Factors Affecting Home Gardening as a Source of Enhancing Household Food Security: A Case Study in Mirigama Ds Division

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ABSTRACT

Home gardens can make a significant contribution in meeting daily household needs for better nutrition and health. The study was based on primary data consisting of hundred and fifteen households in Mirigama DSD selected through stratified random sampling. A questionnaire survey and a site observation was conducted to collect information and to evaluate home gardens respectively. Evaluation and grading was done based on a predefined criterion. Chi-Square test was applied to examine the relationship between the severity of the factors based on the interviews, and the grades obtained. Results obtained implied that frequency of involvement in home gardening activities, proportion of land used for food crop production, pest and diseases, crop damage due to wild animals, basic knowledge in agricultural practices, knowledge on methods of obtaining quality seeds and planting materials, basic knowledge in animal husbandry, influence by the government assistance and women participation had a significant relationship with the level of home gardening.

(Key words : Home gardening, Food Security, Evaluating Home gardens)

Background

The global population is expected to exceed 9 billion by 2050. To cater the increasing demand for food with the rising population, there is a continuous need to increase food production and buffer stocks. In this scenario, countries around the world are resorting to various counter strategies to meet the growing demand and to avert food insecurity and famine. Over the recent years there has been growing interest to strengthen and intensify local food production in order to mitigate the adverse effects of global food shocks and food price volatilities. Consequently, there is much attention towards home gardens as a strategy to enhance household food security and nutrition.

Food security is considered as a key factor to achieve “zero hunger” among the sustainable development goals. Over the past decade national agricultural policies were implemented with considerable emphasis on ensuring food security in household level. Improving availability of healthy and nutrient rich fruits and vegetables at a lower cost were among the objectives targeted through promoting home gardening and providing inputs and knowledge to encourage households to maintain home gardens. During the past years, several government programs “Api wawamu Rata nagamu” - 2011 “Divi neguma” 2012-2014 and Distribution of potted vegetable seedlings for home gardening" - 2015 were carried out with financial allocations of Rs.663 million, Rs.1559 million and Rs. 2.24 million respectively. (Ministry of Agriculture, 2011- 2015)

Regardless of the financial provisions and government intervention taken place in improving the food and nutrition level of households through home gardening promotion programs, a reliable mechanism has not been empowered to monitor the actual ultimate

outcome of the allocated resources. According to the World Health Organization, the recommended level of daily consumption of fruits and vegetables is, a minimum of 400 g per person for the prevention of non-communicable diseases. But the daily fruit and vegetable consumption level of an adult in Sri Lanka is 276 g which is far less than this recommended level.(Perera & Madhujith, 2012).

According to the micronutrient survey carried out by the UNICEF, the percentage of anemic (Hb ,11.0 g/dl) children among 6 - 59 months in Sri Lanka is 15.1 and 17.1 in Gampaha district. Prevalence of anemia among non-pregnant women is 46.7per cent in western province and 44.4 per cent in Gampaha District (Department of Census and Statistics, 2006) Vitamin A deficiency and night blindness among 24-59 month old children are considered as public health issues in Sri Lanka. (Department of Nutrition, Ministry of Health, 2012)

Research Problem

Home gardening programs implemented by the government haven't brought a significant impact either on economic or social lives of people in Sri Lanka. Even though the inputs for home gardening are provided free of charge, the ultimate objective of enhancing the nutritional level of people by increased fruit and vegetable consumption is not achieved.

Even though the statistics reveal that larger segment of the population engage in home gardening, these figures do not directly reflect the home gardens contribution for uplifting the food security of the household. The household food security survey conducted by the Department of

Census and Statistics reveals that the proportion of vegetables obtained through own produce is 9.3 per cent while 87.3per cent is obtained by purchases. According to this survey, only 24.8per cent of the total fruit consumption is obtained by own produce while 68.7per cent is obtained by purchases. (Department of Census and Statistics, 2017) These figures conclude that neither the available 61.5 per cent of home gardens scattered all over the country nor the government intervention and financial allocations for inputs have reached the ultimate objective of increasing the nutrition security through household food production.

Objectives

- To assess the level of home gardening in Mirigama division
- To examine the constraints for food production in home gardens
- To identify the main factors affecting home gardening as a source of enhancing food security

This paper aims at identifying the factors affecting the food production in home gardens while examining the overall performance of home gardens in Mirigama DS Division

LITERATURE REVIEW

Present status of food insecurity in Sri Lanka

Households with sufficient amount of nutritious food for regular consumption is considered to be a household with food security. Based on this definition of food security, 10.3 per cent of the total households in Sri Lanka and 4.2 per cent of the households in Gampaha district are food insecure. (Department of Census and Statistics, 2017)

The most prominent reason for food insecurity is considered as the unexpected price fluctuations of the food commodities.

Figure 1 Distribution of major reasons for food insecurity in Sri Lanka

(Department of Census and Statistics, 2017)

A survey conducted by the department of census and statistics reveals that the foremost reason for food insecurity in Sri Lanka is the unexpected price fluctuations of food commodities as stated by 57 percent of the total respondents, while the second major reason is adverse weather conditions. The strategy used by majority of the food insecure households to overcome food insecurity has been revealed as depending on low cost food regardless of the nutritional requirement.

Home Gardening in Sri Lanka

The definition of home gardening varies according to the perception of the researcher and the research environment. But the definition used by almost all the referred documents bears similar features which could be identified as the definition of home garden. The study on

the enigma of tropical home gardens corroborates this idea. Several authors have tried to describe the term “home garden” none is perhaps universally as the definition. But it is well understood that the concept refers to intimate, multi-story combinations of various trees and crops, sometimes in association with domestic animals, around homesteads. (Kumar & Nair, 2004)

According to the definition declared by the Department of Census and Statistics, a portion of land similar to or less than twenty perches in extent with a dwelling house and some form of a cultivation from which the produce is largely for home consumption is considered as a home garden. (Department of Census and Statistics, 2015)

Out of the total population, 61.5per cent households in Sri Lanka engage in home gardening. In Gampaha district 57.6 per cent of the population engage in home gardening. The village areas contribute for 87.8 per cent while urban sector and estate sector contributes for 9 per cent and 3per cent respectively for the total home gardens in the country. (Department of Census and Statistics, 2017)

Challenges for Home gardens

Lack of land has been identified as a common limitation for home gardening in many of the previous studies. For families without adequate and secure access to land, lack of land is the single most important barrier to home gardening. (Brownrigg, 1985) According to Hoogerbrugge and Fresco, lack of access to land is serious constraint that avoids poor from getting the benefit of home gardening. (Hoogerbrugge & Fresco, 1993)

Although home gardens are primarily rain fed, it is common for home gardeners to irrigate during the dry season. Watering depends on the type of crop and can vary from twice daily to twice annually. Several studies have found that drawing; transporting and hand irrigating the homegarden are the most onerous and time consuming gardening tasks. (Hoogerbrugge & Fresco, 1993; Mitchell & Hanstad, 2004)

Destruction of crops by animals is considered as a major factor affecting home gardens. According to an assessment on the benefits and constraints of home gardening in the Neighborhood of the National Horticultural Research Institute of Nigeria, Destruction of crops by animals (36.5per cent) closely followed the damage due to insect attack.(F. Olajide-Taiwo B., 2010)

Unavailability of planting materials and livestock with agreeable quality at accessible distance and affordable prices has been identified as one of the key constraints faced by home gardeners. According to a study carried out by Mitchell and Hanstad, interventions that seek to advise families on appropriate techniques for improving home garden production may find that home gardening families do not have adequate access to seedlings and other necessary materials. (Mitchell & Hanstad, 2004).

Lack of appropriate and timely knowledge could adversely affect the development of home gardens at any level while suitable advises and technology given at the correct time could have a great

impact on the progression of a home garden. This has been proven by experiments. (Marsh, 1998) Agricultural extension can contribute significantly to home garden production

According to an assessment on the benefits and constraints of home gardening in the Neighborhood of the National Horticultural Research Institute of Nigeria, insect attack ranked first among constraints confronting the garden owners as indicated by 39.7per cent of the respondents.(F. Olajide-Taiwo B., 2010)

THEORETICAL REVEIW

Home gardening as a determinant of food security

In countries and regions that frequently suffer serious food shortages, such as those prone to drought, programmes in the agricultural sector are frequently complemented by public measures such as income and employment generation programmes and direct food transfers as a means of stabilizing household food security and maintaining nutrition levels for the poorest. A cost-effective but organizationally more demanding alternative, however, is a system of direct nutrition interventions. Community participation in achieving household level food security has been identified as a strategy to overcome food shortage which is prevalent in most of the African countries.

Figure 2 The normative dimensions of household food security

Evaluating home gardens

Although home gardens have been extensively described, in previous studies, Nair, 2001 has stated that there is a lack of quantitative data about their benefits. The main reason that they have not been studied is that rigorous, widely applicable methodologies are not available, and those that have been developed for single-species systems are not applicable to such complex systems (Nair, 2001).

The Ministry of Agriculture, Sri Lanka with collaboration with the Department of Agriculture has developed an evaluation criterion

to assess the home gardens considering all the key features related to food production in a home garden. This evaluation criterion was selected for the study purpose as it can be considered a more reliable measure to identify the level of home gardening as food production unit.

3.3 Components of the evaluation criterion for home gardens

This evaluation system consists of fourteen main factors to measure the level of a home garden as a food production system. The factors are as follows.

- Selection of crop varieties according to the region (05 points)
- Optimal usage of the vertical space of the home garden (05 points)
- Optimal usage of the horizontal space of the home garden (05 points)
- Availability of minimum of 5 types of tuber crops or higher (10 points)
- Availability of minimum of 5 types vegetable crops (10 points)
- Availability of minimum of 5 types of leafy vegetables (10 points)
- Availability of minimum of 5 types fruit crops or higher (10 points)
- Availability of perennial 5types of vegetable crops or higher (10 points)
- Integrated farming- Milk Production (10 points)
- Integrated farming - Egg production (05 points)
- Fertilizer usage according to the requirement (05 points)

- Crops located according to their required level of shade (05 points)
- Pest and Disease Management Practices (05 points)
- Weed control (05 points)

METHODOLOGY

The study was based on primary data related to a sample of 115 households in Mirigama DS division. A structured questionnaire was completed through informal discussions. The sample was selected according to the stratified sampling method based on the population of three agrarian service divisions of the Mirigama DS division. Fifty, Forty-five and Twenty households were randomly selected from Meerigma, Pasyal and Pallewela agrarian service divisions respectively. Observation method was used to assess the level of home gardens. The evaluation was conducted through observational method by a trained group of interviewers, based on the national criteria for evaluating home gardens as a source of food security, defined by the Department of Agriculture. Points were allocated based on the structural and functional characteristics of each home garden according to the predefined criteria. The level of home gardening was obtained as grades based on the marks obtained. Four Grades were identified as Grade 1 (75-100), Grade 2 (50-75), Grade 3 (25-50) and Grade 4 (0-25) respectively.

Cross tabulation method and Chi-Square test were used to analyze the relationship of the factors affecting home gardening against the grade obtained for the level of home gardening as a food production system. Statistical Package for Social Sciences (SPSS) 13.0 for windows version

was used for data analysis. The answers given on the factors related to home gardening and the Grade obtained were tested for association using the Chi-Square test.

Ho : Row and column variables in the cross tabulation are independent

H1 : Row and column variables have a relationship

The factors having a significant relationship, with p- values less than the critical value of 0.05 were identified as factors affecting home gardening.

RESULTS AND DISCUSSION

The Level of Home gardening in the DS Division

The level of home gardening in the selected area was examined and graded according to the evaluation criteria defined by the Ministry of agriculture to select the best home garden as a source of food security. The number of home garden obtained Grade 1 was 7.1 per cent out of the valid sample and the number of home gardens obtained Grade 4 was 10.7 per cent. (Table 1) The Highest number of home gardens obtained Grade 3 according to the evaluation based on observation.

Table 1 Level of Home Gardening

Grade		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 1	8	7.1	7.1	7.1
	Grade 2	34	30.4	30.4	37.5
	Grade 3	58	51.8	51.8	89.3
	Grade 4	12	10.7	10.7	100.0
	Total	112	100.0	100.0	

Figure 3 Level of home gardening in Mirigama DS Division

Factors affecting Home gardening

Proportion of land used for food crops

The proportion of land used for growing food crop out of the available land area of the household was tested against the grade obtained for home gardening. (Table 2) The Chi-Square p -value (0.00045) is less than 0.05. Therefore, H_0 is rejected. This implies that the proportion of land extent used for food crop cultivation has a significant relationship with the grade obtained for home gardening.

Table 2 Percentage distribution of proportion of land used for food crop production out of the total area available with respect to the grade obtained for home gardening

per cent Land with food crops			Grade				Total
			1	2	3	4	
ExtFC	>5per cent	Count per cent of total	0 .0per cent	0 .0per cent	9 8.0per cent	5 4.5per cent	14 12.5per cent
	5-25per cent	Count per cent of total	0 .0per cent	5 4.5per cent	19 17.0per cent	3 2.7per cent	27 24.1per cent
	25-50per cent	Count per cent of total	5 4.5per cent	13 11.6per cent	21 18.8per cent	3 2.7per cent	42 37.5per cent
	50-75per cent	Count per cent of total	1 .9per cent	10 8.9per cent	8 7.1per cent	1 .9per cent	20 17.9per cent
	75per cent <	Count per cent of total	2 1.8per cent	6 5.4per cent	1 .9per cent	0 .0per cent	9 8.0per cent
	Total	Count per cent of total	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

According to Table 2, 12.5per cent of the selected respondents have cultivated only 5per cent or less than the available land area and all those home gardens had obtained Grade 3 or 4. All the households having Grade 1 home gardens have cultivated more than 25per cent of the available area with food crops. 51.8per cent of the total households bared Grade 3 home gardens. 18.8per cent home gardens have 25-50per cent the land used for food crop cultivation out of total available area. The land area utilized for food crop cover has a significant impact upon the level of home gardening.

Frequency of Involvement in Home gardening

The involvement in activities of home gardening was observed as a frequency ranging from daily to rare. The frequency of involvement in home gardening activities was examined based on the sequence of involvement eg: daily or 6-7 days per week, 4-5 days per week, 2-3 days per week, only one day per week or rarely. The results obtained were tested against the grade obtained for home gardening. The Chi-Square p -value (0.000) is less than 0.05. Therefor Ho can be rejected. This implies that frequency of involvement in home gardening activities has a significant relationship with the grades obtained for home gardening.

Table 3 depicts the cross tabulation results of frequency of involvement in home gardening as number of days per week (d/w), against the grades obtained for home gardening.

Table 3 Percentage distribution of frequency of involvement in home gardening activities with respect to the grade obtained for home gardening

Frequency of involving in HG			Grade				Total
			1	2	3	4	
Frequency of involvement	Daily	Count per cent of total	8 7.1per cent	10 8.9per cent	8 7.1per cent	0 .0per cent	26 23.2per cent
	4-5 d/w	Count per cent of total	0 .0per cent	8 7.1per cent	8 7.1per cent	0 .0per cent	16 14.3per cent
	2-3d/w	Count per cent of total	0 .0per cent	9 8.0per cent	21 18.8per cent	3 2.7per cent	33 29.5per cent
	1 da/w	Count per cent of total	0 .0per cent	6 5.4per cent	16 14.3per cent	5 4.5per cent	27 24.1per cent
	Rarely	Count per cent of total	0 .0per cent	1 .9per cent	5 4.5per cent	4 3.6per cent	10 8.9per cent
	Total	Count per cent of total	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

The Cross tabulation results reveals that all the households falling into Grade 1 category engage in home gardening activities on daily basis while the 3.6 per cent households out of the 10.7 per cent home gardens falling into the Grade 4 category rarely engage in home gardening activities. None of the households having grade 4 home gardens have involved in home gardening more than 3 days per week. This indicates that frequent involvement in home gardening activities is

one among the influential factors leading to a better home garden with high contribution for household food security.

Pest and Diseases

The severity of the pest and disease problem was tested against the grade obtained. The Chi-Square p -value (0.0010) is less than 0.05. Therefore H_0 can be rejected. This implies that severity of the pest and disease problem has a significant impact upon the grades obtained for home gardening. Table 4 depicts the cross-tabulation results of severity of the pest and disease problem against the grades obtained for home gardening.

Table 4 Percentage distribution of severity of pest and disease problem with respect to the grade obtained for home gardening

Severity of the problem			Grade				Total
			1	2	3	4	
Pest & Disease Problem	Major problem	Count per cent of total	2 1.8per cent	6 5.4per cent	19 17.0per cent	3 2.7per cent	30 26.8per cent
	Moderate problem	Count per cent of total	1 .9per cent	18 16.1per cent	24 21.4per cent	3 2.7per cent	46 41.1per cent
	Slight problem	Count per cent of total	5 4.5per cent	5 4.5per cent	5 4.5per cent	0 .0per cent	15 13.4per cent
	Minor problem	Count per cent of total	0 .0per cent	3 2.7per cent	1 .9per cent	0 .0per cent	4 3.6per cent
	Never a problem	Count per cent of total	0 .0per cent	2 1.8per cent	9 8.0per cent	6 5.4per cent	17 15.2per cent
	Total	Count per cent of tota	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

26.8per cent respondents of the sample have stated pest and diseases as major problem while 41.1per cent respondents have stated it as a moderate problem for improving their home gardens. But when considering the proportion of respondents stated pest and disease problem as a major or a moderate problem, majority (17per cent and 21.4per cent respectively) were households having Grade 3 home gardens. This indicates that the home gardens those are still in the developing stage are more susceptible to adverse effects of pest and disease problems. Majority of the respondents having Grade 3 home gardens have stated that they do not have enough knowledge on appropriate pest and disease management practices.

Crop damages due to wild animals

The severity of the problem of crop damages due to wild animal attacks was tested against the grade obtained for home gardening. The Chi-Square p-value (0.003) is less than 0.05. Therefore H_0 can be rejected. This implies that damage due to wild animal attacks has significant impact upon the grades obtained for home gardening.

Table 5 depicts the cross-tabulation results of severity of the problem of crop damage due to wild animals due against the grades obtained for home gardening.

Table 5 Percentage distribution of severity the problem of damage due to wild animal with respect to the grade obtained for home gardening

Severity of the problem			Grade				Total
			1	2	3	4	
Wild animals damage	Major problem	Count per cent of total	2 1.8per cent	7 6.3per cent	13 11.6per cent	4 3.6per cent	26 23.2per cent
	Moderate problem	Count per cent of total	1 .9per cent	10 8.9per cent	27 24.1per cent	2 1.8per cent	40 35.7per cent
	Slight problem	Count per cent of total	5 4.5per cent	3 2.7per cent	9 8.0per cent	1 .9per cent	18 16.1per cent
	Minor problem	Count per cent of total	0 .0per cent	2 1.8per cent	3 2.7per cent	0 .0per cent	5 4.5per cent
	Never	Count per cent of total	0 .0per cent	12 10.7per cent	6 5.4per cent	5 4.5per cent	23 20.5per cent
	Total	Count per cent of total	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

According to the above table, 23.2per cent of the respondents have stated that the crop damage due to wild animals is a major problem and 35.5per cent of the respondents as a moderate problem for the improvement of food production in home gardens.

Therefore, the results reveal that the damage due to wild animals in home gardens needs considerable attention though it is sometime being neglected.

Knowledge in basic agricultural practices

Basic knowledge on agricultural practices such as land preparation, seedling establishment, seed bed preparation, pest and disease management are essential for maintaining a better home garden. The level of knowledge on basic agricultural practices was tested against the grade obtained for home gardening. The Chi-Square p-value (0.016) is less than 0.05. Therefor H_0 can be rejected. This implies that knowledge on basic agricultural practices has significant impact upon the grades obtained for home gardening.

Table 6 depicts the cross tabulation results of knowledge level on basic agricultural practices against the grades obtained for home gardening.

Table 6 Percentage distribution of awareness on basic agricultural practices with respect to the grade obtained for home gardening

Severity of the problem			Grade				Total
			1	2	3	4	
Knowledge level	Highly aware	Count per cent of total	3 2.7 per cent	15 13.4 per cent	20 17.9 per cent	1 .9 per cent	39 34.8 per cent
	Moderately aware	Count per cent of total	5 4.5 per cent	15 13.4 per cent	25 22.3 per cent	3 2.7 per cent	48 42.9 per cent
	Slightly aware	Count per cent of total	0 .0 per cent	2 1.8 per cent	3 2.7 per cent	1 .9 per cent	6 5.4 per cent
	Seldom aware	Count per cent of total	0 .0 per cent	2 1.8 per cent	9 8.0 per cent	5 4.5 per cent	16 14.3 per cent
	Never aware	Count per cent of total	0 .0 per cent	0 .0 per cent	1 .9 per cent	2 1.8 per cent	3 2.7 per cent
	Total	Count per cent of total	8 7.1 per cent	34 30.4 per cent	58 51.8 per cent	12 10.7 per cent	112 100.0 per cent

All the respondents having a home garden of Grade 1 category have stated that at least one member of the household is highly or moderately aware of the basic agricultural practices such as land preparation, seed bed preparation, crop establishment, pest and weed

control measures etc. Nearly ninety percent of households having the grade 2 home gardens bares a high or moderate level of knowledge on basic agricultural practices. According to the result basic knowledge is fundamental in having a well-established home gardens. Even though majority of the households possess a grade 3 or 4 home gardens, their knowledge level on basic agricultural practices was comparatively higher. Only a considerably low number (2.7per cent) of respondents were “never aware” of basic agricultural practices. However nearly 78 per cent of the respondents have significant knowledge in basic agricultural practices. But majority of them bares home gardens with lower grades due to various other factors.

Basic Knowledge of Animal Husbandry

Availability or unavailability of basic knowledge in animal husbandry was tested against the grade obtained for home gardening. The Chi-Square p-value (0.002) is less than 0.05. Therefore, H_0 can be rejected. This implies that basic knowledge in animal husbandry has significant impact upon the grades obtained for home gardening.

Table 7 depicts the cross tabulation results of awareness on animal husbandry against the grades obtained for home gardening.

Table 7 Percentage distribution of availability of basic knowledge of animal husbandry with respect to the grade obtained for home gardening

Knowledge in animal husbandry			Grade				Total
			1	2	3	4	
	Yes	Count per cent of total	7 6.3per cent	9 8.0per cent	22 19.6per cent	1 .9per cent	39 34.8per cent
	No	Count per cent of total	1 .9per cent	25 22.3per cent	36 32.1per cent	11 9.8per cent	73 65.2per cent
	Total	Count per cent of tota	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

According to the table above, 34.8per cent of the respondents have stated that they possess the basic knowledge in animal husbandry. But there were only 4 poultry farmers and 3 cattle farmers out of the total households. Only one household was having both cattle and poultry farms. This implies that even though the knowledge is available, the involvement in animal husbandry is considerably low among the selected sample. This result implies that even though the knowledge on animal husbandry has a significant impact on improving home gardens, the knowledge alone would not motivate people to initiate animal husbandry practices in their home gardens. Animal husbandry practices are combined with various other factors. The cattle raring requires relatively larger home gardens and proper management practices have to be used to avoid crop damages by the cattle.

Knowledge on methods of obtaining quality seeds and planting material

Availability or unavailability of knowledge on method of obtaining quality seeds and planting material for own home garden was tested against the grade obtained for home gardening. The Chi-Square p-value (0.023) is less than 0.05. Therefore H_0 can be rejected. This implies that awareness on method of obtaining quality seed and planting materials has significant impact upon the grades obtained for home gardening.

Table 8 depicts the cross tabulation results of knowledge level on method of obtaining quality seeds and planting materials against the grades obtained for home gardening.

Table 8 Percentage distribution of awareness on method of obtaining quality planting material with respect to the grade obtained for home gardening

Knowledge in methods of obtaining quality planting material			Grade				Total
			1	2	3	4	
Available	Count per cent of total	8 7.1per cent	31 27.7per cent	50 44.6per cent	7 6.3per cent	96 85.7per cent	
Unavailable	Count per cent of total	0 .0per cent	3 2.7per cent	8 7.1per cent	5 4.5per cent	16 14.3per cent	
Total	Count per cent of total	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent	

According to the above table, 85.7per cent of the respondents stated to be aware of a method to obtain quality seed and planting material for the home garden. Every household with a grade one home garden and 91.1per cent of the households having a grade two home garden were aware of sources to obtain quality seed and planting material.

Influence by government assistance

The level of assistance provided by the government for improving the quality of home garden was tested against the grade obtained for home gardening. The sufficiency or insufficiency of the government assistance provided to improve the home garden was examined based on responses ranging from “Sufficient” to “Highly insufficient”. The Chi-Square p-value (0.001) is less than 0.05. Therefore H_0 can be rejected. This implies that assistance provided by the government has significant impact upon the grades obtained for home gardening.

Table 9 depicts the cross-tabulation results of the level of government assistance against the grades obtained for home gardening. The results on basic knowledge in agricultural practices (see Table 6) further confirms this interpretation of the nature of the assistance provided. While providing more assistance and knowledge for the better home gardens for maintaining their food security level and sustainability, this study highlights the need of uplifting the supportive mechanism to empower and motivate lower level home gardens.

Table 9 Percentage distribution of the level of assistance provided by the government with respect to the grade obtained for home gardening

Severity of the problem			Grade				Total
			1	2	3	4	
Level of Gov. Assistance	Sufficient	Count per cent of total	0 .0per cent	8 7.1per cent	5 4.5per cent	0 .0per cent	13 11.6per cent
	Moderately sufficient	Count per cent of total	3 2.7per cent	13 11.6per cent	20 17.9per cent	1 .9per cent	37 33.0per cent
	Slightly sufficient	Count per cent of total	5 4.5per cent	6 5.4per cent	7 6.3 per cent	2 1.8per cent	20 17.9per cent
	Insufficient	Count per cent of total	0 .0per cent	2 1.8per cent	19 17.0per cent	6 5.4per cent	27 24.1per cent
	Highly insufficient	Count per cent of total	0 .0per cent	5 4.5per cent	7 6.3 per cent	3 2.7per cent	15 13.4per cent
	Total	Count per cent of total	8 7.1per cent	34 30.4per cent	58 51.8per cent	12 10.7per cent	112 100.0per cent

Nearly 45 per cent of the total sample has stated that the assistance provided by the government to improve the quality of the home garden is sufficient or moderately sufficient. None of the households having Grade 1 home gardens has claimed the assistance provided by the government as “insufficient” or “highly insufficient”. But 9 out of the 12 households having Grade 4 home gardens have stated that the assistance provided by the government as “insufficient” or “highly insufficient”. This indicates that government assistance on improving home gardening has been more accessible for high grade home gardens than for the lower grade home gardens. The majority of the people having a positive attitude towards the government assistance

were already having a high or moderate level home garden with regard to enhancing food security. This offers some important insight to the home gardening promotion programs implemented by both government and non-government organizations in prioritizing activities and identifying the beneficiaries.

Women Participation

The gender of the households involved in home gardening was tested against the grade obtained for home gardening. The Chi-Square p-value (0.025) is less than 0.05. Therefore H_0 can be rejected. This implies that gender of the households engaged in home gardening has significant impact upon the grades obtained for home gardening.

Table 10 depicts the cross-tabulation results of the gender of the respondents involved in home gardening and the grade obtained for home gardening.

Table 10 Percentage distribution of the level of gender of the respondents with respect to the grade obtained for home gardening

Gender			Grade				Total
			1	2	3	4	
Female	Count	2	27	41	9	96	
	per cent of total	1.8per cent	24.1per cent	36.6per cent	8.0per cent	85.7per cent	
Male	Count	6	7	17	3	73	
	per cent of total	5.4per cent	6.3per cent	15.2per cent	2.7per cent	65.2per cent	
Total	Count	8	34	58	12	112	
	per cent of total	7.1per cent	30.4per cent	51.8per cent	10.7per cent	100.0per cent	

According to the results, 27 out of the 34 number of Grade 2 home gardens and 41 out of the 58 number of Grade 3 home gardens were initiated by women. But in the other hand majority of the Grade 4 home gardens too was initiated by women. Accordingly, we can conclude that even though the women participation has a significant impact upon the grade obtained, the women participation alone would not lead to higher levels of home gardening.

Other factors considered in this study but not significant

The severity of the problem of adverse effects of climate change for improving the quality of home garden was tested against the grade obtained for home gardening. According to the results, climate change does not have a significant impact upon the level of home gardening. ($0.332 > p=0.05$).

The severity of the problem of adverse effects poor soil quality of home garden was tested against the grade obtained for home gardening. According to the results, soil quality does not have a significant impact upon the level of home gardening. ($0.293 > p=0.05$). Previous studies on agricultural characteristics and challenges of home gardens have confirmed this result. According to Hoogerbrugge & Fresco, most home gardens are found in densely populated areas with reasonably fertile soils. (Hoogerbrugge & Fresco, 1993) The fertilizer requirement was mainly fulfilled by compost and green manure. A small number of home gardens with high grades had used bio fertilizer such as cattle and poultry manure for the home garden.

The severity of the problem, of lack of labor was tested against the grade obtained for home gardening. According to the results, climate change does not have a significant impact upon the level of home gardening. ($0.087 > p=0.05$). This result has been confirmed by previous studies. The home garden normally occupies 'Marginal' labour which refers to the fact that labour inputs in the home garden are flexible, depending on slack periods in field cropping or in off-farm work and reflect the low opportunities for alternative employment. The labour for gardening is nearly always provided by household members instead of hired or exchanged labour. The capital and energy inputs in the garden are low.

Constraints for improving home gardens

Pest and Disease Problem

A greater percentage of the respondents out of the total population have claimed that pest and diseases as major problem (26.8per cent) or as a moderate problem (40.1per cent). Higher proportion of these respondents was having grade 3 home gardens. Accordingly, these observations indicate that pest and disease problem might adversely affect the overall improvement of the home garden, ultimately leading to a lower grading of the home garden. This issue has been observed mostly among the lower grade home gardeners as they are more prone to lack of knowledge in preventive and control measures used to reduce the loss of productivity due to pests and diseases which is a common problem at any level of cultivation. Therefore the higher number of responses claiming pest and disease problem as major or a moderate problem, inevitably draws our attention to the underlying causes of lacking the knowledge on pest and disease control measures.

The respondents facing “major” or “moderate” problems related to pest and diseases were hardly aware of natural pest control measures and methods of identifying the real cause of the pest or disease condition. This knowledge gap has adversely affected the level of production as well as the psychological benefits that could be gained through maintaining a productive home garden.

Figure 4 Severity of Pest and disease problem

Damage due to wild animals

Higher percentage of the sample have stated damage due to wild animal attack is a “strong” or a “moderate” problem that restricts the progress of their home garden. The wild squirrel, porcupine and monkeys were the animal with a highest destructive effect according to the statements of the respondents. Loss of production and damages done to the cultivation at the developing stage negatively effect on the overall production of the home garden and demotivate the people engaged in home gardening.

Figure 5 Severerity of Damage due to Wild animals

Low propionate usage of land for food crop cultivation

The proportion of land used for food crop production out of the available land area of the household is considerably low compared to the available land area for home gardening. The figure 4 shows the proportions of land used by the households for food crop cultivation. The number of home gardens having a food crop cover on at least 50per cent of the available area is 25.9per cent households out of the sample. Majority of the households with Grade 3 and 4 home gardens has not utilized at least 50per cent of the available area for food crop cultivation.

Figure 6 Proportionate usage of land for food crop cultivation with Grade

Calculations by author

Knowledge Gaps

Based on the analysis, lack of relevant guidance on key areas of establishing and developing a home garden can be identified as a constraint to achieve higher level in home gardening. As an example Lack of knowledge in animal husbandry has been identified as a factor affecting the overall food production of home garden, only 34.8per cent of the total population was having basic knowledge in animal husbandry. Only 6 households (5per cent) were performing milk or egg production.

Moreover, severity of the pest and disease problem has been identified as a significant factor affecting the level of home gardening. This implies that relevant knowledge at different stages of home gardening has not been delivered to majority of the households. 67.9per cent of the total population have stated that pest and disease problem is a major or a moderate issue limiting the overall performance

of the home garden. Majority (74.1 per cent) of the respondents having Grade 3 home gardens have stated that they do not have enough knowledge on pest and disease management practices.

The respondents having better home gardens were more connected with the agriculture extension services while the lower grade home gardeners did not have a good relationship with the extension services. Therefore, strengthening the links between the beneficiaries and extension service providers is of fundamental importance in developing home gardens.

SUMMARY AND CONCLUSION

This study provides evidence to conclude following aspects as factors having significant impact on home gardening with regard to enhancing household food security. The proportion of land extent used for food crop cultivation has a significant relationship with the level of home gardening. But the total land area available for home gardening does not have a significant impact upon the level of home gardening. Damage due to wild animal attacks has significant impact upon the level of home gardening. The knowledge on basic agricultural practices has significant impact upon level of home gardening.

Assistance provided by the government has significant impact upon the grades obtained for home gardening. Government assistance on improving home gardening has been more accessible for high grade home gardens than for the lower grade home gardens. Women participation has a significant impact upon the level of home gardening. This findings has been confirmed by previous studies. According to Marsh (1998), even where women play a primary role in

home gardening, it can be important to involve the entire family in projects to promote home gardening. Pest and disease problem has a significant impact upon the level of home gardening. This result highly relates with previous findings on similar studies. According to an assessment on the benefits and constraints of home gardening in the Neighborhood of the National Horticultural Research Institute of Nigeria, insect attack ranked first among constraints confronting the garden owners as indicated by 39.7 per cent of the respondents.(F. Olajide-Taiwo B., 2010) Based on the above factors, following constraints can be identified with regard to developing home gardens for enhancing household food security. Pest and disease problem, damage due to wild animals, low proportionate use of land and lack of appropriate guidance at different stages of home garden can be concluded as limitations for food production in home gardening.

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