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Determinants of adoption of homestead gardening by women and effect on their income and decision making power

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Abstract

Use of homestead gardening in developing countries may be a method for improving income and employment of rural women, but determinants for adoption by women are not well understood. The study identified determinants of adoption of homestead gardening and its effect on income and decision making power of women. A total of 150 adopter and non-adopter women were interviewed and the Mann-Whitney test, and probit model was used to analyze data. Age, years of education, training, farm size, and income influenced the adoption of homestead gardening. Annual income in adopters were 40 % more than non-adopters. Women involved in homestead gardening increased household food production and income which helped them to contribute in decision making and could improve the status of women in the society.

Key words: Asset ownership, Bangladesh, empowerment, income, vegetable

Introduction

Rapidly increasing population, shifting consumer lifestyles and global warming contribute to changes in agricultural production. A homestead garden is a place near a household where crops are grown year round for domestic use and sale (Keatinge *et al.,* 2012). Homestead gardening is mainly practiced by rural women in developing countries to improve household consumption, income, employment, and socio-economic status (Marsh, 1998; Akrofi *et al.,* 2010; Ferdous *et al.,* 2016; Mellisse *et al.,* 2017; Shukla *et al.,* 2017; Kansiime *et al.,* 2018; Pritchard *et al.,* 2018; Rahman *et al.,* 2017; Shackleton and Hebinck, 2018; Whitney *et al.,* 2018). Homestead gardening can empower them in decision making and in developing a sustainable livelihood (Berti *et al.,* 2004; Jones *et al.,* 2005; Gautam *et al.,* 2008; Olney *et al.,* 2009; Chadha *et al.,* 2012; Girard *et al.,* 2012; Jaenicke and Virchow, 2013; Weinberger, 2013).

Half of Bangladesh's population are women and their economic contribution has increased access to education, health facilities, employment market, jobs and social protection (Islam and Alam, 2018). Participating in efficient homestead gardening is a promising sector for women's involvement in entrepreneurial activity (Mahmudul *et al.,* 2003). Indicators of women's empowerment include education (Smith and Haddad, 2000; Berti *et al.,* 2004), control over income (Iannotti *et al.,* 2009; Leroy *et al.,* 2009; Andersen, 2012; Kabir *et al.,* 2019), control over assets (Quisumbing and Maluccio, 2003), and access to credit and extension services (Quisumbing *et al.,* 2014). These influence income and intra-household distribution, which could lead to positive impacts on children's education, household members health, and nutritional status (Sraboni *et al.,* 2014). Women having a significant role in decision-making may lead to improved well-being of the entire family (Sell and Minot, 2018) and changes of their position within and outside of home, particularly greater ownership of household resources; provide greater control over economic services, leadership development, and legal protections, that can have a beneficial effect on efficient production and family income (Adato *et al.,* 2000; Doss and Morris, 2000; Smith *et al.,* 2003; Ross *et al.,* 2015).

Homestead gardening dynamics must be understood to boost rural women's earnings and decision-making power. This study was undertaken to determine the decision to adopt homestead gardening, women's contribution to household income due to homestead gardening, respondent socio-economic factors, and challenges and issues involving rural women engaged in homestead gardening.

Materials and methods

Multistage random sampling was used to collect information. The Comilla district was selected based on number of homestead gardens. Three sub-districts were selected with consultation of the local agricultural extension office (DAE), the leading extension institution in Bangladesh. From each sub-district, 3 villages were selected, and a list of females prepared who were divided into: homestead adopters and non-adopters. A total of 150 females were randomly selected, 85 practiced homestead gardening and 65 were not homestead gardeners. Face to face interviews were conducted from November to December 2018 to collect information on education level, average age, marital

status, family size, income, farm size, off-farm activities, training, access to credit, decision-making power, and cost and return from homestead vegetable cultivation.

Descriptive and econometric models were used and the Mann-Whitney test in SPSS (ver. 20, SPSS, Chicago, IL) was used to compare mean values between groups. The probit model in STATA (StataCorp, 2007, College Station, TX) was used to analyze determinants of adoption of homestead gardening. The probit model is the most appropriate method to evaluate the likelihood of making decisions. The marginal effect of independent variables in the probit model can be achieved by differentiating first and second-order criteria (Greene, 2012). Explanatory variables (Table 1) were based on work by Asfaw *et al.* (2012), Ghimire *et al.* (2015) and Firoozzare and Kohansal (2018). A female was considered adopters if they practiced homestead gardening, and assigned a score of 1; if female did not practice homestead gardening, they were non-adopters and assigned a score of 0.

To determine problems and constraints a Problems Confrontation Index (PCI) was calculated, in which problems are shown in tabular format by frequency and intensity. The PCI was decided on the basis of techniques employed by Hossain *et al.* (2011). A four-point grading system was used to measure respondent problem scores. Responses were allotted scores: High = 3, Medium = 2, Low = 1, and Not at all = 0. The formulae of Kabir *et al.* (2019) were used to determine the Problem Confrontation Index (PCI).

Results and discussion

If the estimated Pseudo R^2 value is rational (containing expressible quantities), differences among explained variables are strongly linked with explanatory components (Ghimire *et al.,* 2015). A significant LR chi-square indicates suitability of variables applied in the model (Table 1). The computed probit predicted results and determinants reflected the propensity of adopting homestead gardening by rural women (Table 2). Education appeared to be important in adoption of homestead gardening. The tendency to adopt homestead gardening by women increased with increased years of education. This is because education enhances the ability to derive, decode, and evaluate useful information for agricultural production received from different sources (Asfaw *et al.,* 2012; Kassie *et al.,* 2011; Oduro-Ofori *et al.,* 2014). The farm is the main asset of the principal growers in the household in the study areas. Farm size is a proxy indicator of wealth, which is an important resource for any economic activity in the rural and agricultural sector. Availability of sufficient farm area is a vital indicator for adopting homestead gardening. The marginal value of farm size, the total area involved in agricultural activities, was positively significant, and rate of adoption of homestead gardening was greater for those having large farms. In the study area most people have very limited farm area including agricultural land and they are mostly involved in cereal crop (mainly rice) production rather than homestead gardening.

Water is essential for crop production, on large farms and smallholder homestead gardening. The marginal value of sources of irrigation water was significantly, and positively, associated to women engaging in homestead gardening. Females used irrigation water from wells, tube well, deep tube well, ground water, and collected rain water for homestead gardening. Permanently installation of a mechanical sources of water, collected rain, or use of ground water are expensive. The greater the distance to the source of water, the higher the cost. Financially sound females could set up permanent irrigation sources and use water for homestead gardening. Some females took loans from bank, or other financial organization, to set up a permanent water source,

Table 1. Description of variables

	Description	Mean	SD	Hypothesized sign
Adoption of homestead gardening (Dummy) variable	1 if the respondent adopted homestead garden, 0 otherwise	0.50	0.31	
Dependent variable				
Age (years)	Head of household	43.5	10.5	+, -
Schooling (years)	Years of education for head of household	6.80	3.60	+
Marital status (Dummy)	1 if the household head is married, 0 otherwise	3.12	0.98	+, -
Farm characteristics				
Distance to market	Distance to market (km)	11.40	5.30	-
Farm size	Area (ha) under cultivation, current year	0.20	0.09	+
Soil fertility (Dummy)	1 if the soil is fertile, 0 otherwise	5.70	3.00	+
Irrigation	Source of water use for irrigation	3.30	1.20	+,-
Fertilizer	Type of fertilizer used	2.60	1.00	+,-
Socio-economic and institutional				
Training	Number of trainings received in previous years	3.20	2.90	+
Extension service	How many times extension personnel visited in preceding years	4.30	2.50	+
Off-farm work (Dummy)	1 if takes part in non-agricultural work, 0 otherwise	0.92	0.76	+
Motivation of gardening	Reasons for adoption of homestead gardening	2.80	0.94	+
Reasons for non-gardening	Problems faced in gardening	0.98	0.54	-
Inputs availability (Dummy)	1 if inputs is available locally, 0 otherwise	1.80	0.90	+
Access of credit (Dummy)	1 if respondent had credit access, 0 otherwise	0.59	0.49	+
Women decision making power (Dummy)	1 Participation of women in household decision making, 0 otherwise	0.50	0.51	+
Income	Amount of money income in taka[b]	25475	80830.16	+

[a] '+', '-' for independent variables refers to predicted positive and negative impact on dependent variable.

[b] Taka is Bangladeshi currency (1USD = TK85 at the time of data analysis).

Table 2. Determinants of homestead gardening adoption

Variable	Coefficient	SE	Marginal effect
Age	0.02	0.01	0.009*
Primary education	0.66	0.36	0.23**
Secondary education	1.12	0.37	0.41***
Above secondary education	1.61	0.46	0.58***
Household members	0.28	0.20	0.11
Marital status	-0.11	0.11	-0.04
Distance to market	0.03	0.18	0.10
Farm size	1.00	0.50	0.55***
Soil fertility	0.85	0.54	0.43**
Irrigation	1.00	0.50	0.55***
Fertilizer	0.30	0.20	0.10
Training	1.00	0.50	0.55***
Access to extension services	0.90	0.38	0.42**
Off-farm work	0.03	0.10	0.09
Inputs availability	0.20	0.15	0.12
Access of credit	0.01	0.21	0.12
Decision making power	1.41	0.25	0.56***
Income	1.10	0.49	0.44**
Model diagnostic			
Log likelihood	-71.8		
LR chi^2	62.9***		
Pseudo R^2	0.30		

*,**,*** significant at 10, 5 or 1%.

but there is a burden associated because income from homestead gardening may not be sufficient to support subsequent payment of interest on the loan. Easy availability of water encourages women to adopt gardening (Ghimire *et al.,* 2015).

The marginal effects of impacts of each explanatory variable on willingness of women to adopt homestead gardening varied (Table 2). Training is a requirement for human development and productivity (Markovic, 2019; Nigam and Rajendra, 2019). Training facilities/programs, and trained women, were positively linked to adoption of homestead gardening than were women who did not receive training, indicating skilled women can capture more technical insights about gardening. Well trained women contribute to an improved farming environment, financial assistance, and expanded roles in economic well-being for their family (Bushamuka *et al.,* 2005; Feleke and Zegeye, 2006; Mignouna *et al.,* 2011; Mariano *et al.,* 2012; Yigezu *et al.,* 2018). The probit model indicated the practice of homestead gardening was significantly, and positively, associated with decision-making power of rural women. Income was used to capture relationships of empowerment on adoption of homestead gardening by women, and women's contribution in decision making was linked to financial stability and engagement in homestead gardening (Sharaunga *et al.,* 2016). Location of market did not affect adoption of homestead gardening because most agricultural products are sold at the local market located adjacent to the village.

Adopters generated income by selling vegetables from home gardens (Table 3). Non-adopters did not receive income from homestead gardening, but may have cultivated a small garden for their own consumption. Adopters involved in practicing homestead gardening for an extended time had acquired enough experience to establish better channels for selling produce and to focus on high-market-value crops. This could explain differences in income generated by the 2 groups. Annual income of non-adopters was lower than adopters, indicating homestead farming could improve living standards (Trinh *et al.,* 2003).

Table 3. Sources of annual income (Taka)

Source of income	Adopter	Non-adopter	Significance
Homestead farming	20000	0	***
Fishing	14000	12000	**
Business (small scale)	7000	6000	
Wages	8000	7000	
Agriculture	13000	10000	**
Others	8000	7000	

*,**,*** significant at 10, 5 or 1% level of significance. According to the Mann-Whitney test for each indicator. Total sample size = 150, adopters = 85, non-adopters = 65. 1USD = TK85 at the time of data analysis.

Homestead income generation influenced household expenditure (Table 4). Adopters and non-adopters spent the majority of their income purchasing food materials. As adopters increased the contribution in household budgets, they had the ability to spend more on food, and children's education and health care (Table 4). Adopters contributed expenditures to better the family condition and because adopter education level is higher they are involved in community organizations where they may be influenced to make changes in their lives (Kerr and Chirwa, 2004; Kerr *et al.,* 2008; Rahman and Islam, 2014).

Table 4. Distribution of household expenditure

Expenditure	Households (%)		Significance
	Adopter	Non-adopter	
Food	50.0	47.0	***
Education	12.2	7.8	**
Clothing	11.6	18.7	
Health care	13.1	10.8	**
Productive asset	8.0	8.0	
Housing	3.2	6.6	
Social activities	1.9	1.1	

*,**,*** significant at 10, 5 or 1%. level of significance. According to the Mann-Whitney test for each indicator. Total sample size = 150, adopters = 85, non-adopters = 65.

The power of female participants on family decision-making capacity of adopters and non-adopters respondents was assessed on the basis of socio-economic elements of living standards, which are generally governed by males. More women adopters gained more control either on their own, or through consultation, with their husband than non-adopter women. Adopters had more power to make decisions on production, child education, access to credit, and quality of household food (Table 5). Relative proportions of female beneficiaries (adopters) are higher than those for non-adopters, implying homestead gardening could assist rural women through contributing income in their families. Women who are actively involved in homestead gardening, and income generated from the home garden, regulated themselves (Gebrehiwot, 2013). Decisions on agricultural production related activities depend on crop grown (Sultana and Thompson, 2008; Clement *et al.,* 2019). Increased household food production enables women to have greater power to make decisions within the family and provide opportunities to execute decisions.

Effects of homestead gardening on constructive decision making, command on income, child schooling, ownership of property, availability to and decision making on credit utilization, social relationships, decision-making, and workload varied (Table 6). All women's empowerment indicators were higher for adopters than non-adopters.

Table 5. Indicators and percent decision making power

Indicator (type of decisions)	Decision level (% of respondents)						Significance
	Adopter			Non-adopter			
	Male	Female	Male and Female	Male	Female	Male and Female	
Production decision	20.0	20.0	60.0	66.7	13.3	20.0	***
Product selling decisions	46.7	33.3	20.0	62.7	17.3	20.0	
Child schooling	26.7	40.0	33.3	69.3	13.3	17.3	***
Access to, and decisions about, credit	20.0	46.7	33.3	66.7	10.7	22.7	***
Asset ownership	36.7	20.0	33.3	70.7	9.3	20.0	*
Types and quality of food	26.7	40.0	43.3	46.7	20.0	33.3	**
Visiting woman's parental home	26.7	46.7	33.3	73.3	13.3	13.3	**

*,**,*** significant at 10, 5 or 1%. level of significance according to the Mann-Whitney test for each indicator; Total sample size = 150, adopters = 85, non-adopters = 65.

Table 6. Outcome of improved empowerment

Outcome	Household (%)		Significance
	Adopter	Non-adopter	
Input in production decisions	40.5	29.7	**
Control over income	56.0	30.0	***
Child schooling	45.0	22.0	***
Ownership of assets	30.8	20.2	
Access to, and decisions about, credit	44.0	34.0	***
Group membership and decision making	40.0	20.0	**
Workload	25.0	18.0	

*,**,*** significant at 10, 5 or 1%. level of significance according to the Mann-Whitney test for each indicator. Total sample size = 150, adopters = 85, non-adopters = 65.

For homestead garden adopters, contribution of sub-indicator to input of production of all family agricultural activities decisions was higher than for non-adopters. Women's empowerment achievement occurs when women have control over ownership of agricultural land, group membership, and leisure (Gupta *et al.,* 2019). Rural development interventions might empower women allowing them to focus on asset accumulation, credit availability and community management skills (Diiro *et al.,* 2018). Due to lower contribution in income of non-adopters, they have fewer dominants on household assets giving them a weak position in the family. Ownership of productive resources improved the negotiating position of a woman in the household (Meier zu Selhausen, 2016) and household wellbeing outcomes might rely on the desire of the dominant person (Wouterse, 2016).

The estimated PCI value of the 7 problems varied but fit within a probable theoretical range of 0 (no problem) to 450 (high problem) (Table 7). The majority of homestead gardeners indicated inadequate knowledge and information were main problems. Every respondent agreed that shortage of credit was a high problem to smoothly running their homestead gardening. The majority of respondents indicated lack of training facilities is a major problem. Of 150 respondents, most faced the problem to a high extent, fewer faced the problem to a medium extent, and fewer confronted the problem to low extent. No one indicated lack of training facilities was not a problem. Women who received training adopted homestead gardening with the outcome of increased self-confidence and participation in social functions, with increased efficiency of household operation and food consumption (Du Plessis and Lekganyane, 2010; Yasmin *et al.,* 2014; Patalagsa *et al.,* 2015; van den Bold *et al.,* 2015). Shortage of water, distance to market and non-cooperation from husband, were medium category problems faced by homestead women gardeners.

The market system in rural areas is essential for developing the rural economy and residents' life standards (Sirisha, 2016). Inadequate resources, lack of availability of water, limited extension, and advisory services are key barriers to homestead vegetable production in developing countries (Galhena *et al.,* 2013). Geographical constraints (inconvenient location and inaccessible water sources), lack of awareness, information and consulting services, and fewer marketing facilities threaten to impede homestead production (Fan *et al.,* 2019). Rural women indicated a shortage of credit facilities and problems with input subsidies are constraints to adoption of homestead gardening. Adequate information and guidelines can encourage women to adopt homestead gardening.

Adopters transmit their ideas and experiences about homestead gardening, family nutrition, and other issues to other women to gain self-confidence by involving social activities. The determinants could be useful for expanding homestead gardening.

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Table 7. Computation of the Problem Confrontation Index (PCI)

Problem	Extent of problem confrontation				PCI	Rank order
	High (3)	Medium (2)	Low (1)	Not at all (0)		
Inadequate knowledge and information	80	40	30	0	350	1
Lack of capital	50	40	110	0	340	2
Lack of training facilities	65	50	35	0	330	3
Availability of water	50	45	55	0	295	4
Non-cooperation from family	40	45	65	0	275	5
Distance to market	20	30	100	0	220	6
High input cost	40	30	80	0	210	7

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