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## A study on nutritional security and economic empowerment of women through homestead nutrigardens in Nellore district of Andhra Pradesh

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### Abstract

This study evaluates the benefits of homestead nutrigardens on nutritional security and economic empowerment of women. The ten households were randomly selected in adopted villages (Devispeta, Veguru, Amamcherla, Nellore district, Andhra Pradesh, India) and provided the Nutrigarden kits (Vegetable and Green Leafy Vegetable seeds) for conducting Front line demonstration (FLD) and expert suggestions were given to women for management of pests and diseases by using organic pesticides and fungicides. The parametrical data was collected in every 30 days for a period of six months. The results showed that the average vegetable consumption of households was about  $18.5 \pm 0.52\text{kg/month}$  and after the experiment vegetable consumption was increased and ranged between 34 and 38kg/month. The average income of the selected households was  $9380 \pm 4208.03$  rupees/month without any homestead vegetable farming. After the experiment the average income of the households was increased ( $10694 \pm 4194.70$  rupees/month). The average income generated from homestead vegetable garden was about  $1314 \pm 31.04$  rupees/month). The significant difference ( $p < 0.001$ ) was observed in income and vegetable consumption of households. Availability of vegetables and income were increased as a consequences nutritional security and economic empowerment of women were attained in households.

**Keywords:** Homestead nutrigarden, nutritional security, economic empowerment

### 1. Introduction

Governments and donators increasingly target women as important agents for promoting sustainable agricultural food production, enhancing household nutritional security, protecting the environment and developing the socioeconomic status of the family (Narayana *et al.*, 2019)<sup>[6]</sup>. In India, number of projects are designed without due considerations of women's life and other conditions such as productive and reproductive roles and as a consequences for women's work burdens, availability of time and local disparities, gender disparities and nutritional imbalances may intensify. Further, even project related to women empowerments in one area do not translate her capacity to take decisions, choices and power relations in other area of women's life.

The protein-energy malnutrition is a major problem due to the limited availability of sources, and other socioeconomic conditions. The plant protein sources can be used as a remedial tool for eradication of nutrient deficiency (Guleria *et al.*, 2017)<sup>[2]</sup>. National Institute of Nutrition, Hyderabad has recommended 300g. Vegetables including 120g. Green leafy vegetables, 90g. Root vegetables and 90g other vegetables/capita/day to combat malnutrition. In rural India, women tend to have high rates of under nutrition, are more than twice as likely as men to be anaemic, tend to eat least and last and absorb a disproportionate share of shocks. Studies that measure empowerment in different areas suggest that the linkage between economic empowerment and nutritional wellbeing are complex, particularly in rural contexts. Women's empowerment and child stunting remain key development challenges in society (Holland & Rammohan, 2019)<sup>[4]</sup>.

Agriculture based approaches are increasingly being propagated for tackling micronutrient malnutrition and women's empowerment in agriculture influences choices made in the realm of agriculture itself, it can also influence nutritional outcomes of the family. Women can play a crucial role in the alteration of intra-household dynamics that can result in improved health and nutrition outcomes especially for children. Food-based approaches are essentially aimed at increasing the bioavailability of the concerned micronutrients. 'Bioavailability is defined as the amount of a nutrient that is potentially available for absorption from a meal and once absorbed,

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utilized for metabolic process in the body (Gupta *et al.*, 2019) [3].

Food Policy in India has been centred on calorie consumption as the primary means of achieving food security. Prior to 1970's, staple food availability and price stability were major concerns which led to an emphasis on self-sufficiency in food production. Large scale food availability and price stability were major concerns which led to an emphasis on self-sufficiency in food grain production. Large scale productivity gains and self-sufficiency in food production (Pingali *et al.*, 2017) [7].

According to the Food and Agricultural Organization of the United Nations (FAO), food security exists when “all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy, energetic and active life”. This definition includes four main dimensions of food security, namely availability, access, utilization, and stability (Schleifer & Sun, 2020) [8]. By following this definition, we can infer that food insecurity means one or more of these constituents is/are compromised. In total world population, 43% of labour force comprises women only and globally gender disparity is the major problem. So there is a necessity to empower women to enhance the rights to minimize the problems and increase the self-confidence. Food Security and nutritional security and socioeconomic status of the household can be improved by women empowerment.

Vegetables and green leafy vegetables are rich sources of macro and micro-nutrients helps to control malnutrition in underdeveloped and developing countries. According to estimates, women can minimize the undernourished population by 95-100 million people globally by acting as food producers and caretakers to ensure household food security and nutrition. In spite of the involvement in managing and providing food security to households, women still fall into the group of people who are vulnerably disempowered from the economic and social perspectives in the society. They also cannot speak out for their privileges, especially land rights. Assuring women's equal rights to land, water and other resources, is necessary for raising agricultural productivity and securing food and nutrition (Aziz *et al.*, 2020) [5]. Therefore, the present study was undertaken to empower the women for economic and nutritional security through the homestead nutrigardens at household-level

**2. Materials and Methods**

**2.1. Study Area**

A Front line Demonstration (FLD) experiment was conducted by Krishi Vigyan Kendra, Nellore (ANGRAU) in small households of its adopted villages Devispeta, Veguru, Amamcherla which are located in Nellore district, Andhra Pradesh (AP). Ten households were randomly selected for evaluation of benefits of homestead nutrigardens based on willingness to participate in the experiment to that women distributed vegetable and green leafy vegetable seeds (Rs 250/-) (Table-2), 0.01 hectare area was used for vegetable plantation and given experts suggestions to women to control insects and pests using organic fertilizers like Neem oil, different kinds of kasayams (Garlic, Ginger, Green chilli Solutions) etc., Six months monthly follow-up visits were done to obtain parametrical data.

**2.2. Survey Design and Data collection**

Information obtained from the survey included the following:

1. Characteristics of household head (gender and educational level) and socioeconomic profiles (average age, family size, income and location).
2. Vegetable plantation (i.e. area, species, labour input and expenditure cost).
3. Contributions of Vegetable plantation (i.e. proportion of vegetable diet coming from homestead plantation).
4. Vegetable yield.
5. Vegetable consumption.
6. Cost of the vegetables.

**2.3. Statistical Analysis**

All the values are expressed as mean ± standard deviation. Graph Robot, is a free web app for plotting and statistical analyses and used in this study for calculation of mean, standard deviation and plotting graphs. Significant differences between means were determined by the t-test paired comparison test procedure at the 0.001% significant level.

**3. Results and Discussion**

**3.1 Profiles of Participating Households**

The socio demographic variables selected for the research study were as age, educational qualifications; income of the family, family size, occupation, marital status and the data was presented in table 1.

**Table 1:** Socio demographic variables of Families

S.No	Age (yrs)	Number (%)	S.No	Educational Qualification	Number (%)
1	21-35	2 (20%)	4	Below 5 <sup>th</sup>	5 (50%)
	35-45	6 (60%)		primary	2 (20%)
	45-55	2 (20%)		Secondary	3 (30%)
Total		10 (100%)	Total		10 (100%)
S.No	Income (Rs/Month)	Number (%)	S.No	Occupation	Number (%)
2	Below 5000	3 (30%)	5	House wives	3 (30%)
	5000-10000	5 (50%)		Farmers	6 (60%)
	10000-15000	1 (10%)		Business	1 (10%)
	Above 15000	1 (10%)		Teachers	0 (0%)
Total		10 (100%)	Total		10 (100%)
S.No	Marital Status	Number (%)	S.No	Family Members	Number (%)
3	Married	9 (90%)	6	2-4 members	9 (90%)
	Widow	1 (10%)		Above 4	1 (10%)
Total		10 (100%)	Total		10 (100%)

Table- depicted that the low income, gender disparities, lack of educational qualifications, lack of knowledge, lack of self-confidence, lack of sources, lack of accessibility and availability of foods for the households. The recent research

studies revealed that the households' socio demographic variables greatly affect the socioeconomic status, nutritional security and economic empowerment of households.

**Table 2:** Total Yield of Vegetables for six months after Established Nutrigarden

Expenditure incurred (Rs) at initial	Parameters	Vegetables Yield (kg) & Cost (Rs)			
		For Month (Kg)	Cost (kg-Rs 20/- (approx))	For Six months (Kg)	Cost (kg-Rs 20/- (approx))
Rs 250/-	Household consumption (4 no)	35	700	210	4200
	Selled Vegetables kg-Rs 20/- (approx)	30	600	180	3600
Total Yield vegetables		65	1300	390	7800

The average vegetable yield for month was 65 kg (Table-2) from that consumed household purpose 35kg/month (saved 700 rupees/month) and sold 30kg/month (earned 600 rupees) for month from nutrigarden. The participating household women were with an average age (Table-3) of 43.7±6.51 years old. 90% of household heads were men and received little education. The household's average income was 112560±50496.47 rupees/ annum.

If food is actually or potentially present, another key question is whether or not households and individuals have sufficient access, namely whether they have adequate resources or entitlements to acquire appropriate food for a nutritional diet. This dimension relates to the purchasing power of consumers and the evolution of real incomes and food prices, but also includes traditional rights to land or other common resources for food production. Accordingly, certification may impact both positively or negatively individuals' or households' access to food by changing their income or land rights. The third dimension is food utilization, which refers to whether or

not households are maximizing the consumption of adequate nutrition and energy. Sufficient energy and nutrient intake requires good care and feeding practices, food preparation, dietary diversity, and intra-household distribution of food. Hence, utilization determines the nutritional status of individuals (Schleifer & Sun, 2020) [8].

**3.2. Impact of homestead nutrigarden on economic empowerment of women**

The average income of the selected households was 9380 ± 4208.03 rupees/month without any homestead vegetable plantation. After the experiment the average income of the households was increased (10694 ± 4194.70 rupees/month). The average income generated from vegetable garden was about 1314 ± 31.04 rupees/month (Table 3). There was a significant difference ( $p < 0.001$ ) in an income of the households with the impact of homestead vegetable garden (fig 1).

**Table 3:** Vegetable Consumption and income of families before and after establishment of Homestead Nutrigarden

No. of Families	Vegetable consumption rate before experiment (kg/month)	Vegetable consumption after experiment (kg/month)	Age of women	Total vegetable yield (kg/month)	Average Cost - Kg@20/- Total amount	Monthly income of the family before experiment	Monthly income of the family after experiment
1	18	34	35	68	1360	4800	6160
2	18	34	34	65	1300	4700	6000
3	18	35	45	68	1360	4500	5860
4	19	35	42	64	1280	9500	10780
5	19	35	44	64	1280	9500	10780
6	19	35	43	68	1360	9500	10860
7	19	35	40	65	1300	9800	11100
8	19	35	45	65	1300	8500	9800
9	18	38	54	65	1300	14500	15800
10	18	35	55	65	1300	18500	19800
Mean	18.5	38	43.7	65.7	1314	9380	10694
SD	0.52	1.10	6.51	1.55	31.04	4208.03	4194.70

Values are expressed as mean ± sd and mean differences were calculated by t-test (paired comparison) at 0.001% significant level

Income is the main factor affecting the households in various activities of women's welfare such as decision making choices, self-confidence, and utilization of resources, freedom, and socioeconomic status of the households. Household wealth is associated with three indicators but not in a consistent way: women in wealthier households have less influence in decision making and also feel that their opinion is relatively less important, but are more likely to have access to cash to spend (Mahmuad *et al.*, 2012) [5]. Studied the measurement of women's empowerment in rural Bangladesh and concluded that women's empowerment is a dynamic process that can be quantified, measured, and described in a variety of ways. A woman's years of schooling are significantly associated with one of two self-esteem indicators and with freedom of mobility. Household wealth has a

significant and positive association with a woman's resource control but a significant negative association with her total decision making score. A review of the differential effects of economic transfers to women versus men on household labour force participation, investment decisions, and child health and education outcomes can be found in society. While women's empowerment in agriculture influences choices made in the realm of agriculture itself, it can also influence nutritional outcomes. Women can play a crucial role in the alteration of intra household dynamics that can result in improved health and nutrition outcomes especially for children. This is driven, globally, by a change in their control of income, decision making power, access to health services and nutrition education while recognizing constraints of time and resources faced by them (Gupta *et al.*, 2019) [3].

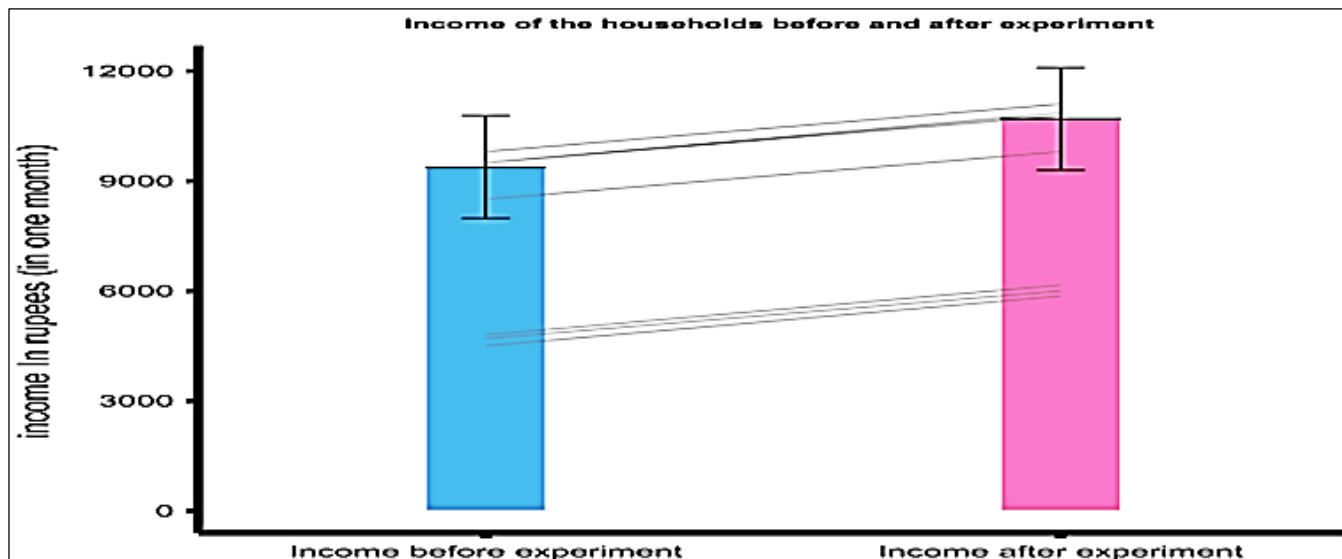


Fig 1: Income of the households with mean bars and standard deviation error bars

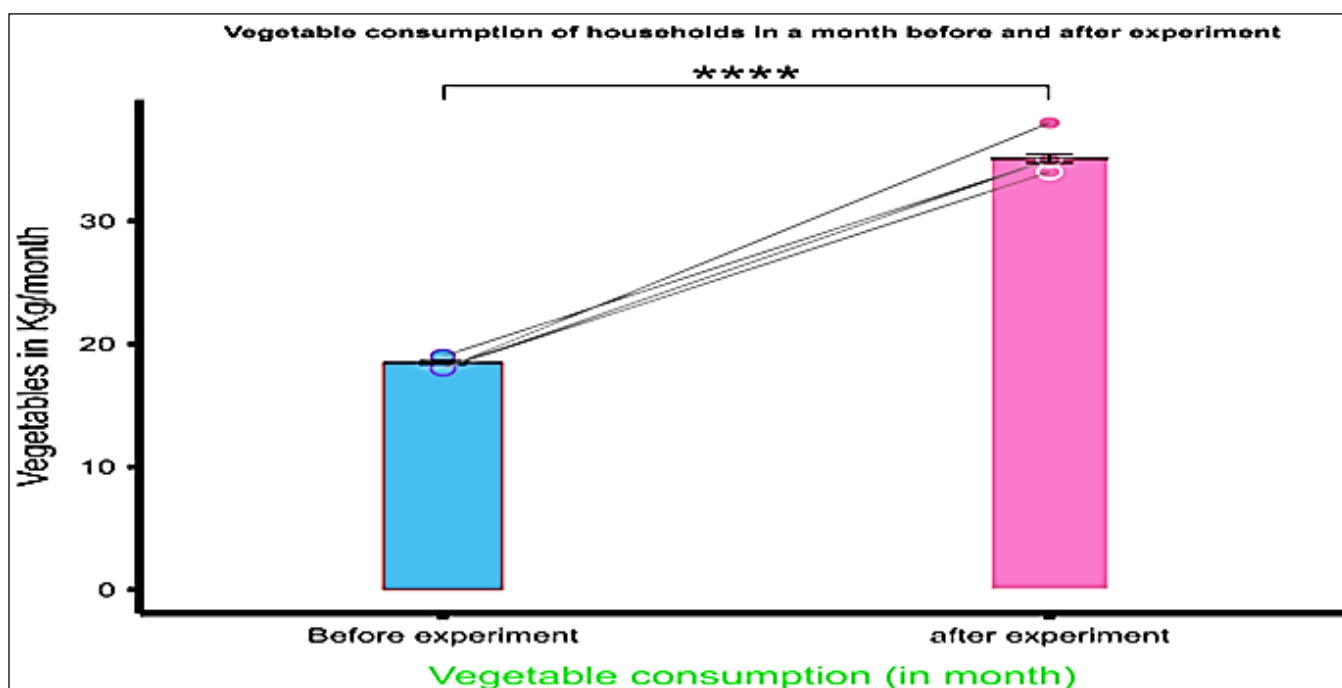


Fig 2: Vegetable consumption of households with mean bars and standard deviation error bars (Significant differences at 0.001% level)

**3.3. Impact of Homestead Nutrigarden on Nutritional Security of Households**

The average vegetable consumption of households was about  $18.5 \pm 0.52$  kg/month and after the experiment vegetable consumption was increased, and ranged between 34 and 38 kg/month (Table 3). There was a significant difference ( $p < 0.001$ ) in vegetable consumption in households before and after the establishment of vegetable nutrigarden (fig 2). According to FAO and WHO the average per capita consumption of vegetables was about 400 mg per day/person. It is very difficult to meet these requirements for low income households. The vegetables and green leafy vegetables used in the homestead nutrigarden were presented in table 4. These results showed that the nutritional security was attained with increased availability of vegetables and green leafy vegetables

in households with reasonable price rates. Before the experiment there were number of barriers for availability and price of the vegetables for households.

Low fruit and vegetable consumption is a key contributor to all forms of malnutrition. Health and food quality were primarily seen through a food safety lens and negative aspects were frequently attributed to increased pesticide use. Availability, reasonable price and affordability of fresh fruit and vegetables were important drivers of their acquisition and consumption. Promoting communal gardens may increase the availability of affordable fruit and vegetables. Financial incentives would likely be effective in increasing consumption of fruit and vegetables (Surendran *et al.*, 2020) [10].

**Table 4:** List of vegetables and green leafy vegetables used in homestead nutrigarden

S.No	Name of the Vegetables	Before Established Home Stead Nutri-garden				After Established Home Stead Nutri-garden			
		Daily	Weekly	Fort night	Monthly	Daily	Weekly	Fort night	Monthly
1	Bendi		once				Thrice		
2	Beans			once			Thrice		
3	Clusturd beans			once			Twice		
4	Brinjal		once				Thrice		
5	Ridge gourd			once			Once		
6	Bottle gourd				once		Once		
7	Bitter gourd				once		Once		
8	Colocasia		Twice				Twice		
9	Amaranth			once			Thrice		
10	Chirrikoora			once			Thrice		
11	Gogu			once			Thrice		
12	Palak				Once		Thrice		
13	Coriander leaves		occasionally			Daily			

One definition of women's empowerment is "an expansion in the range of potential choices available to women so that actual outcomes reflect the particular set of choices which the women value". Empowerment is also seen as the process by which the powerless gain greater control over their lives, gaining power not over others but to achieve goals and ends. Thus, exercising choice is seen as gaining power. While the process of empowerment is applicable to both sexes, it is more relevant for women since women's disempowerment is more pervasive as it cuts across class and other social distinctions, and is made more complicated by the fact that household and intra-familial relationships are a major source of women's powerlessness (Mahmud *et al.*, 2012) [5].

Homesteads vegetable productions, the important part of rural settlements, are a multifunctional compound space for rural households to produce, live, entertain and communicate. It occupies the core of the interaction of the Human-Earth system in rural areas (Su *et al.*, 2019) [9]. The low consumption of fruits and vegetables increased the risk chances of protein-energy malnutrition, vitamin deficiencies, cardiovascular diseases, obesity and cancer. According to the WHO/FAO nutritional guidelines recommended that the consumption of fruits at two servings and three servings of vegetables per day. The low income households need to spend half income to follow these nutritional guidelines, and therefore in our research the availability of vegetables and green leafy vegetables were increased with reasonable price by using homestead nutrigarden and thereby extra income was generated to change socioeconomic status of families and to meet the recommended nutritional guidelines.

#### 4. Conclusion

Promotion of home gardens as an eco-friendly sustainable agricultural practice to improve Nutritional security and enhance economic growth. Home gardens fulfill social, cultural and economic needs, while providing a number of ecosystem services. In the wake of a global food crisis and the soaring food prices, there has been increased emphasis on enhancing and building local food systems. Household women face many obstacles that spoil their welfare. Insurances that seek to empower them, for example, by amending livelihood opportunities, often do not transform into meliorations in other areas, notably in their nutritional status. Indeed, many existing measures of women's empowerment have equivocal associations with indices of nutritional status. This is likely because existing Operationalization of empowerment often focus on aspects

that are somewhat lateral from factors that influence nutrition. In this context, there is renewed attention to food production and livelihood enhancement through home gardens. Recognizing the value and potential of home gardens for enhancing food security and livelihoods, numerous initiatives have been launched by governmental organizations in India that are providing support and building local capacity to enhance the productivity and also for scaling up home garden activities.

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