on the latter is not statistically significant).

The information campaign also increased the prices women receive for their products. Table 5 shows the results of estimating an specification similar to that of Equation 1, but where the unit analysis is the last transaction of each product sold to a buyer in the last

two months. The dependent variable is the log price.[6] As shown in Table 5, the intervention had a positive and statistically significant impact on the price that women receive for their products. The intervention increased the price received by women on any product by 31.5 percent (Column 1), with effects in both agricultural products (53.7 percent, Column 2) and animal products (34.9 percent, Column 3).[7] This result is consistenT with a set of studies finding that providing price information results in changes in the distribution of prices received by farmers (Hildebrandt et al., 2020; Labonne and Chase, 2009; Mitra et al., 2018; Svenson and Yanagizawa, 2009).

5.3 Participation in the SFP market

Despite the success at delivering information about the SFP and encouraging women to increase their sales and receive better prices, the intervention did not have an effect on the willingness of participants to join the SFP. Table 6 reports the impacts of the intervention on women's participation in the SFP and on markers of their willingness to do so in future. In the table, there are no statistically significant differences between treated and control women in their likeliness of either being registered as SFP providers at endline (Column 1), or of being interested in registering (Column 2). Similarly, Columns 3 and 4 respectively detect no effects on the likeliness of having sold products to a registered provider in the two months prior to endline, nor on the likeliness of planning to speak to a SFP provider in the near future. Although not participating in the SFP might be explained by the little time elapsed between the treatment and endline survey (2 months), lack of willingness to participate in the future suggests that this is not the only factor driving the results. On the country, women kept facing a number of barriers to participation in the SFP, which were not affected by the information campaign.

[6] We collected price information for the last transaction reported by the interviewee for each of the products traded with an specific buyer in the last two months. Thus, the regression is for the last transaction reported for each product-buyer combination. The average individual in the control group had 1.07 buyers in the last two months, and we do not find a statistical difference for the treatment group. Moreover, women in our sample only sold between one and two products on average.

[7] Since selection into sales is a possibility, especially given the effects of the treatment on the likeliness of selling animal products, we run the same specification but using an IPW estimator. The results are shown in Table A5 and suggest that selection into sales is not the main driver of the effect on prices. Once we attempt to correct for selection, the results seem to be larger, if anything.

5.4 Barriers to participation in the SFP Market

To understand why women are not interested in participating in the School Feeding Program, despite receiving information on how to do so, this section studies the main barriers encountered by farmers to participate in the program. To shed light on the barriers faced by farmers and study the differences between those who choose to participate and those who do not, the analysis compares the characteristics of farmers who are registered in the SFP with those who are not registered. In order to assess the status quo of these barriers abstracting from any potential impact of the information campaign, the analysis is performed on the control group unless otherwise specified.

Product portfolio and land size: An important barrier hampering farmers' incentives to register as SFP providers seems to be the need to supply a diverse portfolio of products throughout the year. While there is no established rule on the number of providers that can cater to each school, focus groups with school parents' organizations (OPFs) reveal that schools prefer to work with one single registered provider with the ability to cater to the entire school and meet the school demand for products. Qualitative evidence suggests that this simplifies the process for schools and reduces transaction costs. Figure 1 plots the distribution of land size of farmers in the control group, differentiating registered providers from other (unregistered) farmers. The scale of registered SFP providers is higher than that of other producers. The median land size of registered households (7 *cuerdas*) more than doubles that of unregistered producers (3 *cuerdas*). In addition, as show in Figure 2, registered providers appear to count with a broader availability of products throughout the year, as can be observed by their higher probability of having sold any of the listed SFP products both during the year before the baseline interview (Panel a) and during the two months before the endline survey (Panel b). Finally, there seem to be challenges for unregistered producers also in terms of product availability and readiness through the year. For instance, in the case of corn, a product in high demand by schools, while unregistered and registered producers were equally likely to have sold the crop over the course of the year prior to baseline, in the two months prior to endline the SFP providers were six times more likely to have sold it than their unregistered counterparts (12 percent vs. 2 percent in the right panel of Figure 2). Arguably, for farmers with low production levels or limited storage capacity, the inability of selling the entire range of foods to schools in a timely manner may represent an important impediment to joining the program.

Skills: Women considering registering as a SFP provider seem to also encounter barriers in terms of managerial and agricultural skills. Focus groups with MAGA officials and extensionists in San Marcos suggest that aspiring providers often lack certain managerial skills, such as basic planning and bargaining skills. Besides managerial skills, the SFP also enforces specific food quality and safety standards which require a certain level of technical skills and adoption of good agricultural practices.[8] Farmers registered in the SFP do appear to be more aware of food quality standards and proper product storage conditions.[9] Evidence also suggests that registered women enjoy higher levels of technification in their agricultural activity compared to unregistered farmers. At baseline, women registered in the SFP reported to use more specialized inputs, machinery, and technical infrastructure than their unregistered counterparts. The sharpest differences can be observed in the use of pesticides/herbicides, improved seeds, and technified irrigation systems: registered farmers are 21 percentage points more likely to use pesticides or herbicides in their agricultural process, 12 percentage points more likely to use improved seeds, and 16 percentage points more likely to use technified irrigation systems (see Figure 3).

Registration process and trust in institutions: Aspiring SFP providers also run into a number of institutional roadblocks. While the information campaign was effective at delivering information about the registration process, very few farmers perceive that the registration process is easy. The intervention did increase the share of individuals that report knowing how to register as a provider (from 11 to 18.8 percent), and it more than doubled the share of individuals who consider that registration is easy (from 4.6 percent in the control group to 10.4 percent in the treatment group): nonetheless, these percentages

[8]For example, the fruits and vegetables that the schools buy must be of uniform and shiny color, fresh scent, good texture, and uniform size. Also, eggs must be clean with a good smell, not show any crack, and be packed using cardboard. Finally, to comply with packaging, crops must be put in net-type mesh sacks in a specific order (grains at the bottom, tubercles at the middle, and fruit and vegetables on top.

[9]Before the intervention, 81.6 percent of registered farmers in the baseline reported they stored their products in clean and dry places, against 67.1 percent of non-registered women. At endline, when women in the control group were asked about how they packaged eggs, 91.8 percent of registered women replied one of the correct methods (secure packaging in cardboard, baskets, or boxes to avoid product loss), vis-à-vis 85.2 percent of those non-registered. Although the video shown during the information campaign did not focus extensively on the agricultural practices, it depicted certain practices and general information regarding the quality standards demanded by the SFP. These recommendations included simple messaging on the requirement that crops must not have bruises or signs of decomposition or infection, nor contain impurities or damage by plagues or diseases, and should be stored in clean and dry spaces. Also, the video pointed out that eggs must be clean and stored in proper packaging such as carboard, baskets or boxes. However, the impact evaluation analysis did not find evidence that these simple messages changed farmers' agricultural practices.

are still pretty low, speaking to an intrinsic difficulty of the process for the vast majority of women. As mentioned in Section 2, to be registered as SFP providers, producers must meet two fundamental requirements: (i) be classified as small commercial producers in the official MAGA Family Agriculture registry; and (ii) be registered with the Superintendency of Tax Administration (SAT) to have a tax identification number (NIT) and be able to issue invoices. During focus groups, producers expressed their concern about the potential cost of the process, as many would rely on professional accountants to take care of the related paperwork and follow-up. Moreover, trust in institutions remains an issue. According to focus groups and field interviews, aspiring providers fear the Tax Authority because, due to persistent informality in rural areas, they have never had any contact with it before, and believe taxation might rip out the benefits from selling to schools. From an index showed in 5 that ranks trust in each institution from 1 to 4 (with 1 meaning no trust at all and 4 meaning very much trust), the MAGA and MINEDUC score around 2.9, while the SAT scores 2.4, among participants in our endline survey. As such, promoting trust in the key institutions involved in the SFP might be an important driver of registration. Importantly, the digital information campaign seems to have slightly improved women's self-reported trust levels, as measured by our trust index, in the MAGA (5.1 percent) and the SAT (9.1 percent).

Prices: Although prices do not feature prominently among the major barriers to SFP registration mentioned by farmers, it is sound to analyze whether the reference SFP prices might have a role in discouraging women from joining the program.[10] The actual prices charged by providers to schools for each sale are based on three criteria: (i) SFP reference prices set jointly by the MAGA and MINEDUC, (ii) agreement with other providers in the same municipality, and (iii) some adjustment to local market prices. While bargaining between MAGA and MINEDUC might push SFP prices down (as schools have the clear incentive to obtain the most out of their SFP budget, which brings the MINEDUC to lobby for lower prices), at first glance, reference prices per se do not seem to be bad compared to the prices that farmers could get on the market. Taking the example of eggs, SFP reference prices are aligned to the average prices women in the control group reported obtaining on the market during the period of the intervention: 52.2 percent of registered providers and 44 percent of unregistered producers obtained lower prices in the market (Figure 4, Panel a). A similar pattern can be observed when looking at other SFP agricultural products (Figure 4,

[10]The information campaign disseminated information on SFP reference prices, and it resulted in 5 percent of producers mentioning low prices as a significant obstacle to their businesses.

Panel b). Thus, it is unlikely that low reference prices alone would explain the lack of interest in registration among non-registered farmers. Nevertheless, higher prices would increase the benefits to registration, especially in the presence of other barriers such as those highlighted earlier in this section. According to focus group interviews, in fact, official prices do not account for the food safety, transportation, and taxation costs borne by faraway producers, nor do they consider the cost differences between local varieties of staple crops in different climatic zones. Moreover, for given reference prices, the squeezed time frame within which schools demand food reduces producers' profit margins by increasing their costs (especially transport costs), as recognized by some interviewees from rural schools.

5.5 Incidence of COVID-19

The disruption of COVID-19 had heterogeneous impacts on, among others, population's mobility across municipalities in Guatemala. The national government implemented an alert system where mobility was more restricted where COVID cases were higher.

Table 7 studies if the effects of the intervention varied with the incidence of COVID-19 at the local level. Panel A replicates the main results on sales, prices, and participation in the SFP for the complete sample. Panel B focuses on the municipalities where the average incidence of COVID-19 for the period between the intervention and the endline (April to August 2021) was below the median.[11] Panel C focuses on the municipalities an incidence equal or above the median.

In places with low incidence of COVID-19, women were more likely to sell animal products and benefit from higher prices. However, they also show less interest in the SFP market: women were less likely to register as SFP providers, less interested in registering as providers in the future (although not statistically significant), not more likely to have sold their products to a registered provider, and are not planning to speak to a provider in the future (Columns 5 to 8, Panel B). On the contrary, women in locations with higher COVID incidence (Panel C) did not benefit from sales or prices and were more likely to join the SFP market.

Overall, one plausible explanation is that women used the SFP information in the traditional market. This information might have been used to sell products they did not before and/or to bargain for higher prices. On average, important barriers remain that prevent women from joining the SFP, as discussed in Section 5.3. However, in areas where the traditional market was depressed by the disruption of COVID-19, the SFP market became an

[11] The national government published information by municipality every two weeks.

attractive opportunity as it continued operating during the pandemic.

6 Conclusion

This paper has shown that a light-touch intervention such as a simple digital information campaign can be used in rural Guatemala to effectively disseminate market information and spur women's entrepreneurship in agribusiness. Women who received the treatment improved their knowledge about the School Feeding Program and started seeing it as an economic opportunity. Notably, the intervention had a higher impact on SFP awareness among women that had not been previously reached by traditional extension services, in practice closing the information gap between receivers and non-receivers of official agricultural extension. The intervention also encouraged them to increase their sales of products of animal origin receive higher prices.

While digital technologies have long been regarded as a useful complement to development strategies in the agrifood sector, their effective deployment becomes all the more crucial at a time when the disruptions of the COVID-19 outbreak have been reverberating all along the food chain and in particular among the most vulnerable – in Guatemala and globally. The digital information campaign has been instrumental in reaching women farmers in remote areas despite the challenging context of social distancing and mobility restrictions, with simple yet effective messaging.

These encouraging results, however, come with some important caveats: despite all their newly acquired knowledge, women who received the digital information campaign were still overly cautious about getting involved in the SFP. In the current setting, the program seems better suited to comparatively larger producers, with more sophisticated production systems and a higher capacity of supplying a broader pool of products throughout the year. In addition, low levels of trust in the main institutions involved in the program make such informal mechanisms even more pervasive.

Jointly considered, these findings suggest that continued work is needed to keep aligning the structure of the SFP to the reality of smallholder producers and women, if the program is to include them more systematically. Recommendations in this sense include a blend of digital and analog strategies, to overcome barriers in terms of awareness, empowerment, agricultural production and skills, market structure, and institutional challenges. For instance, the promotion of women's association, as well as women's access to land ownership and formal rights can impact intrahousehold decision-making and entrepreneurship. More-

over, streamlined and well-targeted technical assistance is necessary to ensure deeper human capital formation in rural settings, as well as a package of interventions aiming at improving access to finance and productive inputs and the promotion of rural producers' groups.[12]

Thanks to their ability to penetrate among broad audiences and to reduce the cost of remoteness, digital technologies can support this agenda, but to be effective at scale they require a suitable conducive environment in terms of infrastructure, regulatory environment, and human capital. In Guatemala as in many other countries around the world, investing in digital development, strengthening the regulatory environment, increasing rural connectivity and mobile penetration, and promoting digital literacy and skills will have high payoffs.

[12]see Perego et al. (2022) for detailed policy implications of the analysis in this paper.

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Tables

Table 1: Descriptive Statistics

Variable	Treatment Mean (S.D.)	Control Mean (S.D.)	Overall Mean (S.D.)	(1)-(2) p-value
Interviewee age	37.831	37.506	37.670	0.951
	(13.016)	(13.620)	(13.212)	
Interviewee completed primary education	0.539	0.572	0.556	0.614
	(0.554)	(0.575)	(0.570)	
Household head completed primary education	0.418	0.418	0.418	0.723
	(0.602)	(0.512)	(0.558)	
Number of household members	6.184	6.395	6.289	0.316
	(3.187)	(3.092)	(3.095)	
Cultivated land in cuerdas	6.294	6.670	6.479	0.874
	(9.943)	(12.779)	(11.422)	
Household harvested and sold their products in the past 12 months	1.000	1.000	1.000	N/A
	(0.000)	(0.000)	(0.000)	
Household harvested traditional SPF crops in the past 12 months	0.804	0.848	0.826	0.912
	(0.546)	(0.499)	(0.525)	
Household sold traditional SPF crops in the past 12 months	0.667	0.715	0.691	0.538
	(0.716)	(0.623)	(0.675)	
Any household member is registered as SFP provider	0.115	0.129	0.122	0.842
	(0.372)	(0.453)	(0.412)	
Interviewee knows of the existence of the SFP	0.766	0.766	0.766	0.925
	(0.436)	(0.456)	(0.445)	
Household used chemical pesticides/herbicides in the last 12 months	0.557	0.520	0.539	0.541
	(0.552)	(0.617)	(0.587)	
Climatic zone: Central	0.204	0.211	0.208	0.134
	(0.894)	(0.977)	(0.929)	
Climatic zone: Plateau	0.333	0.393	0.362	0.395
	(1.155)	(1.131)	(1.155)	
Climatic zone: Coastal	0.463	0.395	0.430	0.591
	(1.294)	(1.181)	(1.257)	
N	445	435	880	
Clusters	[123]	[138]	[252]	

Table 2: Treatment effect on information intake about the School Feeding Program

VARIABLES	Aware of SFP	Knows the crops that the schools buy from the SFP	Knows SFP buys from local farmers	Knows that can register as SFP provider	Knows the steps to register	Thinks is easy to register
	(1)	(2)	(3)	(4)	(5)	(6)
Effect of the Treatment	0.036	0.065*	0.108**	0.078*	0.078***	0.058**
	(0.029)	(0.038)	(0.039)	(0.048)	(0.035)	(0.024)
Outcome mean in control group	0.880	0.750	0.458	0.328	0.110	0.0455
Num clusters	229	229	229	229	229	229
Observations	625	625	625	625	625	625
R-squared	0.150	0.155	0.255	0.182	0.207	0.251
Stratum FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Control for outcome at BL	YES	NO	NO	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Treatment effect on SFP information intake by participation in traditional extension programs

VARIABLES	Aware of SFP	Knows the crops that the schools buy from the SFP	Knows SFP buys from local farmers	Knows that can register as SFP provider	Knows steps to register	Thinks is easy to register
	(1)	(2)	(3)	(4)	(5)	(6)
A: Has participated in agricultural training						
Effect of the Treatment	-0.053	-0.036	-0.039	-0.023	0.044	0.079**
	(0.033)	(0.046)	(0.059)	(0.067)	(0.047)	(0.035)
Outcome mean in control group	0.924	0.814	0.517	0.331	0.128	0.0407
Num clusters	174	174	174	174	174	174
Observations	340	340	340	340	340	340
R-squared	0.248	0.234	0.395	0.278	0.288	0.325
B: Has never participated in agricultural training						
Effect of the Treatment	0.110**	0.166**	0.254***	0.142**	0.083*	0.016
	(0.053)	(0.073)	(0.064)	(0.068)	(0.049)	(0.035)
Outcome mean in control group	0.824	0.669	0.382	0.324	0.088	0.052
Num clusters	151	151	151	151	151	151
Observations	285	285	285	285	285	285
R-squared	0.331	0.279	0.443	0.375	0.326	0.395
Stratum FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Control for outcome at BL	YES	NO	NO	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Treatment effect on women's willingness to participate and sales of SFP products

VARIABLES	Any agricultural or animal product	Sold SFP agricultural product	Sold SFP animal product
	(1)	(2)	(3)
Effect of the Treatment	-0.032	0.016	0.075*
	(0.032)	(0.040)	(0.040)
Outcome mean in control group	0.838	0.347	0.380
Num clusters	229	229	229
Observations	625	625	625
R-squared	0.304	0.275	0.226
Stratum FE	YES	YES	YES
Controls	YES	YES	YES
Control for outcome at BL	YES	YES	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Treatment effect on (log) prices

VARIABLES	Any product	Sold SFP agricultural products	Sold SFP animal products
	(1)	(2)	(3)
Effect of the Treatment	0.315**	0.537***	0.349*
	(0.133)	(0.166)	(0.181)
Outcome mean in control group	2.042	1.915	2.133
Num clusters	189	118	145
Observations	977	672	638
R-squared	0.147	0.219	0.171
Stratum FE	YES	YES	YES
Controls	YES	YES	YES
Control for outcome at BL	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Treatment effect on women's participation in the SFP

VARIABLES	HH registered to sell crops to the SFP	Interested in registering	Sold crops to a registered SFP provider	Plans to speak to a registered SFP provider
	(1)	(2)	(3)	(4)
Effect of the Treatment	0.015	-0.052	0.011	-0.019
	(0.025)	(0.201)	(0.043)	(0.035)
	0.551	0.795	0.794	0.572
Outcome mean in control group	0.201	0.391	0.193	0.202
Num clusters	229	198	207	207
Observations	625	501	475	471
R-squared	0.509	0.192	0.319	0.414
Stratum FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Control for outcome at BL	YES	YES	YES	YES

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

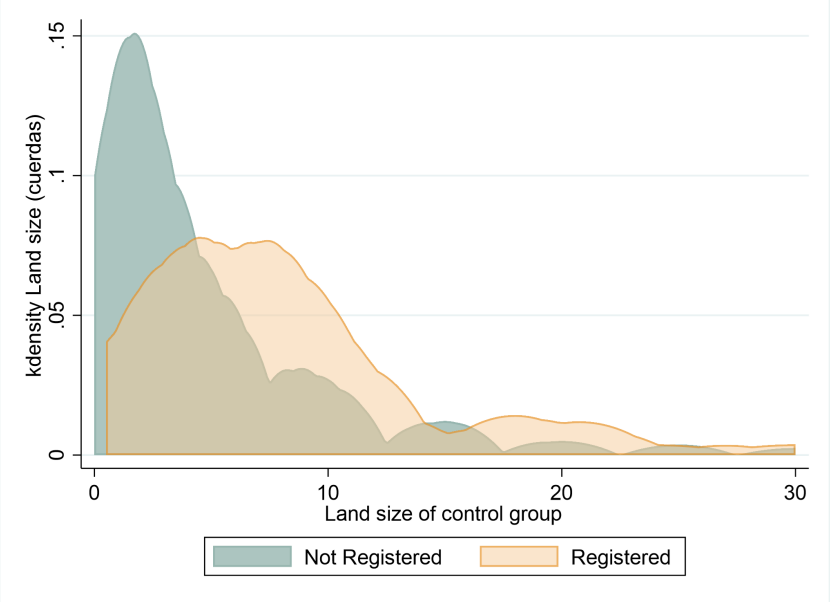
Table 7: Treatment effect on women's willingness to participate and sales of SFP products by municipalities' COVID incidence level

VARIABLES	Sold any agricultural or animal product	Sold SFP agricultural product	Sold SFP animal product	Prices (log)	HH registered to sell crops to the SFP	Interested in registering	Sold crops to a registered SFP provider	Plans to speak to a registered SFP provider
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	A: Total							
Effect of the Treatment	-0.032	0.016	0.075*	0.315*	0.001	0.016	0.012	-0.026
	(0.032)	(0.040)	(0.040)	(0.133)	(0.034)	(0.154)	(0.031)	(0.026)
Outcome mean in control group	0.838	0.347	0.380	2.042	0.201	0.295	0.136	0.143
Num clusters	229	229	229	189	229	229	229	229
Observations	625	625	625	977	625	625	625	625
R-squared	0.304	0.275	0.226	0.147	0.301	0.138	0.246	0.326
	B: Municipalities that presented COVID cases below San Marcos's median							
Effect of the Treatment	-0.024	0.047	0.107*	0.488**	-0.103**	-0.098	0.024	-0.107***
	(0.050)	(0.058)	(0.059)	(0.209)	(0.043)	(0.151)	(0.040)	(0.036)
Outcome mean in control group	0.842	0.362	0.349	1.913	0.243	0.316	0.145	0.178
Num clusters	120	120	120	91	120	120	120	120
Observations	310	310	310	494	310	310	310	310
R-squared	0.325	0.272	0.274	0.208	0.390	0.215	0.340	0.395
Stratum FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Control for outcome at BL	YES	YES	NO	NO	YES	YES	YES	YES
	C: Municipalities that presented COVID cases equal or above San Marcos's median							
Effect of the Treatment	-0.055	0.001	0.033	-0.082	0.115**	0.257	-0.036	0.071*
	(0.047)	(0.056)	(0.064)	(0.178)	(0.057)	(0.253)	(0.048)	(0.041)
Outcome mean in control group	0.833	0.333	0.410	2.177	0.160	0.276	0.128	0.109
Num clusters	116	116	116	102	116	116	116	116
Observations	315	315	315	483	315	315	315	315
R-squared	0.346	0.381	0.382	0.180	0.272	0.327	0.246	0.316

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figures

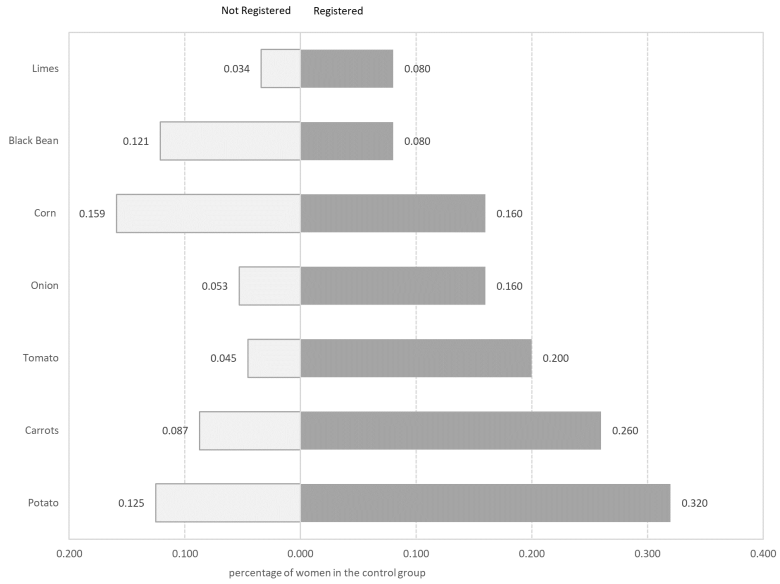
Figure 1: Distribution of farmers' land size by registration status in the control group



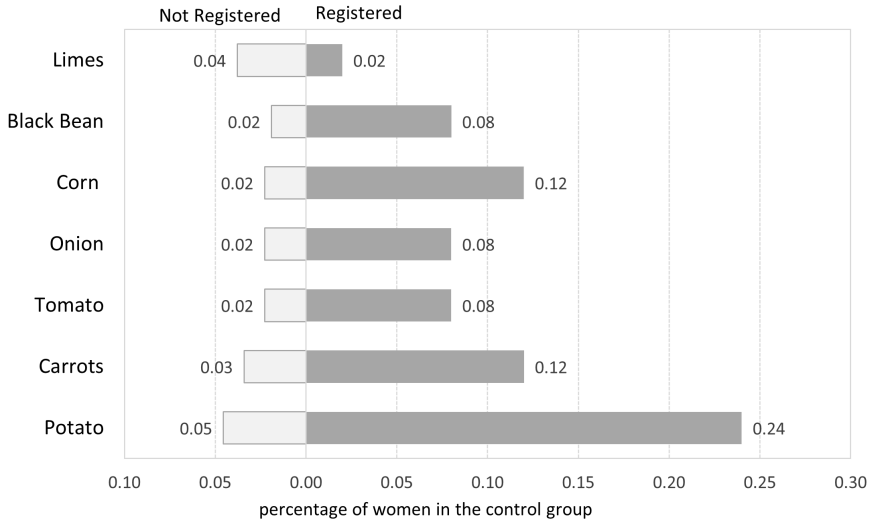
Note: Estimates as simple means of women in the control group.

Figure 2: Share of sales of SFP agricultural products by registration status and reference period

(a) Last year (baseline)

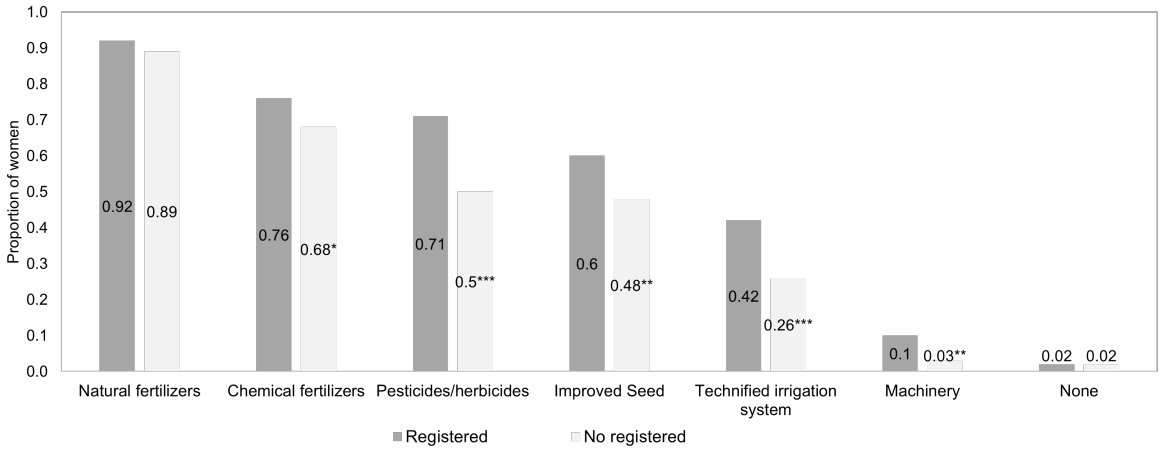


(b) Last two months



Note: Estimates as simple means of women in the control group.

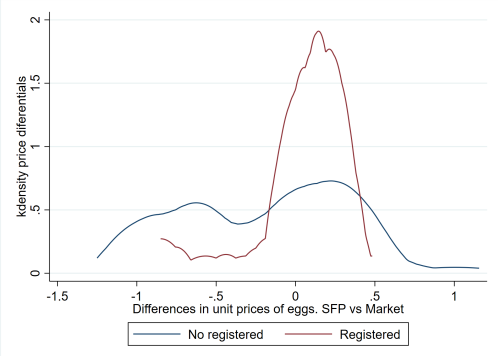
Figure 3: Adoption of agricultural practices, by SFP registration status



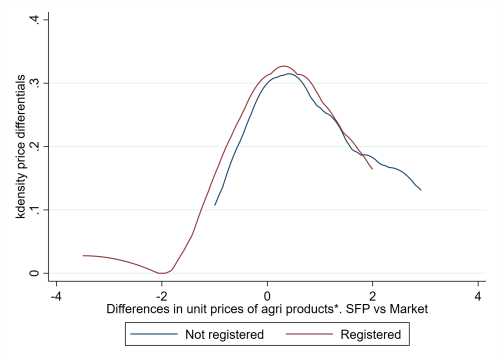
Note: Estimates as simple means of women in the control group.

Figure 4: Distribution of price differential between SFP and market prices, by registration status

(a) Eggs



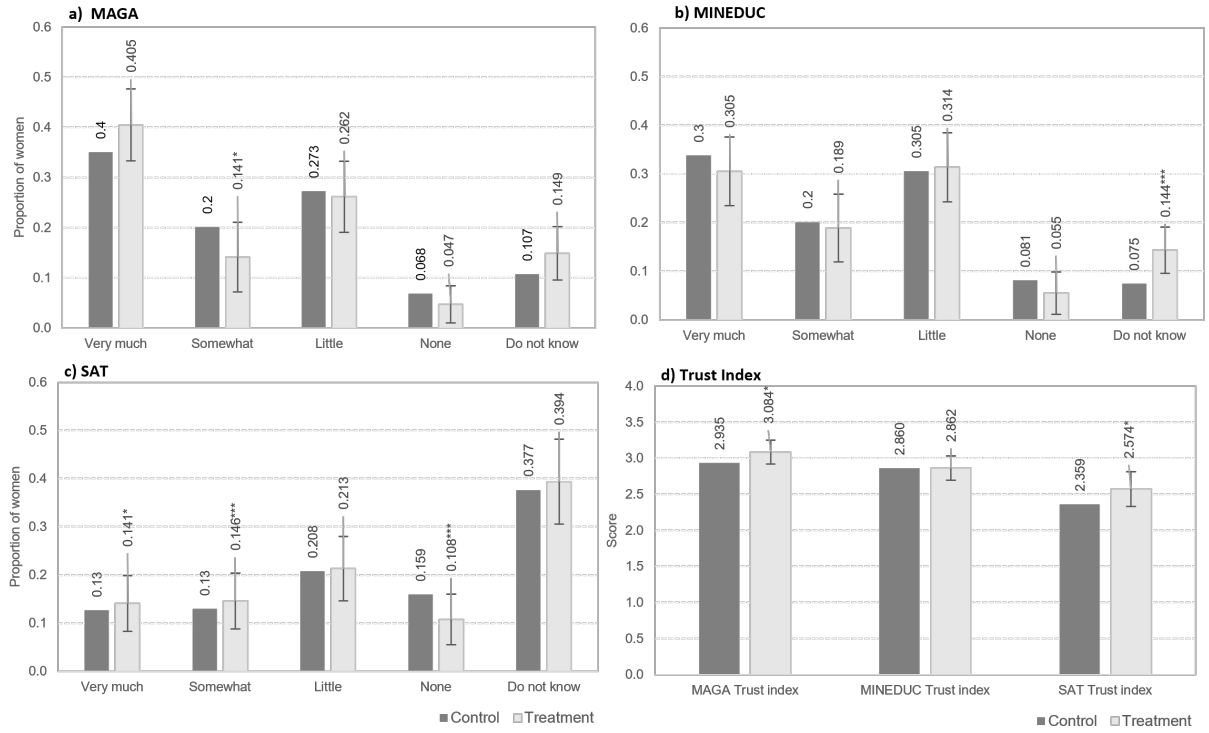
(b) Agricultural products



Note: Estimates as simple means of women in the control group.

Agricultural products include black beans, carrots, potatoes, and onions.

Figure 5: Treatment effect on institutional perception



Note: The index does not include the category don't know/no response and may be underrepresenting population with an education level lower than primary (54 percent) and in the plateau area (51 percent).

7 Annex

Table A1: Descriptive Statistics for re-connected women

Variable	Treatment Mean (S.D.) (1)	Control Mean (S.D.) (2)	Overall Mean (S.D.) (3)	(1)-(2) p-value (4)
Interviewee age	38.286	38.232	38.260	0.995
	(12.519)	(11.940)	(12.141)	
Interviewee completed primary education	0.526	0.567	0.546	0.661
	(0.559)	(0.521)	(0.542)	
Household head completed primary education	0.412	0.436	0.424	0.420
	(0.517)	(0.449)	(0.489)	
Number of household members	6.203	6.255	6.228	0.944
	(3.252)	(2.927)	(3.085)	
Cultivated land in cuerdas	6.709	6.918	6.811	0.811
	(9.752)	(12.840)	(11.281)	
Household harvested and sold their products in the past 12 months	1.000	1.000	1.000	N/A
	(0.000)	(0.000)	(0.000)	
Household harvested traditional SPF crops in the past 12 months	0.818	0.863	0.840	0.695
	(0.485)	(0.431)	(0.460)	
Household sold traditional SPF crops in the past 12 months	0.662	0.739	0.700	0.169
	(0.649)	(0.576)	(0.615)	
Any household member is registered as SFP provider	0.117	0.159	0.138	0.387
	(0.346)	(0.478)	(0.418)	
Interviewee knows of the existence of the SFP	0.788	0.774	0.781	0.567
	(0.413)	(0.411)	(0.413)	
Household used chemical pesticides/herbicides in the last 12 months	0.557	0.513	0.535	0.407
	(0.514)	(0.574)	(0.547)	
Climatic zone: Central	0.215	0.226	0.221	0.145
	(0.840)	(0.864)	(0.850)	
Climatic zone: Plateau	0.363	0.389	0.376	0.898
	(1.047)	(0.955)	(1.013)	
Climatic zone: Coastal	0.422	0.385	0.404	0.269
	(1.104)	(0.963)	(1.047)	
N	325	314	639	
Clusters	[112]	[126]	[231]	

Table A2: Take-up questions for the treatment group

The respondent recalls	Treatment Mean [SD]
1. The video about SFP	0.962
	[0.191]
From the video recalls:	
What the SFP is	0.055
	[0.229]
How to sell crops to the SFP	0.268
	[0.268]
Products purchased by SFP schools	0.255
	[0.437]
Recommendations on product quality	0.327
	[0.470]
Relevant information from the video about the SFP	0.630
	[0.483]
2. The text messages about SFP	0.785
	[0.411]
From the text messages recalls:	
How to sell crops to the SFP	0.196
	[0.398]
Products purchased by SFP schools	0.128
	[0.335]
Products purchased by SFP schools	0.128
	[0.335]
Contact information of MAGA specialists	0.076
	[0.266]
Contact information of SFP suppliers	0.212
	[0.410]
Relevant information from the text messages about the SFP	0.329
	[0.470]

Table A3: Treatment effect on main information source about the SFP

VARIABLES	Aware of the SFP	Knows through MAGA or Videos SMS	MAGA	Videos SMS	School/Teacher/SPO	Other sources
	(1)	(2)	(3)	(4)	(5)	(6)
Effect of the Treatment	0.0400	0.117***	0.0756**	0.0520***	-0.117***	-0.00470
	(0.0315)	(0.0351)	(0.0332)	(0.0125)	(0.0387)	(0.0386)
	0.369	0.000892	0.0187	0.000111	0.00272	0.813
Outcome mean in control group	0.880	0.199	0.199	0	0.576	0.354
Num clusters	229	214	214	214	214	214
Observations	625	560	560	560	560	560
R-squared	0.100	0.320	0.339	0.089	0.216	0.111
Stratum FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Control for outcome at BL	YES	YES	YES	NO	YES	YES

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
Covariate variables included are presented in Appendix 1.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Treatment effect on sales of SFP animal products

VARIABLES	Sold any SFP animal product	Eggs	Chicken meat	Cow Cheese	Cow meat
	(1)	(2)	(3)	(4)	(5)
Effect of the Treatment	0.075*	0.060	0.055**	0.007	-0.004
	(0.040)	(0.041)	(0.025)	(0.015)	(0.004)
Outcome mean in control group	0.380	0.341	0.0682	0.0325	0.00325
Num clusters	229	229	229	229	229
Observations	625	625	625	625	625
R-squared	0.226	0.220	0.123	0.185	0.066
Stratum FE	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES
Control for outcome at BL	NO	NO	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Treatment effect on (log) prices - IPW

VARIABLES	Any product	Sold SFP agricultural products	Sold SFP animal products
	(1)	(2)	(3)
Effect of the Treatment	0.53*	0.561	0.966***
	(0.277)	(0.380)	(0.317)
Outcome mean in control group	2.036	1.971	2.134
Num clusters	166	93	125
Observations	908	558	568
R-squared			
Stratum FE	YES	YES	YES
Controls	YES	YES	YES
Control for outcome at BL	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Treatment effect on SFP information intake by ethnicity

VARIABLES	Aware of SFP	Knows the crops that the schools buy from the SFP	Knows SFP buys from local farmers	Knows that can register as SFP provider	Knows steps to register	Thinks is easy to register
	(1)	(2)	(3)	(4)	(5)	(6)
A: Indigenous Population						
Effect of the Treatment	0.0103	0.0381	0.0833	0.114	0.159**	0.085**
	(0.083)	(0.121)	(0.106)	(0.102)	(0.065)	(0.040)
Outcome mean in control group	0.818	0.682	0.409	0.318	0.061	0
Num clusters	60	60	60	60	60	60
Observations	128	128	128	128	128	128
R-squared	0.432	0.390	0.488	0.382	0.411	0.410
B: Non-indigenous Population						
Effect of the Treatment	0.0498	0.0561	0.123**	0.103**	0.0679*	0.0576*
	(0.032)	(0.037)	(0.048)	(0.052)	(0.036)	(0.030)
Outcome mean in control group	0.897	0.769	0.471	0.331	0.124	0.0579
Num clusters	174	174	174	174	174	174
Observations	497	497	497	497	497	497
R-squared	0.131	0.182	0.272	0.190	0.216	0.261
Stratum FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Control for outcome at BL	YES	NO	NO	NO	NO	NO

Notes. Fixed effects using variable stratum are included in all estimation regression.
Standard errors are clustered by village.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$