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Establishment of Nutri garden: An holistic approach towards nutritional security

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Abstract
Malnutrition among Indian subcontinent is prominently seen, and the rural sector is the major victim of hidden hunger. Several programme concentrating on the issue has been continuously targeting to overcome the issue. Krishi Vigyan Kendra, Kalyandurg under the Frontline demonstration carried out intervention in Nijavalli village of Kundurpi Mandal, Anantapur District, Krishi Vigan Kendra, Kalyandurg Jurisdiction. Present intervention was planned and targeted towards the economically backward area. Which was studied in context with the other control village where the Frontline demonstration has not been carried out. Meticulous studying of the result of the intervention was carried out and it was found that Nutri garden intervention along with nutrition education with appropriate measure for the management will not only benefit the family in terms of nutritional security but also aids in generation of additional income.

Keywords: Balanced diet, malnutrition, Nutri-garden, nutrition education, nutrients, under nutrition

Introduction
Nutrition plays a very crucial role in the well-being of any living organism. Nature and nurture play an important role in determining the health of a living being (vikaspedia) [4]. Although India might have achieved food security to a greater extent, but the nutritional security is still a constraint. Hidden hunger is prevalent and the facet of it revealing that approximately one in two children is undernourished (Mahendra and Alakh 2010) [7]. Many governmental and voluntary agencies are taking several steps to address the issue. Nonetheless, the reachability is still limited. Maternal undernutrition plays a crucial role in influencing maternal, neonatal and child health outcomes (Mason *et al*., 2012) [8]. Women nutrition is determinant for the birth outcomes, undernutrition in children and stunting rates in young children. Undernourishment and biologically immature mothers tend to give birth to low-birth-weight children. It is imperative that measures for improving nutritional situation in the country are given utmost priority (NHRM report) [10]. The prevalence rate of undernutrition in women is much higher in rural areas (40.6%) compared to urban regions (25%) (Vir Sheila C. and Malik Richa, 2015) [12]. The undernutrition rates in women in low wealth index is almost three-fold higher compared to highest wealth indexed countries. Moreover, unlike Nigeria and Ethiopia, a substantial and sharp decrease in undernourished prevalence rate of women is observed in India with increase in wealth quintile (Black *et al*., 2013) [1]. Most nutritional guidelines recommend the consumption of at least two servings of fruits and three servings of vegetables per day (WHO/FAO) [6] (World health report) [12]. Majority of which does not meet the recommended daily allowance (Del G, *et al* 2015) [2] (Murphy 2014) [9].
The economically weaker section and rural people are mainly affected. Due to greater market distant and due to unavailability and due to higher cost, the families residing in rural areas concise themselves to whatever available in the vicinity (Victoria et.al., 2016) [14]. This results in limited variety of consumption of fruits and vegetable which are the main source of vitamins and minerals. Establishment of nutri garden in household ensures the continuous supply of variety of vegetables sufficient to a family as well as the excess produce can be sold for which can be an additional source of income. As women in the family plays important role in the maintaining nutrition of the family, the intervention was ascertained to the housewife. Hence the present study was planned with the objective to educate the families, to establish nutri garden and to record outcome of it.

Materials and Methods

The adopted village of Krishi Vigyan Kendra, Kalyandurg, Anantapur District, of Acharya N G Ranga Agricultural University was selected for the study. The study was carried out in the Nijavalli village of Kundurpi Mandal, and Dasampalli village, Kalyandurg mandal of Anantapur District in 2021-22. Totally 30 families of low-income groups were selected from Najavalli village for intervention and distributed Nutri Garden seed kit procured from NHRDF (National Horticultural Research and Development Foundation), Kurnool. The 15 farm families of Dasampalli village were selected for control where most of the farm women doesn't have nutrigarden in their backyard. The kit consists of 18 different types of vegetables and fruits seed/plant including seeds of leafy vegetable of 4 varieties and Cucurbits of 3 varieties and other vegetables of 5 varieties and plants of 6 fruits (papaya, sapota, lemon, sweet orange, custard apple and guava). The families were also educated and enlightened about the importance of Vitamins and minerals and its rich sources. They were also trained in management of nutri garden. After the intervention the yield of the crop was recorded, and consumption was noted. The consumption of the produce was recorded by 24 hours recall method. The knowledge level was also tested.

Results and Discussion

Table 1: Demographic characteristics of the population studied

Age Group	Female	Male
60-80	3	10
40-60	11	12
25-40	15	12
6-25	19	12
0-5	10	8
Total	58	54

Table 2: Occupation of the family

n= 45	
Occupation	**No. of families**
Agriculture	45
Poultry	26
Dairy	17
MGNREGA/ agriculture labour	38
Horticulture	36

Table 3: Housing of Family

n=45	
Type of Housing	**No. of families**
Pucca house	11
Semi pucca	25
Kaccha house	9

Table 4: Education level of population

n=112						
Education	**Male**	**%**	**Female**	**%**	**Total**	**%**
No School	17	31.5	22	37.9	37	33.0
Primary (5th standard)	13	24.1	13	22.4	26	23.2
High school	13	24.1	12	20.6	27	24.1
Graduation	3	5.5	1	1.7	4	3.5
*Preschool/infants	8	14.8	10	17.2	18	16.1
Total	54		58		112	

Table 5: Recommended daily allowances of fruits and vegetables (ICMR-NIN, RDA 2020)

S. No.	Source of nutrition	Approx. quantity recommended in daily diet				
		Adult man	Adult women	Children	Adolescent girls	Infants 6-12 months
1.	Green leafy vegetables like coriander leaves, spinach, curry leaves, amaranthus, gogu, sorrel leaves, moringa leaves etc.	100 g	100 g	100 g	100 g	25 g
2.	Other Vegetables And – Cluster Beans, French Beans, Broad Beans, Lady's Finger, Tomato, Capsicum, Brinjal, Bitter Gourd, Ridge Gourd,	200g	200 g	100 g	200 g	25 g
3.	Roots And Tubers - Potato, Onion, Beetroot, Carrot, Radish, Sweet Potato	200 g	200 g	100 g	200 g	50 g
4.	Fruits -Guava, Papaya, Lemon, Banana, Pomegranate, Aonla, Custard Apple, Pineapple	100 g	100 g	100 g	100 g	100 g
5.	Medicinal plants like tulasi, aloe vera, moringa, turmeric	As per the requirement				

Table 6: Approximate quantity of fruits and vegetables required for the consumption by family with 4 members

Minimum area required for a family of 4 members (Family with 2 adults and 2 children). 150 - 200 sq meters or 5 cents		
	Per day	For 120 days
Adult man	600 g	72 kgs
Adult women	600 g	72 kgs
1st child	400 g	48 kgs
2nd child	400 g	48 kgs
Total requirement	2 kgs	240 kgs

Table 7: Nutri Garden yield /Month

Green leafy vegetables	Qty. in (Kgs)	Other Vegetables	Qty. in (Kgs)	Cucurbits	Qty. in (Kgs)	Roots and tubers	Qty. in (Kgs)	Beans	Qty. in (Kgs)	Other fruits and vegetables	Qty. in (Kgs)
Fenugreek	12.4	Tomato	30.4	Bitter gourd	13.5	Carrot	12.2	Cluster beans	15	Guava	4
Amamranthus	10	Brinjal	29	Ridge gourd	18	Radish	15.8	French beans	8.2	Drumstick	6
Spinach	7	Okhra	15	Cucumber	15.2	Sweet potato	15	Field beans	5.5	Papaya	8
Gogu	4	Chilli	6	Bottle gourd	19	Onion	20.3	Cowpea	4.5		
Coriander	6.8			Pumpkin	25						
Sorrel	15										
Curry leaf	5										
	60.2	0	80.4	0	90.7	0	63.3	0	33.2	0	18
		Total vegetable and fruits production/ Month									345.8

Table 8: Summarized production, consumption, sale of the produce

Particulars	Yield in Kgs
Green leafy vegetables	60.2
Other vegetables	80.4
Cucurbits	65.7
Roots and tubers	63.3
Beans	33.2
Other fruits and vegetables	18
Total	345 kgs
Particulars	Yield in Kgs
Green leafy vegetables	60.2
Other vegetables	80.4
Cucurbits	65.7
Roots and tubers	63.3
Beans	33.2
Other fruits and vegetables	18
Total	345 kgs

Table 9: Average production of vegetables per season per week

Average Production of vegetables per week (Kharif)				
Crop	**Area (Sq m)**	**Production (Kg)**	**Consumption (Kg)**	**Sold (Kg)**
Brinjal	5.9	1.8	1.25	0.55
Tomato	6.5	1.85	1.2	0.65
Clusterbeans	7.05	1.95	1.1	0.95
Lady's finger	7.3	2.05	1.4	0.65
Bitter gourd	6.4	1	0.6	0.5
Ridge gourd	6.6	1	1	0
Bottle gourd	6.1	1.35	1	0.35
*Methi	2.5	2-3 bunches	2-3 bunches	0
*Gongura	2.5	2-3 bunches	1-2 bunches	1 bunch
*sabbaku	1.7	2-3 bunches	2-3 bunches	0
*Palakalaku	1.7	2-3 bunches	2-3 bunches	0
Bachhali	1	0.2	0.2	0
Coriander	2	0.2	0.2	
*Chukkakura	2	2-3 bunches	1-2 bunches	1 bunch
Chilli	2	1	0.5	0.5
Average Production of vegetables per week (Rabi)				
Crop	**Area (Sq m)**	**Production (Kg)**	**Consumption (Kg)**	**Sold (Kg)**
Brinjal	6	2	1.5	0.5
Tomato	6.5	2	1	0.5
Chilli	2	1	0.5	0.5
Carrot	5.7	2.6	1.5	1.1
Beetroot	5.7	2.6	1.4	1.2
Potato	1	3	3	0
Radish	5.7	3	1.5	1.5
Cluster beans	5	3	2	1
Lady's Finger	5	3	3	0
Bitter gourd	6.4	1	0.6	0.4
Ridge gourd	6.6	1	1	0

Bottle gourd	6.1	1.35	1	0.35
*Methi	2.5	2-3 Bunches	2-3 Bunches	0
*Gongura	2.5	2-3 Bunches	1-2 Bunches	1 Bunch
*sabbaku	2	2-3 Bunches	2-3 Bunches	0
*Palakalaku	2	2-3 Bunches	2-3 Bunches	0
Bachhali	1	0.2	0.2	0
*Chilakura	1	0.2	0.2	0
*Dantiaaku	2	1-2 Bunches	1-2 Bunches	0
*Chukkakuira	2	2-3 Bunches	2-3 Bunches	0
Average Production of vegetables per week (Summer)				
Crop	**Area (Sq m)**	**Production (Kg)**	**Consumption (Kg)**	**Sold (Kg)**
Tomato	7	1.5	1	0.5
Cucumber	4	2	2	0
Bottle gourd	6.1	1.5	1	0.5
French beans	4	2	2	0
Cluster beans	5	3	2	1
Cowpea	5	3	2	1
Brinjal	6	2	1.5	0.5
Onion	4	2	2	0
Palakalaku	2	2-3 Bunches	2-3 bunches	0
Chukkakura	2	2-3 Bunches	2-3 bunches	0
Gongura	2	2-3 Bunches	2-3 bunches	0
Menthi	3	2-3 Bunches	2-3 bunches	0
Ridge gourd	6	1	1	0
Bitter gourd	6	1	1	0
Pumpkin	1	1	1	0

*Vegetables values are mentioned as per the locale consumption and sales practice.

Table 10: Average savings in expenditure on vegetables and fruits due to Nutri garden (Rs./Month) as recorded from the respondent

Average savings in expenditure on vegetables and fruits due to Nutri garden (Rs./Month)			**Utilization of savings in Rs./Month (Due to nutri-garden)**			
Fruits	**Vegetables**	**Total**	**To buy other fruits**	**To buy nutritive cereals**	**To buy pulses**	**Miscellaneous (Mutton, fish, milk, groceries, saving)**
300	2850	3150	650	1800	500	200

Table 11: Comparative yield of vegetables for demo and check

Yield (Kg)		**% change in yield**	**Economics of demonstration (Rs./ha)**				**Economics of check (Rs./ha)**			
Demonstration	**Check**		**Gross Cost**	**Gross Return**	**Net Return**	**BCR (R/C)**	**Gross Cost**	**Gross Return**	**Net Return**	**BCR (R/C)**
345.8	190	82	7652	13045	5373	1.95	5627	8475	1848	1.27
t test (p value) < 2.2e-16 (difference of means is highly significant)										

Demographic Information

The selected sample consists of 58 female and 54 males. Including age group from 1day to 80 years. Totally 18 infants, 31 persons under 25 years were present. Totally 18 women under study were lactating mothers and 25 pregnant women were considered under the study. Principle occupation of the participants is Agriculture, and they have subsidiary occupation through daily wages from working in agricultural fields or MGNREGA. Majority of the participants i.e., 55% are residing in semi pucca house whereas 25% are residing in Pucca house and 20% are residing in Kachha house (Table 1 & 3).

Majority has left the school after the Primary and majority have the educational qualification less than 5th standard. The 56.2% of the participants have either have gone upto primary schooling or does not even went to school. 27.6 Per cent people includes people completed their higher schooling (24%) or graduation (3.5%) (Table 4).

Average annual income of the family ranges from 2.5 to 3.5 lakh. 2% of the farmers having small and medium farmers are earning more than 3.5 lakh per annum upto 6 lakh.

The average requirement of vegetables for a family consists of 6 members is around 2 kgs which can be grown in an area of about 150 – 200 sq m. Total vegetable produced in a 5 cents area/ month is around 345 kg which after meeting the daily needs of the family remains and excess produce aids in the generation of additional income. The additional income is used for the procurement of other fruits, nutritive cereals, and meat etc. The nutri garden is cultivated throughout year for the continuous supply of vegetables. The farmers were trained to utilize vegetable and other organic waste for its utilization to make the *vermi* compost and has also been provided the fabric structure of vermicompost. The farmers cultivating the nutri garden without any use of chemical fertilizers and pesticides.

Compared to control, it is observed to be more than 80% increase in the yield of the vegetables and benefit ratio of the demo comes up to be nearly 2 (Table 10 & 11). The Nutri Garden ensures the family to have wholesome nutrition and it also aids in generating direct (through selling of excess produce) and indirect income (from purchasing from the market) for the family.

Distribution of nutri garden kits to farmers and farm women

Nutri garden pot

Nutri garden plot

Conclusion

Nutrition plays very key role in maintenance of health. It is important in all stages of life of human being. It has very important role especially for Pregnant, lactating. Women in Rural and economically backward are very much prone to malnutrition during the crucial period. Addition to this the early marriage and repetitive pregnancies without much gap led to severe malnutrition. Which is again becomes vicious cycle of malnutrition as the malnourish women tend to give birth to the malnourished child. Nutri garden were demonstrated in the village for the benefit of the rural family especially economically backward family. It was conducted in three phases

1. Selecting the beneficiaries.
2. Creating awareness and educating them for management of the nutri garden.
3. Demonstrating and recording the yield, consumption and additional income generated from it. The Nutri garden demonstration has a positive impact and the beneficiary family are benefited by having nutritious food along with the additional income. The additional income thus generated from the sale of excess produce were utilized for miscellaneous activities. This aids in improving the nutritional status of the family henceforth beneficial ensuring the wellbeing of the family especially women and children of the family. It aids not only in ensuring family nutrition but also empowers women.

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