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# Sowing seeds of empowerment: effect of women's home garden training in Bangladesh

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## Abstract

**Background:** There is a lack of scientific evidence that home gardens contribute to women empowerment, which eventually leads to greater gender equality, although it is generally assumed that they do. Using data from poor rural households in Bangladesh, this paper analyzes if and how women's training in home gardening and nutrition empowers women. The study used a mixed methods approach, combining statistical analysis of quantitative data for 456 women with content analysis of qualitative data from in-depth interviews.

**Results:** The results show that home garden training is popular and widely accepted by both men and women largely because it does not contest existing socially constructed gender roles. Nevertheless, we find clear signs of increased control by women over food supplies and income, and gains in women's self-confidence and role in the community—as husbands and outsiders begin to recognize their agricultural skills. However, such improvements have been gradual rather than radical. Many men and women appreciated the new opportunity to work together on something of common interest that advanced their quality of life.

**Conclusion:** The evidence presented shows gradual but clear signs of women empowerment as a result of training in home gardens and nutrition.

**Keywords:** Agriculture, Home-based food production, Gender inequality, Gender analysis, Women's Empowerment in Agriculture Index

## Background

Socially constructed gender roles of men and women strongly influence household food consumption. This is particularly so in rural Bangladesh: men eat first, children second, and women eat last; women prepare all food, but it is men who do all the shopping for food; and women are traditionally confined to household chores while men work outside in their fields or as laborers. It is within such context that home gardens are seen as an intervention that could contribute to better nutrition as well as women empowerment (e.g. [16]).

Home gardening is the use of an area around the residence where various herbs, fruits, and vegetables can be

grown year-round for household consumption together with some livestock [6, 13, 21]. The literature on home gardening is extensive, particularly for Bangladesh. Current evidence for the effect of home garden interventions on women empowerment and gender equality in Bangladesh comes from three studies that are briefly described in the following.

First, Bushamuka et al. ([3] and also reported in Iannotti et al. [10]) studied the long-running home garden program of Hellen Keller International in Bangladesh. They compared active and former participants of the home garden program with a control group using quantitative survey data collected in 2002. In terms of gender, they focused on women's perception of their participation in household decision-making. Active and former participants felt that they had gained influence in decisions about the participation in meetings, the use of household

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land, small household purchases and their mobility outside the home. The authors explained this positive impact from the fact that women made an increased economic contribution to the household, which was recognized by the other household members and led to more respect, enhanced social status, and decision-making power.

Hallman et al. [8] studied the distribution of improved vegetable varieties (originating from AVRDC – The World Vegetable Center) to women by the local nongovernmental organization Gono Kallayan Trust in Saturia district near Dhaka. They combined quantitative with qualitative data. Their quantitative data showed that women in households who had received the intervention had slightly greater social mobility as they visited friends and went to the market more often ( $p < 0.10$ ). From their qualitative data, they observed that homestead vegetable production fitted with women's livelihood strategies as it required very little land and cash, women could flexibly allocate time to the garden and did not need to move beyond the homestead.

Kumar and Quisumbing [14] combined the data used in Hallman et al. [8] with a follow-up survey in 2006–2007 and applied propensity score matching to correct for selection bias. The objective of their study was to find out the differential impact of targeting women's groups rather than individual women on the intra-household gender asset gap. They showed that technology dissemination through women's groups was more effective in closing the gender asset gap. They also provided qualitative evidence that sharing of home-produced vegetables helped to establish a feeling of solidarity among women.

Several other studies have touched on home gardens and gender, though have not conducted an impact evaluation. First, Akhter et al. [1] studied home gardens in Sylhet district in northeast Bangladesh and showed that women are clearly in control of the garden management. They explained that women have an interest in home gardening because they see the benefits in terms of food security and better health for their family and natural resource conservation. Second, Hillenbrand [9] described the approach of Hellen Keller International in transforming gender through its homestead food production program in Bangladesh. Based on qualitative observation, she writes that part of the program's popularity and success may be explained by the fact that it does not contest existing gender norms or patriarchal power structures. She also describes that the program has adopted a more gender transformative approach when it was realized that women empowerment is a foundation for improving nutrition and food security.

The above-mentioned studies touch on the effect of home garden interventions on women empowerment, but are not comprehensive and focused assessments of

the questions if and how home garden interventions contribute to women empowerment. The objective of this study is therefore to analyze if and how women's training in home gardening and nutrition empowers poor rural women in rural Bangladesh. Similar to the previous studies, we applied a mixed methods approach drawing on quantitative and qualitative data.

The paper starts by describing the conceptual framework that we used for the study, the intervention that we analyzed and the data we collected. The results and discussion sections describe home gardening's economic, personal, and social contribution to women empowerment in rural Bangladesh. The paper ends with a conclusion.

## Methods

### Conceptual frame

Women empowerment is a broad concept that includes elements of choice, participation and influence and control over resources and benefit flows. The Women's Empowerment in Agriculture Index (WEAI) captures these dimensions and relates them to the context of agriculture [2]. We therefore used it as the conceptual frame for our study.

The WEAI builds on definitions of empowerment by Kabeer [11, 12] and Narayan [18]. Kabeer defined it as the process of increasing people's ability to make choices, especially for those who have been denied this ability. Narayan has a less-individualistic definition and gives more prominence to social relationships and institutions in defining empowerment as the ability to improve and expand matters involving resources and interpersonal relationships and the ability to participate, negotiate, influence, and hold accountable institutions that affect life.

Building on the above definitions and relating them to agriculture, Alkire et al. [2] conceptualized women empowerment as improvements across five domains: (1) Production decisions: women's sole or joint decision-making about food and autonomy in agricultural production, with no judgment on whether women's sole or men and women's joint decision-making contributes to women empowerment. (2) Control over resources: ownership of, access to, and decision-making power on productive resources such as land, water and credit. (3) Control of use of income: women's sole or men and women's joint control over the use of income. Here, we expanded the definition of income to also include in-kind income from the home garden. (4) Leadership in the community: women's membership in economic and social groups, and speaking in public comfortably. (5) Time: allocation of time to productive and domestic

tasks and satisfaction with the time available for leisure activities.

Although the WEAI was developed for the purpose of quantifying women empowerment and comparing it across locations, we only use it here to structure our analysis according to the five domains of empowerment.

### **Mixed methods approach**

This study used a mixed methods approach combining qualitative and quantitative methods, allowing data triangulation to add robustness to the analysis [7]. Quantitative data were collected from women using a structured questionnaire survey. The survey was part of a larger effort to evaluate the impact of home gardens on the production and consumption of vegetables and was therefore not only used for this paper. The survey recorded which person in the household made the decisions about various gardening and general household activities and the relative time spent on each activity. Data were also collected about general household characteristics and recent changes in garden management.

To assess the effect of the training program, we compared the responses of trained women with those of a control group of non-trained women. Both groups were eligible for training, but the control group was yet to receive the intervention. Selection bias is an issue in any impact evaluation study that uses observational rather than experimental data. We checked the existence of selection bias by comparing the observed household characteristics between intervention and control households.

Randomly selected quantitative data have the advantage of being representative of a larger population of households, but the structured format necessary for a questionnaire survey makes it less suitable to fully capture people's opinions about gender norms. Qualitative methods, specifically focus group discussions and in-depth individual interviews, were therefore used to gather more in-depth information about these aspects and about the internal and external factors that influence women's attitudes toward gardening and related activities.

Descriptive statistics were used to analyze the quantitative data. A non-paired mean comparison test (*t* test) and Chi-square test were used to test for significant differences in sample means for trained and non-trained households. The grounded theory approach was used to analyze the qualitative data [4]. We formed categories developed from the field and during the transcript analysis. The effectiveness of the grounded theory approach lies in the systematic and sequential data analysis that allows the research process to comprehend the study's critical aspects immediately after observation (*ibid.*).

Starting the analysis from the beginning of the study and evaluating the preliminary conclusions will help prevent overlooking important key points [5, 15]. To identify the similarities and differences of the responses, the study used open coding [4] to interpret the phenomena and gain insights that are different from what is normally produced from conventional methods of analysis. Data were grouped according to emerging themes and given a conceptual label to form categories and subcategories. All responses were accounted for during the analysis, reaching theoretical saturation [17].

### **Intervention studied**

The prevalence of malnutrition in rural Bangladesh is among the highest in the world [22]. Although the prevalence of hunger has much decreased in recent decades, micronutrient undernutrition remains a key problem. Home gardening has received renewed interest in recent years because it has the potential to increase micronutrient intake by increasing the quantity and quality of nutrient-rich foods produced and consumed. Because women do not usually go to the market to buy food, home gardening would allow them to have more control over the household's food supply. Hence, nutrition education and counseling combined with the promotion of home gardens is thought to be particularly effective [6].

Since the early 1990s, AVRDC – The World Vegetable Center has been implementing home vegetable gardens in Bangladesh. From 2011, AVRDC worked with the Bangladesh-based international nonprofit organization BRAC (formerly known as the Bangladesh Rural Advancement Committee). From 2012 to 2014, over 8000 women participated in the training.

Women eligible for the training had to meet certain criteria (see also [19]). First, the intervention targeted smallholder farm households by requiring that households should have some land but not exceeding one acre (0.4 ha). Second, households with at least one child below 5 years were given priority. Third, participants should have some experience in cultivating vegetables, but have not received any similar kind of intervention. Last, women should be interested to participate in the project.

The intervention introduced eight improved locally available and nutrient-rich varieties of vegetables suitable for home garden cultivation, but households were free to grow any other vegetables or fruits as well. Women were given a 1-day intensive training that centered on nutrition and garden establishment at local BRAC training centers in early 2012 and 2013. Through the nutrition training, women learned the role of nutrition in preventing diseases, functions of various nutrients in the human body, nutritional value of commonly consumed vegetables, and the nutrient availability and disease-combating

features of different colors of vegetables. Women also learned cooking methods to better preserve the nutritional content of vegetables.

In the technical part of the training, trainers taught site selection, site and land preparation, garden layout and design, seedbed preparation, seasonal vegetable selection, sowing practices, fertilization, irrigation and drainage, weeding, and insect and disease management without pesticides. Home gardens are common in Bangladesh, but the promoted designs were most strikingly different in the use of raised planting beds, proper planning, fences with synthetic nets to keep out farm animals, and quality seeds.

Seven to 14 days after the training, a BRAC training officer would come to visit the households and helped in setting up the garden. Women were given seed packs only if their gardens were near completion. BRAC officers aimed to visit and cover all trainees during the monitoring period (on a weekly basis for the first 6 months after the training). The visiting frequency was reduced to a monthly basis during the second 6 months.

#### Data collection

All data were collected from the rural areas of Jessore and Barisal districts of Bangladesh in a 6-week period from mid-April to the end of May 2014. For the quantitative survey, the sample was stratified by subdistricts (called 'upazillas' in Bangladesh), unions (the smallest rural administrative unit usually consisting of nine villages), and villages. We purposively selected subdistricts and unions but randomly selected one village from each union and 10–15 households from each village. The sample included 456 observations, including 171 trained and 285 non-trained households from a total of 14 villages.

For the qualitative survey, we conducted a total of 12 focus group sessions in 6 villages (3 per district). Villages were selected according to their proximity (near, medium, far) from the district center as this was expected to influence opportunities to engage in off-farm work. Only villages where the project had conducted the training in 2012 or 2013 were selected. Focus group discussions were organized separately with men and women to allow participants to more freely express their opinions about their relationship with the opposite sex. The female group only included those women who had received the training and the male group included their husbands, brothers, and fathers. A foreign researcher conducted the interviews in English, while a Bangladeshi researcher would translate back and forth in Bengali. The interviews were recorded using a digital voice recorder while the researcher would write field notes in English. The individual interviews used the same checklist of questions as the focus group discussions, but in addition we did a

daily activity clock exercise to document the activities carried out by women in 1 day. It reflected the responsibilities and workload of women according to their daily schedule.

Although the study involved human subjects, the study was observational rather than experimental and no invasive data collection methods were used. All respondents participated in the study on a voluntary basis, and were informed about the purpose of the study by an enumerator at the start of the interview, and gave their consent to participate in the study. No other form of ethical approval was sought.

## Results and discussion

### Household characteristics

There were no significant differences in average household characteristics between the trained and non-trained households (Table 1). Each group had an average size of about 5 members and the ratio of dependents (aged under 15 or over 64) to working age adults (aged 15–64) was 0.75. The average women gardener was 36 years old and had attended 5 years of formal education. Their husbands were on average 7 years older and had spent a similar period in school. The amount of land allocated to women's home gardens was 17 square meters ( $m^2$ ) while the agricultural fields of the men were about 2500  $m^2$ . The absence of significant differences in quantitative household characteristics between the control and intervention groups suggests the absence of selection bias. All variables combined explained less than 5 % of the variation in program placement, which does not justify the use of propensity score estimators. The likelihood that findings will be biased because of program placement bias is therefore low.

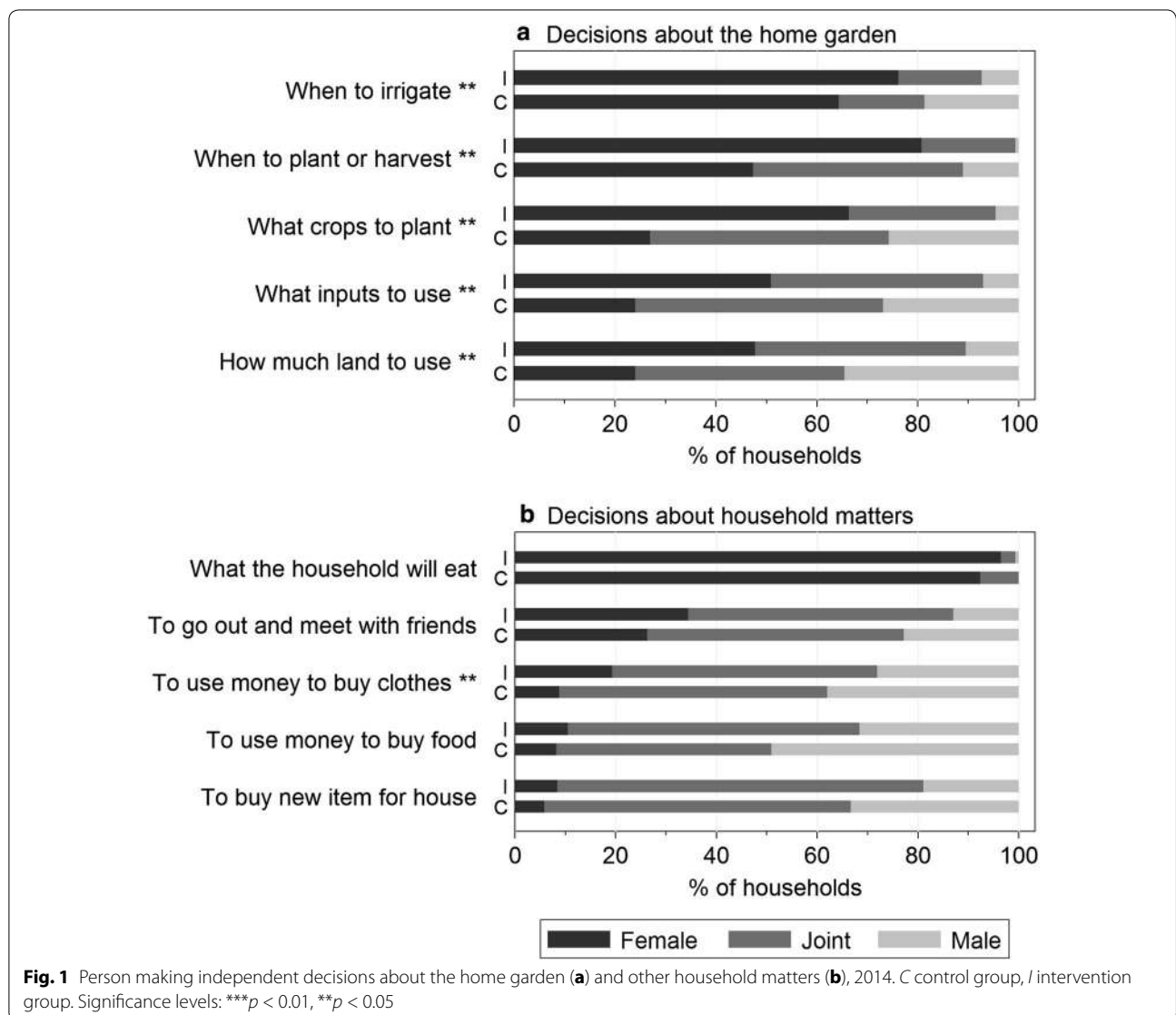
### Production decisions

The quantitative data showed that women who had received the training had more freedom to decide over most gardening tasks such as crop choice, planting and harvesting times, crop management, and inputs to use (Fig. 1a). There was a significant ( $p < 0.05$ ) difference between the intervention and control groups in all five aspects. The relatively independent decision-making of women with regard to garden activities contrasts with a stronger male dominance in most other household decisions (Fig. 1b). It includes the use of money to buy food, clothes or household items, and even the decision to meet with friends. The only household decision that women could clearly make independently was the choice of food they prepared. We found no significant difference between the control and intervention groups except for the decision to buy clothes ( $p < 0.05$ ), which showed that women trained in home gardening could more independently decide about this.

**Table 1 Household characteristics of intervention and control groups (average per household), 2014**

Characteristic	Control (n = 171)		Intervention (n = 285)		Sign.
	Sample mean	SD	Sample mean	SD	
Household size (persons)	5.0	1.7	4.7	1.4	NS
Dependency ratio	0.8	0.5	0.7	0.5	NS
Age of women gardener (years)	35.9	10.9	35.6	9.8	NS
Age of husband (years)	43.2	13.3	41.9	11.6	NS
Education of women gardener (years)	4.9	3.3	4.6	3.3	NS
Education of husband (years)	4.5	3.6	4.1	3.5	NS
Cultivable land of household (1000 m <sup>2</sup> )	2.4	1.8	2.5	3.2	NS
Land area used for home garden (m <sup>2</sup> )	44.9	25.5	43.5	14.6	NS

Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , NS not significant. Two-sample *t* test was used for all variables



**Fig. 1** Person making independent decisions about the home garden (a) and other household matters (b), 2014. C control group, I intervention group. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$

### Control over resources

Women in Bangladesh have little control over productive resources such as land and money. Hence, the allocation of the compound area to a home garden and the purchase of inputs would typically involve men. The availability of land and inputs was a constraint for many women gardeners. Woman F explained<sup>1</sup>:

*I had to stop home gardening after two years. At first, I didn't have land, so I borrowed from someone else. I could not sell a lot of vegetables (only BDT 200) because I had to give 50 % to the landowner. I felt extremely bad because after harvesting, I had to give up a big part of my produce. That's why I want to have my own land. If I have the land for home gardening, then I can utilize the manure from my cows.*

Women connected the land issue with inheritance practices, which was an important concern for many women. They felt that the existing inheritance law had a strong bias toward sons and disadvantaged wives and daughters. According to the female respondents, discrimination of daughters should be reduced, with sons and daughters being treated equally.

The control over land appeared to be an important concern, yet the main limiting factor for home garden production was not land, but water. One woman remarked that her household still had to buy vegetables because there was not enough water during some periods of the year. Some women had to fetch water from afar, while others used a nearby pond. However, ponds would run dry when there is no rain. Other women said it was difficult to plant vegetables in the rainy season because of very heavy rainfall. However, we did not find that access to water had a gender dimension.

### Control of use of income

In-kind income from the garden was definitely more important than cash income as confirmed by both the quantitative and qualitative data. During the qualitative interviews, women expressed that their home gardens allowed them to provide their household with more and better quality food, and lessened their dependency on men to purchase food from the market. Women said they normally had to wait for whatever food their husbands would bring home; therefore, the more productive home gardens made food more readily available whenever there was a need for it. This allowed them to serve vegetables more regularly, thereby diversifying the household diet. The women mentioned that because they did not have

to ask their husbands to buy vegetables, they could occasionally ask them to buy other foods such as fish or meat, further contributing to dietary diversity. Female respondents from Barisal thought that after the training, they also ate more food in general. However, respondents from Jessore did not explicitly mention this.

The questionnaire data showed that 43 % of the households sold some of their home garden produce. On average, the revenue from selling was less than USD 3.6 per year. About 25 % of the households sold less than USD 1.5 per year. Men did most of the selling. In cases where women themselves sold the produce, it was mostly to neighbors. Although the income from home gardening was small, the effect on income saved from not having to buy vegetables was more important—though not quantified through the survey. These savings were used to purchase other food items and contribute to other household expenditures. Since the purpose of home gardening is to improve household nutrition, selling was not the main goal of the project and can be considered as an added benefit.

Through the focus group discussions, it became clear that men strongly rejected the idea that women would go to the market to sell garden produce. Women said they did not want to go to the market for fear of being chastised, which shows that they were not willing to break away from the social norm of being homebound. Home gardening did not give them an incentive to challenge this norm.

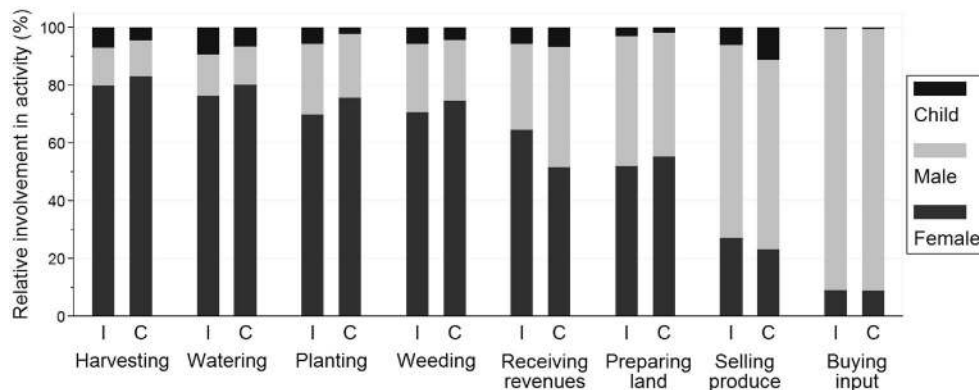
Men generally agreed that women should have control over the produce from home gardens, since it was the fruit of their labor. They also generally agreed that income from selling should belong to women. The quantitative data (Fig. 2) also showed that trained women more frequently received the cash revenues when produce was sold than the women in the control group. Yet, women during the focus group discussions indicated that they would usually give the money to their husband or son to manage, as they would not be able to go and spend it themselves. Only a minority of the women insisted on keeping the money themselves.

Women said that they spent the extra income mostly on food and school items for their children. It also appeared that home gardening sparked the interest of some women to venture into other economic activities. Some were thinking about planting fruit trees or keeping livestock as a business; others were considering off-farm activities such as knitting and food processing. However, none of their ideas had materialized during the time of our study.

### Leadership

Two years after the training, many women could still accurately recall which vegetables were rich in certain

<sup>1</sup> The alphabet letters refer to the order by which respondents were interviewed in the study as to keep them anonymous.



**Fig. 2** Relative contribution of men, women and children to home garden work, 2014. C control group, I intervention group. Significance levels: \*\*\* $p < 0.01$ , \*\* $p < 0.05$

nutrients (e.g. vitamin A in spinach, iron in red amaranth) and associate certain vegetables or colors with health benefits (e.g. carrots are good for the eyes, red vegetables are good for the heart). In general, women became more aware of the importance of vitamins and nutrition for family health. Some elderly respondents in Barisal said they used to lack energy and were burdened by diseases, but felt that their health had improved after eating garden vegetables regularly.

Men also indicated to have learned new things about vegetable cultivation. Some men said they learned from their wives how to prepare better planting beds and how to deal with certain insect pests. They applied some of these in their own fields and saw the benefits. The experiences made men more supportive of women's home gardening.

Other people in the village also became interested after seeing the improved home gardens. The trained women willingly demonstrated and taught the different steps in establishing gardens to those who had not received the training. The fact that husbands, brothers, and neighbors recognized their new agricultural skills and asked the women for advice made them feel appreciated in the community. For example, woman B, a mother of five who helped other women and men to set up their own home gardens, said that she usually did not speak out in public in the past, but felt more confident after having initiated a small group of women gardeners in her community. She was proud to be interviewed as it showed people were interested to hear her thoughts. She explained that:

*Because of my home garden, other women who were not able to receive the training also established their own. Two men were also interested and they asked me to teach them how to do it. One of the men was very happy about the results and decided to culti-*

*vate two home gardens. I also demonstrated to other women how to cultivate a home garden and I shared my remaining seeds with them. I trained 20 women in total. I enjoy teaching and demonstrating the steps in establishing a home garden. All the women I trained are now successfully cultivating their own gardens. Because of home gardening, I made 20 new friends.*

Women in some of the villages visited each other's gardens to share experiences. It is otherwise uncommon for women in rural Bangladesh to have their own social circle and meet with friends to do activities together. Home gardening thus allowed some women to have more social interaction.

## Time

### *Productive workload*

The division of work was discussed at length in the focus groups with men and women. To start the discussion, they were asked to give their opinion on the statement "men are providers, women should stay at home". It led to strong and contrasting opinions that are illustrative of the social transformation happening in rural Bangladesh.

In the male group, most men preferred women to work at home or in the home garden, but not in the agricultural fields. Men reasoned that working in the field is hard work, which is not suitable for women who have plenty of chores to do in and around the house. However, a minority of old and young men disagreed with the statement, saying that it depends on the kind of work, and that it is only ignorant or uneducated people who think like that.

When the same topic was discussed with women, the majority disagreed that they should stay at home. Most said that men and women should work as a team to bring

development to their children, and give equal effort to bring prosperity to the household. Some women vigorously argued that times have changed and they can do the same work as men. However, there were also some women who disagreed and said that they enjoyed the fact that men are providers of the family and that they just stay at home. They said they already struggle to complete all household chores and would not have the time to do outside work.

Such stark differences in opinions were largely absent with respect to working in the home garden. Located on or near the compound, everyone agreed that the home garden was a woman's domain. Men encouraged their women to do home gardening because they saw clear benefits, while it did not contest their traditional view of women's role in the household. This suggests that home gardens perpetuate the social role of women as caretakers of the home, rather than help strengthen their socio-economic position.

Yet, very different from the traditional division of labor, men and women worked together in the home garden. Women said they can do all kinds of garden work themselves, but men would usually offer to help with certain strenuous tasks such as preparing planting beds, making the drains, and erecting fences. The quantitative data in Fig. 2 confirm that men did about half of the land preparation. For households that received the training in home gardens, men even made a significantly ( $p < 0.05$ ) greater contribution to the land preparation than for the control households. However, women did most of the other activities such as harvesting, watering, planting, and weeding.

The fact that men and women worked together as a team on something of common interest is a radical change from the prevailing gender norms, and suggests

that home gardens contributed to more gender equality in this respect. For example, woman B (a mother of five) said,

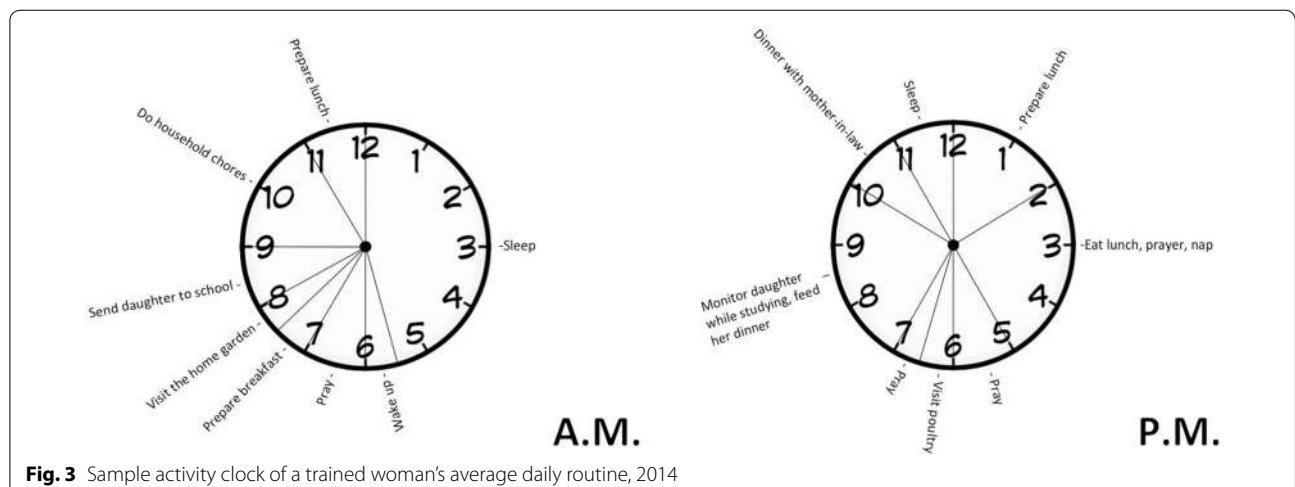
*My husband helps me prepare the land and in any activity that requires hard labor. My relationship with my husband is now good because we can get vegetables from the home garden. He encourages me to grow more vegetables in the garden because I get to earn BDT 2000-3000 each season [USD 25-40].*

The fact that men gained an opportunity to do work in the women's domain, and the fact that men and women worked together on something of joint interest show an important change in the gender division of labor.

**Women's domestic workload**

With many chores to do to sustain a large household, it is a concern whether the improved home garden adds to women's workload and takes away their time for childcare or resting. The quantitative data showed that on average, the trained women spent 10.6 min per day in their garden, while this was 4.4 min for the control group—the difference being significant ( $p < 0.01$ ). Therefore, the training program did increase women's time allocation to the home garden, though only by an average of 6 min per day.

The survey data revealed that nearly all trained women said they had enough time for family, rest, personal care, household chores, socialization, as well as home gardening. Data collected from the activity clocks of women also confirmed this finding (Fig. 3). According to the activity clocks, women got about 6 h of sleep a day. In the morning, women do household chores, prepare breakfast, fetch water, visit the home garden, take care of livestock, and start to prepare lunch. Afternoons are spent with



**Fig. 3** Sample activity clock of a trained woman's average daily routine, 2014



final lunch preparations, eating, resting, personal care, and another visit to the home garden. At night, women check on their livestock, monitor their children's studies, eat dinner, and sleep. Women also spent time on religious activities, offering prayers throughout the day.

Monitoring children while they are studying appeared to be a common task for women, as they wanted to ensure their children received a better education than they themselves had received. Many households hired private tutors (mostly for mathematics and English) who visited the house twice or thrice a week. Some of the women used income from the garden to pay for this.

## Conclusion

The results of this study confirm that women's training in home gardening and nutrition in Bangladesh largely fits into existing socially constructed roles of men and women, particularly that of women being bound to the home and being caretakers of the household. Home gardening does not contest men's authority over economic life and the activity fits to women's sphere of life. This finding confirms earlier studies on homestead vegetable production by Hallman et al. [8] and Hillenbrand [9]. Although home garden interventions do not directly confront gender inequality, our study showed clear indications that it does make a positive contribution towards women empowerment. It gave women greater control over what the household eats and also gave women control over a small source of cash income. Most importantly, trained women became recognized by other women and men in their community for their agricultural skills, which was a source of self-esteem and social interaction outside their usual social circle of family and neighbors. Women as well as men appreciated working together on something of joint interest that furthered their households' development. The observed improvements in women empowerment are gradual rather than radical. The fact that they are gradual probably facilitated the rapid acceptance of home garden interventions in Bangladesh and thereby provided benefits to a large number of rural Bangladeshi women.

Including women empowerment as an explicit aim of home garden projects is likely to make them more effective as women's training in nutrition and agriculture might not be enough to instigate social change. In this study we found particularly positive effects on women empowerment where women had formed a small group of fellow gardeners in their community. Based on this finding, home garden projects could initiate the formation of women gardening groups after the training. Women gardening groups would allow women to share ideas and experiences about the home garden, family health and nutrition, and other issues. Such groups

would also help women gain self-confidence by engaging in social relationships outside their family and contribute to sustaining improvements made during the project.

## Abbreviations

AVRDC: AVRDC – The World Vegetable Center; BDT: Bangladesh taka (1000 BDT is about 13 US dollar); BRAC: Bangladesh Rural Advancement Committee; USAID: United States Agency for International Development; USD: United States dollar; WEAI: Women's Empowerment in Agriculture Index (WEAI).

## Authors' contributions

All authors planned jointly the study, the hypothesis and the objectives. Shahana B and MP collected and analyzed the qualitative data. PS designed the quantitative survey and analyzed the data. MP and PS drafted the manuscript. All authors contributed to manuscript improvement. All authors read and approved the final manuscript.

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MP holds an MSc. degree in International Agriculture from Taiwan's National Chung Hsing University and was consultant at AVRDC – The World Vegetable Center at the time of writing. PS is Agricultural Economist and Lead Specialist – Impact Evaluation at AVRDC – The World Vegetable Center in Taiwan. Shahana B is Sociologist and independent consultant in the fields of maternal and child health, nutrition and family planning based in Dhaka. Shawkat B is Anthropologist and Senior Country Liaison Scientist at International Potato Center (CIP) and Chief of Party of the USAID Horticulture Project in Bangladesh.

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## Competing interests

The authors declare that they have no competing interests.

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